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November 7, 2012

Mr. Gary Hooser
Office of Environmental Quality Control
State of Hawai`i
235 S. Beretania Street, Room 702
Honolulu, Hawai`i 96813

Mr. Jiro Sumada, Acting Director
Department of Planning and Permitting
City and County of Honolulu
650 S. King Street, 7th Floor
Honolulu, Hawai`i 96813

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OFC. OF ENVIRONMENTAL QUALITY CONTROL

Dear Mr. Hooser and Mr. Sumada:

Simultaneous Filing of
Draft Supplemental Environmental Impact Statement
For Turtle Bay Resort Expansion

On behalf of Turtle Bay Resort, LLC, I hereby transmit the documents package for the Draft Supplemental Environmental Impact Statement (SEIS) for the proposed Turtle Bay Resort Expansion project. The proposed action is situated on property identified as TMK 5-6-003:por.1, por. 3, por. 10, por. 17, por. 26, 33, 40-42, 44, 46, 48, 49; 5-7-001:1, 16, 17, 20, 22, 30, 31, 33; 5-7-003:72; and 5-7-006:1, 2, 22, 23. It is located in the district of Ko`olau Loa on the island of O`ahu.

I request that a Notice of Availability for Public Comment be published for 45 days in the next available edition of the Environmental Notice (November 23, 2012). The Draft SEIS includes copies of all written comments received during the early consultation process and during the 30-day public consultation period for the EA/Supplemental EISPN.

Also enclosed is a distribution list for verification of OEQC under Section 11-200-20, Hawai`i Administrative Rules. Upon receiving verification from OEQC (along with the bulletin proof of the notice containing the pertinent details for commenters), we will make the Draft SEIS and bulletin proof available to those so indicated on the distribution list so that they will have the full 45-day statutory period to review and comment on the Draft SEIS.

Finally, enclosed for OEQC are a completed OEQC Publication Form, two printed copies of the Draft SEIS, an Adobe Acrobat PDF file of the same, and an electronic copy of the publication form in MS Word. Simultaneous with this letter, we have submitted the summary of the action in a text file by electronic email to the OEQC.

Enclosed for DPP are a completed OEQC Publication Form, three (3) printed copies of the Draft SEIS, and eight (8) copies of the PDF file of the same.

If you have any questions or require any additional information, please call me at 382-3836.

Very truly yours,

Lee Sichter
Lee Sichter LLC

Enclosures

Publication Form
The Environmental Notice
Office of Environmental Quality Control

Instructions: Please submit one hardcopy of the document along with a determination letter from the agency. On a compact disk, put an electronic copy of this publication form and a PDF of the EA or EIS. Mahalo.

Date:	November 7, 2010
Title of Action:	Proposed Expansion of Turtle Bay Resort
Type of Document:	Supplemental Draft Supplemental EIS
Name of Project:	Turtle Bay Resort Expansion
Type of Document:	Draft Supplemental EIS
Name of Applicant:	Turtle Bay Resort, LLC
Address:	57-091 Kamehameha Highway
City, State, Zip:	Kahuku, Hawai`i 96731
Contact and Phone:	Mr. Drew Stotesbury, (808) 447-6951
Consultant:	Lee Sichter LLC
Address:	45024 Malulani Street #1
City, State, Zip:	Kane`ohe, Hawai`i 96744
Contact and Phone:	Lee Sichter, (808) 382-3836
Approving Authority:	Department of Planning and Permitting
Address:	650 South King Street, 7th Floor
City, State, Zip:	Honolulu, Hawai`i 96813
Contact and Phone:	Ms. Sharon Nishiura, (808) 768-8031
Island Affected by Action:	O`ahu
TMK:	5-6-003:por.1, por. 3, por. 10, por. 17, por. 26, 33, 40-42, 44, 46, 48, 49; 5-7-001:1, 16, 17, 20, 22, 30, 31, 33; 5-7-003:72; 5-7-006:1, 2, 22, 23
Street Address:	Turtle Bay Resort, 57-091 Kamehameha Highway, Kahuku, Hawai`i 96731
Nearest Geographical Landmarks:	Turtle Bay & Kahuku Point
Latitudinal/Longitudinal	

Coordinates: Latitude 21.41.51.3162; Longitude -157.59.32.2146

Statutory/Administrative Authority: Chapter 343, HRS & Section 11-200-26, Hawaii Administrative Rules

Project Summary:

This document supplements the Kuilima Resort 1985 Revised Final EIS to address current plans to expand the existing Turtle Bay Resort. The new Proposed Action represents an over 60% reduction in density from the 1985 EIS. It limits new hotel development to two new hotels, totaling 625 units, centrally located near the existing hotel; a 75% reduction in the number of hotel units proposed in 1985. It includes 590 new resort-residential units; 160 community housing units that will be priced to be affordable to residents of the region; 73 acres of park area; 12 new public shoreline access ways; shoreline setbacks in excess of requirements ranging from 150 to 300 feet; a new resort entrance; improvements to Marconi Road; a new Equestrian Center; a Farmers Market; and a low-density resort commercial area called the Gathering Place. Proposed for development over an 11-year period (2014-2025), it will create a cumulative total of over 8,700 construction jobs. At build out, the Proposed Action will generate over 1,500 on-going operational jobs on-site. The Proposed Action enhances the previously proposed expansion in the 1985 EIS by committing to significantly less density and a more culturally and environmentally sensitive approach to development.

Form Preparer: Lee Sichter LLC
Address: 45024 Malulani Street #1
City, State, Zip: Kane`ohe, Hawai`i 96744
Contact and Phone: Lee Sichter, (808) 382-3836

DISTRIBUTION LIST
FOR TURTLE BAY DRAFT SUPPLEMENTAL EIS

Copies of the Draft SEIS (either in printed or digital format) will be submitted to the following agencies, organizations, and general public for review, as required by the OEQC. Please note that in an effort to save paper, we have advised all consulted parties that the Draft SEIS will also be available on a website entitled www.turtlebayseis.com

In addition to the parties listed below, all parties who submitted substantive comments on the EA/SEISPN will be notified prior to the publication date that the Draft SEIS will be available on the aforementioned website, and they will also be given the option of receiving a printed copy of the document or an electronic copy on a compact disc.

Federal Agencies
Department of the Interior, Geological Survey, Pacific Islands Water Science Center
Department of the Interior, Fish and Wildlife Service
Department of Commerce, National Marine Fisheries Service
Department of Interior, National Parks Service
Department of Agriculture, National Resources Conservation Service
Department of Transportation, Federal Aviation Administration
Department of Transportation, Federal Transit Administration
Commander, 14th Coast Guard District, U.S. Coast Guard

State Agencies
Office of Environmental Quality Control
Department of Agriculture
Department of Accounting and General Services
Department of Business, Economic Development and Tourism
DBEDT Research Division Library
DBEDT Strategic Industries Division
DBEDT Office of Planning
Department of Defense
Department of Education, Hawaii State Library, Hawaii Documents Center
Kaimuki Regional Library
Kane`ohe Regional Library
Pearl City Regional Library
Hawaii Kai Regional Library
Hilo Regional Library
Kahului Regional Library
Lihu`e Regional Library
Kahuku Public & School Library
Waialua Public Library
Waialua Public Library
Kaneohe Public Library

Department of Hawaiian Home Lands
Department of Health, Environmental Health Administration
Department of Land and Natural Resources
DLNR – Historic Preservation Division
Department of Transportation
Office of Hawaiian Affairs
University of Hawaii, Thomas H. Hamilton Library
University of Hawaii, Edwin H. Mo`okini Library
University of Hawaii, Maui College Library
University of Hawaii, Kaua`i Community College Library
University of Hawaii, West Oahu Library
University of Hawaii, Water Resources Research Center
University of Hawaii, Environmental Center
Legislative Reference Bureau

State Elected Officials
United States Senator Daniel K. Inouye
United States Senator Daniel Akaka
United States Representative Collene Hanabusa
United States Representative Mazie Hirono
Governor Neil Abercrombie
Senator Donovan Dela Cruz
Senator Clayton Hee
Representative Gil Riviere
Representative Jessica Wooley

City and County of Honolulu
Department of Planning and Permitting (Accepting Authority)
Board of Water Supply
Department of Customer Services
Department of Design and Construction
Department of Environmental Services
Department of Facility Maintenance
Department of Parks and Recreation
Department of Transportation Services

City and County of Honolulu Elected Officials
Council Chairman Ernest Martin
North Shore Neighborhood Board #27
Ko`olauloa Neighborhood Board #28

News Media
Honolulu Star Advertiser
Hawai`i Tribune Herald
West Hawai`i Today
The Garden Isle

Maui News
Moloka`i Dispatch

Public Interest Groups
Defend O`ahu Coalition
Ko`olauloa North Shore Coalition

General Public
D. Ward
Banksy (no last name provided)
Star Harthern
Steve Wolf
Amy Chiang
Carl Jerry Vasconcellos
Karen Turner
Linda Shea
Joseph Grassadonia
Angela (no last name provided)
Bill Sager
Bart Smith
Pamela Sue
Mary Bilger
Bill Quinlan
Scott Langford
Mark Mead
Milica Barjaktarovic
Edward J. Jones
Madeline Neely
F. Black
Jill Voeks
Bea Coffee
Sara (no last name provided)
Friends of Hauula
Joan Koff
Marilyn Cole
Neil Freeman
Joy Silver
David Druz
Jeffrey Mironov
Everett Magnuson
Maria Pacheco
Scott Langford
William Barrera

Paul Nelson
Beth Hyams
Adrian Izweriw
Mary Jo Buell
Emilia Perry
Tait Duryea
Edie Claire
Kathleen Pahinui
Maxwell Brick
Kainalu Hecomovich
Karen Banes
Elizabeth Nelson
Lynette Gehring
Odin Hill
Susan Cortes
Matt Kester
Garid (no last name provided)
Edward J. Jones
Sandy McClanahan
Randy Ching (Sierra Club)
Julie Cooke
Bonnie Corrigan
Sean Ginella
DeeDee Letts
Nancy McGovern
Justin Parker
Rob Barreca
Paul Nelson
Jess Snow
Creighton Mattoon
Cathleen Mattoon
Mike Dixon
Karen Turner
Everett Magnuson
Michael Schwinn
Ann Palacios
Elaine Hornal
Carl Higgins
Priscilla Magallanes
Jason (no last name provided)
Linda Shea
Paul and Judy Nelson
Sarah Cadiz (First Hawn Bank)

Lucky Cole
Jean and Mark Martinson
John Ritter
Eric Burton
Gil Riviere
Keep the North Shore Country
Tim Tybuszewski
Kent Fonoimoana
Raymond Beatty
Barbara Fisher
Stanley May
Mark Manley
Meleana Judd
Mike and Kathy Mociun
Bob Leinau
Choon James
Nancy and Mike McGovern
Kelly Viszolay
Brian Emmons
Nick Denzer
Tinker Blomfield
Aukai Ferguson
James O'Shea
Timothy Vanderveer
Henry Matson
Nick Marck
Bob Comeau
Andrea Anixt
Angela Huntemer

Draft Supplemental Environmental Impact Statement for

TURTLE BAY RESORT EXPANSION

Portions of Ahupuaʻa O ʻŌpana-Kawela, Ahupuaʻa O Hanakaʻoe, and Ahupuaʻa O Kahuku, Koʻolau Loa District, Island of Oʻahu

Volume One of Four

PREPARED FOR TURTLE BAY RESORT, LLC by LEE SICHTER LLC • NOVEMBER 2012

PREPARED FOR TURTLE BAY RESORTS, LLC by LEE SICHTER LLC • NOVEMBER 2012

Draft Supplemental Environmental Impact Statement for

TURTLE BAY RESORT EXPANSION

Portions of Ahupuaʻa O ʻŌpana-Kawela, Ahupuaʻa O Hanakaʻoe, and Ahupuaʻa O Kahuku, Koʻolau Loa District, Island of Oʻahu

This document is prepared pursuant to Chapter 343, Hawaiʻi Revised Statutes as amended, and Hawaiʻi Administrative Rules Chapter 200 of Title 11, Department of Health (environmental impact statement rules).

This document and all other ancillary documents were prepared under my direction.

Nov 2, 2012

Drew Stotesbury, CEO, Turtle Bay Resort, LLC *Date*

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EXECUTIVE SUMMARY:

INTRODUCTION

This Supplemental Environmental Impact Statement (SEIS) is being prepared pursuant to and in accordance with the requirements of Hawaii Revised Statutes, Chapter 343; Hawaii Administrative Rules, Chapter 11-200; and the ruling of the Hawaii Supreme Court in Unite HERE Local 5 et. al. v City and County of Honolulu and Kuilima Resort Company, Civil No. 06-1-0265 (2010). It is intended to supplement the 1985 Kuilima Revised Final EIS (hereinafter, "the 1985 EIS").

The Court decision was rendered just after a change of ownership of the Resort. Before beginning preparation of the SEIS, the new owners of the resort, Turtle Bay Resort, LLC, (TBR) initiated an extensive public outreach program for the purpose listening to the community's concerns and vision for the Resort. They also sought to identify key elements of a development plan for the resort that would reflect a balance of needs of the community, the investors and the environment. TBR also retained an expert team of local consultants to help prepare a new Comprehensive Plan for its properties. After a year of meeting with elected officials, agencies, private organizations, members of the general public, and *kūpuna* (elders); and as the result of extensive master planning efforts; the owners decided to significantly reduce the size, scope and area of the proposed resort expansion. The resulting efforts of the project team resulted in the formulation of the Proposed Action.

Because the 1985 EIS was limited to an analysis of the lands proposed for resort expansion (and did not include the existing hotel, condominium apartments, or mauka agricultural lands), the project team determined that the required SEIS would need to replicate the scope of the original document. Therefore, the Proposed Action, which is the subject of this SEIS is limited to the general area addressed in the 1985 document and now referred to as the SEIS Lands.

The SEIS enhances the 1985 EIS by recommending a more culturally sensitive approach and practical sustainable development and guidelines. The approach developed by the project team to inform the planning and development of the Proposed Action is called *Tomorrow's Ahupuaʻa*, which is detailed in the Striving for Sustainability document attached as Appendix A. *Tomorrow's Ahupuaʻa* provides a cultural framework for the resort expansion that embraces traditional Hawaiian principles of land stewardship. It acknowledges cultural traditions, evaluates their applicability to contemporary environmental, socio-political, and economic objectives, and recommends a detailed program (guidelines) for expanding the Resort in a manner that strives to be more environmentally sustainable and culturally sensitive.

TBR's preferred alternative, hereinafter the Proposed Action, in the SEIS substantially reduces the scope, density and area of the resort expansion. The SEIS also includes a Cultural Impact Assessment and an updated Supplemental Archaeological Inventory Survey.

Brief Overview of the SEIS

The SEIS consists of four volumes. The first volume contains the following (in addition to this Executive Summary and a Glossary of Terms):

- **Chapter One – Statement of Purpose and Need:** This chapter states the purpose of the Proposed Action and the reasons that is needed. It also presents introductory information about the SEIS and the site of the Proposed Action.

- **Chapter Two – Environmental Setting:** This chapter presents the existing conditions at the resort; establishing a baseline against which the impacts resulting from the Proposed Action, and defined alternatives, can be evaluated. In support of the cultural orientation embraced in the new plan for the resort expansion, the baseline setting is presented and oriented in a manner that corresponds to the traditional Hawaiian land divisions associated with the SEIS Lands. The environmental setting is divided into two categories;

  1) the natural environment, and
  2) the human environment.

- **Chapter Three – Proposed Action:** This chapter describes in detail, the elements of the proposed resort expansion that constitute the Proposed Action.

- **Chapter Four – Alternatives:** This chapter presents an extensive discussion of the alternate development programs that were considered as part of the project team's extensive planning process that resulted in the formulation of the Proposed Action.

- **Chapter Five – Probable Impacts and Mitigation Measures:** This chapter discusses the impacts that will result from the implementation of the Proposed Action, in the same sequence as the baseline information was presented in Chapter Two. The discussion of impacts is divided into two categories;

  1) the natural environment, and
  2) the human environment.

  The chapter also identifies measures proposed to mitigate significant impacts.

- **Chapter Six – Contextual Issues:** This chapter discusses the relationship of the Proposed Action to the governmental programs, policies, land use approvals, and regulations that would guide its implementation. It also addresses several aspects of environmental assessment that are proscribed by Chapter 343.

- **Chapter Seven – Preparation and References:** This chapter discloses who prepared the SEIS and also identifies the reference material used in the analysis.

Volume Two contains the following:

- **Chapter Eight – Public Outreach:** By law, an EIS is required to include all substantive written comments received during official comment periods, and the project team's written response to each comment. This chapter contains all the written comments received after the publication of the SEIS Preparation Notice and responses to them. It also contains written comments received at an Open House sponsored by TBR and responses to them. The chapter begins with a discussion of public outreach. An extensive proactive community engagement process conducted by the new TBR management team sought to understand community aspirations, concerns and build relationship with the community. A deliberate attempt was made by the TBR project team to initiate a request with the various stakeholders to genuinely "listen" to not only their concerns but their vision for their community in general and TBR in particular. The TBR project team and owners committed to and listened to the community before proposing any specific plan. Input from the community influenced the TBR project team in their substantial revisions to the Master Plan to incorporate a more culturally sensitive approach to land stewardship and consequently substantially reduced density and increased public benefits. This chapter also discloses how the SEIS was distributed for review.

Volumes Three and Four contain the following:

- **Appendices:** The SEIS contains copies of all technical documents and detail of *Tomorrow's Ahupua'a* as a cultural approach to a higher level of sustainability that were prepared by the project team as part of the environmental assessment process. Following are the appendices included in the Volume 3 of the SEIS:

  A. A Cultural Approach to Sustainability
  B. Unilateral Agreement
  C. Draft Supplemental Archaeological Inventory Survey
  D. Cultural Impact Assessment
  E. Marine Resources Impact Analysis

  Following are the appendices included in Volume Four of the SEIS:

  F. Flora and Fauna Impact Analysis
  G. Supplemental Archaeological Inventory Survey Plan
  H. Socio-Economic Impact Analysis
  I. Traffic Impact Analysis Report
  J. Air Impact Analysis
  K. Noise Impact Analysis
  L. Cultural and Natural Resources Management Plan
  M. Trip Generation Survey Report

Summary of the Proposed Action

In accordance with *Tomorrow's Ahupuaʻa*, the Proposed Action identifies three primary land areas within the SEIS Lands, based on historic and cultural Hawaiian land divisions:

1. Ahupuaʻa O ʻŌpana-Kawela – at the western part of the resort property and fronting Kawela Bay
2. Ahupuaʻa O Hanaka`oe – in the middle of the resort property and fronting both Turtle Bay and Kuilima Cove.
3. Ahupuaʻa O Kahuku – at the eastern part of the resort property, including the Palmer golf course, fronting Kuilima Bay, and the Punahoʻolapa Marsh.

The Proposed Action represents an over 60% percent density reduction from the original expansion project that was granted land use and zoning approvals in 1986. (see Figure ES-1)

Consistent with the historic uses of the Ahupuaʻa of Hanakaʻoe, the Proposed Action concentrates hotels and higher density development in the resort's existing core area. It specifically proposes two (2) new hotel sites and a new community Gathering Place in proximity to the existing Turtle Bay Hotel. This is a substantial reduction from the five (5) hotel sites contemplated in the 1985 EIS. Further, the Proposed Action provides for 625 new hotel units, rather than the 2,500 new hotel units in the original plan – a 75% reduction.

Pursuant to numerous considerations, including community input, the oceanfront sites originally proposed in 1985 for hotel development in Ahupuaʻa O ʻŌpana-Kawela (to the west) and Ahupuaʻa O Kahuku (to the east) have been reprogrammed to much lower densities and resort-residential use. At Ōpana-Kawela, density will be reduced by over 75% percent of what is allowable under existing zoning. Similarly, Ahupua`a O Kahuku is planned for 160 affordable Community Housing over 170% increase over thʻ requirement and resort-residential development with 65% less density than is allowed under existing entitlements. The result is the concentration of development in the central core of the SEIS Lands and the general preservation of a rural character to the east and west. By implementing generous shoreline setbacks, this development concept also provides wide, unencumbered public access to the entire shoreline.

The Proposed Action includes the following:

- Two (2) new full-service hotels with a combined total of 625 units. The hotels may be operated as time-share or traditional service hotels;
- 590 new resort-residential units, consisting of a combination of multi-family and single-family units;
- 160 Community Housing units in excess of the 59 units required that will be priced to be affordable to residents of the Koʻolau Loa/North Shore region;
- Approximately 73 acres of park area distributed among five parks;
- A total of 12 new public shoreline access ways;

Figure ES-1:

Proposed Action

AREA	ACRES	UNITS/ACRE	UNITS
Hotel (H-1a, 1b)	25.9	14	375
Hotel (H-2, 2a)	19.0	13	250
Existing Turtle Bay Hotel	34.5	14	500
TOTAL HOTEL	79.4	14	1,125
Resort Residential (RR-1)	39.1	2	75
Resort Residential (RR-2a, 2b)	20.3	7	150
Resort Residential (RR-3a, 3b)	24.8	4	100
Resort Residential (RR-4a, 4b)	33.4	4	120
Resort Residential (RR-5)	25.6	4	100
Resort Residential (RR-6)	11.2	4	45
Resident Housing (RES-1)	12.4	9	112
Resident Housing (RES-2)	8.8	5	48
TOTAL RESIDENTIAL	175.6	4	750
Existing Kuilima Estates	33.1	11	368
Gathering Place (Piko)	9.6		
Existing Clubhouse	1.2		
New Clubhouse	2.3		
TOTAL OTHER	13.1		
Golf Course (G-1)	123.1		
Golf Course (G-2)	191.5		
Punahoolapa Wildlife Preserve	100.0		
Park (P-1)	4.8		
Park (P-2)	38.0		
Park (P-3) - Bird Sanctuary	6.0		
Park (P-4)	9.4		
Park (P-5)	11.3		
Equestrian Center	8.8		
Farmers' Market (east)	3.4		
Farmers' Market (west)	4.1		
Parcel 5-6-003:033	3.8		
AG Well (Lot 524)	2.0		
TOTAL OPEN SPACE	506.2		
Kuilima Drive (Existing)	4.5		
P-1 Access Road	0.4		
RR-1/2 Access Road	0.7		
Equestrian Road	2.6		
Marconi Road Expansion	11.3		
Kaihalulu Drive	24.8		
TOTAL ROADWAYS	44.3		
Parcel 5-7-003:072	0.2		
TOTAL SITE	**851.9**		

Note: Shoreline shown per 2006 Shoreline Certification

WCITARCHITECTURE

BELT COLLINS

TURTLE BAY RESORT MASTER PLAN

07 . 31 . 2012 |

- An approximate 100-acre Punahoʻolapa Marsh wildlife preserve;
- Shoreline setbacks in excess of minimum requirements and ranging from 150 feet to 300 feet and resulting in a combined total of approximately 42 acres of setback area;
- A new resort entrance near Kawela Bay and a new lateral roadway (tentatively named Kaihalulu Drive) extending the length of the resort generally parallel to the shoreline;
- Improvements to Marconi Road and the eventual signalization of all three resort's intersections with Kamehameha Highway (Kaihalulu, Kuilima and Marconi);
- The renovation of the Fazio Golf Course to be combined with the existing Palmer Golf Course to create a 27-hole golf complex, with a new Golf Clubhouse;
- A new Equestrian Center to replace the existing facility;
- A network of interior pedestrian paths and equestrian trails;
- A Farmers' Market; and
- A new low-density commercial resort center called The Gathering Place, which will also host guests and regional visitors.

Understanding the Property

The efforts that have been undertaken to produce this SEIS embrace the concept of *Tomorrow's Ahupua`a*. The SEIS presents new and updated studies of the resort property, including marine resource assessment; near shore water quality analysis; flora and fauna inventories; new social, economic, and cultural impact studies; a supplemental archaeological inventory survey; and report on a cultural approach to sustainability. Together, these new and updated studies form the basis for evaluating the probable impacts of the Proposed Action on the environment.

Summary of the Anticipated Impacts of the Proposed Action and Recommended Mitigation Measures

The following table summarizes the impacts discussed in the SEIS that would likely result from implementation of the Proposed Action. Significant beneficial and adverse impacts are indicated in boldface type. Wherever impacts are identified, measures to mitigate them are recommended. However, it should be noted that the Proposed Action itself is a highly mitigated alternative to implementing the full build out of the resort expansion as allowable under existing land use and zoning approvals.

Table ES-1: Summary of Impacts and Measures to Mitigate Them

Subject Area	Nature of Potential Impact	Recommended Mitigation
The Natural Environment		
Topography	N	
Soils	I	Comply with regulatory standards, implement BMPs
Vegetation	I	Re-landscape areas with native plants where appropriate
Fauna	N	
Avifauna	**SA**	Employ BMPs for golf course operations, shield night lighting
Hawaiian Hoary Bats	N	
Groundwater	**I**	Use treated effluent to supplement irrigation demand thereby reducing need for non-potable water
Drainage	**SB**	Restore Kawela Stream alignment to improve water quality in Kawela Bay and address potential for flooding
Marine Water Quality	**SB**	Restore Kawela Stream to its original alignment to improve water quality in Kawela Bay
Marine Biota (general)	I	Employ a public education program to educate fishermen, address fishing practices, and consider the creation of a Marine Life Conservation District at Kawela Bay
Sea Turtles	I	Employ a public education program to increase awareness
Hawaiian Monk Seals	I	Employ a public education program to increase awareness
Views	I	Utilize setbacks and architectural design to minimize visual impacts of new development
Air Quality	N	
The Human Environment		
Traffic	**SA**	Provide traffic improvements at major intersections in accordance with DOT & DTS requirements and employ Transportation Demand Management (TDM) strategies in the resort community to reduce auto traffic. The developer will work in coordination with the State DOT to determine its fair share of contributions to regional traffic improvements that may result from implementing the Proposed Action
Noise	A	Use walls, berms, or air conditioning to mitigate noise impacts on residences within 65 LDN noise contour at Kamehameha Highway
Archaeological Resources	**SA**	Implement treatments recommended in Supplemental Archaeological Inventory Survey upon its approval by SHPD
Cultural Resources	**SA**	Implement the cultural protocols of *Tomorrow's Ahupua`a* including proposed Cultural & Natural Resource Management Plan

Agricultural Resources	N	Not applicable to SEIS Lands, but the Applicant is working with Trust for Public Lands to preserve 470 acres of agricultural land in perpetuity on mauka side of Kamehameha Hwy
Population Growth	I	The Proposed Action mitigates population impacts
Employment and Wages	**SB**	8,746 new construction jobs through 2025, and 1,981 new direct and indirect operational jobs from 2025 on
Fiscal Effects	**SB**	$160 million in net revenue to State and $45 million in net revenue to City and County of Honolulu through 2025
Housing	**SB**	160 new Community Housing units
Education Facilities	N	
Health Care Facilities	N	
Recreation Facilities	**SB**	Proposed Action includes new parks, 12 new public shoreline accesses and shoreline path connecting these areas
Public Safety Services	N	
Disaster Preparedness	N	
Wastewater	N	
Solid Waste	I	Offset increased volume with reuse/recycle program
Water Use	**SB**	At completion of the Proposed Action, the resort will require approximately 1.2 million gallons per day of potable water. However, the water will be provided by the resort's existing well system and nearly 800,000 gallons per day of excess water will be contributed to the Board of Water Supply's regional distribution system for the benefit of the residents of Ko`olau Loa
Utilities	I	Reduce electrical demand by constructing to LEED standards and implementing energy efficiency protocols

Cumulative and Secondary Impacts

Through 2025, the Proposed Action will create a cumulative total of 8,746 construction jobs. Of this total, 5,482 will be indirect and induced jobs, which are defined as jobs that are supported when construction firms buy materials and services locally. Wages generated from indirect and induced jobs are estimated to be $35.5 million annually from 2025 on. Wages resulting from off-site visitor spending are estimated at $18.4 million from 2025 on.

As the result of the Proposed Action, primary population growth in the Koʻolau Loa/North Shore (KNS) region is forecast to include 951 regional residents and 2,206 visitors by 2025. As nearly all the resort's future workers will likely come from the KNS region, the Proposed Action is not anticipated to generate significant secondary population growth. New household formation in the region is estimated to be between 83 and 167 households as the result of the Proposed Action.

The anticipated population growth is anticipated to generate from 49 to 123 new K-12 school enrollments to 2025, and 8 to 20 new preschool enrollments. It is estimated that the population increase will create demand for nine new acute care beds and one new emergency medical

services staff position by 2025, as well as 5 new police patrol officer positions and 3 fire operation positions. No new public safety facilities are forecast to be required.

The cumulative increase in traffic volume on Kamehameha Highway in the vicinity of the resort is forecast to increase about 64% by the year 2025 during the morning peak hour and by about 42% during the afternoon peak hour. However, this increase in traffic volume will not change the Level of Service (LOS) on Kamehameha Highway, which today is rated at "E", and will remain at "E" in 2025 when the Proposed Action is targeted for completion.

Alternatives Considered

An extensive evaluation of project alternatives resulted in the identification of three (3) reasonable alternative development plans for the proposed resort expansion:

- **Full-Build Out Alternative:** This alternative would entail expansion of the resort in compliance with existing land use and zoning approvals. Under this alternative, the resort is permitted to construct 2,500 new hotel units, 910 new resort-residential units, and 90 affordable housing units together with appurtenant infrastructure and amenities as provided for in a Unilateral Agreement that runs with the land. The alternative includes the existing golf courses and an equestrian facility.

- **Resort Residential Only Alternative**: This alternative limits expansion of the resort to 500 new resort residential units, with no new hotel development.

- **Conservation Partner Alternative**: Under this alternative, most of the coastal areas in Ahupua`a O ʻŌpana-Kawela and Ahupuaʻa O Kahuku would be preserved in open space: development would be focused in Ahupuaʻa O Hanakaʻoe around the existing hotel and on property presently occupied by the Fazio Golf Course (which would be closed). Resort expansion would be limited to two (2) new hotels containing a total of 440 units, 252 resort-residential units, and 48 affordable housing units, together with appurtenant infrastructure and amenities as allowable under law. Implementation of this alternative would require the participation of a third party to provide economic consideration to compensate for the legally entitled reduced development density.

Unresolved Issues

Seven unresolved issues have been identified at the time the Draft SEIS (DSEIS) is being published. They include the following:

Affordable Housing Program: At the time of the writing of the DSEIS, a specific program has not been prepared that details the manner in which the affordable housing program will be implemented in terms of financing options, restrictions on use, buy-back provisions, etc. Prior to the commencement of the Proposed Action, TBR plans to work with the Department of Planning and Permitting and Hawaii Housing, Finance, and Development Corporation to finalize an acceptable program.

Kuilima Wastewater Treatment Plan Upgrade: At the time of the writing of the DSEIS, TBR plans to upgrade the treatment process to improve the quality of wastewater effluent to R-1 quality so that it may be used within certain portions of the SEIS Lands. Prior to the commencement of the Proposed Action, TBR plans to determine the final feasibility and how best to implement this upgrade once volume capacity requirements correlate with proximate site development.

Conservation Easement: A conservation easement has been proposed to protect the long-term use of the resort's agricultural lands mauka of Kamehameha Highway. While these lands are not within the SEIS Lands, they are an integral part of the resort's Comprehensive Plan and the concept of *Tomorrow's Ahupua`a*. At the time of the writing of the DSEIS, TBR has signed a Letter of Intent with the Trust for Public Lands ("TPL") concerning the creation of a conservation easement relative to certain agricultural lands situated outside the SEIS Lands, on the mauka side of Kamehameha Highway; however, there are a number of steps in this process which remain to be completed in order to close this transaction, including obtaining an appropriate appraisal of these mauka agricultural lands and finalizing the conservation easement document. TBR hopes to close the conservation easement transaction with TPL by the end of the 1st quarter 2013 and in any event prior to the commencement of the Proposed Action.

Mauka Storm Water Drainage Retention/Detention: At the time of the writing of the DSEIS, TBR is working with its civil engineering team on a long-term storm water management plan including retention and detention strategies on the *mauka* agricultural lands owned by Turtle Bay Mauka, LLC situated on the *mauka* side of Kamehameha Highway. Implementation of this long-term plan is intended to reduce runoff after significant storm events, some of which affect levels of near shore turbidity. However at this time it has not yet been determined whether these proposed plans are technically and or financially feasible or supported by regulatory agencies. Prior to the restoration of Kawela Stream to its West Main Drain alignment as contemplated in the Proposed Action, TBR plans to work through design, feasibility, and construction issues related to this long-term plan.

City and County Zoning District Boundary Amendments: At the time of the writing of the DSEIS, it has not been determined whether the implementation of the Proposed Action will require adjustments to be made to the boundary lines of any existing zoning district. If, and to the extent such adjustments do become necessary, TBR will apply for administrative zoning district boundary amendments.

Implementation of a Marine Life Conservation District at Kawela Bay: As presented in the DSEIS, the creation of an advisory council is recommended to assist the resort in addressing issues that will affect users of the coastal resources for recreational purposes. The resort's Unilateral Agreement requires that best efforts be made to promote the creation of a Marine Life Conservation District (MLCD) at Kawela. But to do so will require broad-based input from the community. Therefore the issues of if and how to implement a MLCD are not yet resolved. TBR plans to encourage community input prior to development of proximate parcels to Kawela Bay.

Critical Habitat for Hawaiian Monk Seals: At the time of the writing of the DSEIS, a proposal to designate all or a portion of waters of the main Hawaiian Islands as a critical habitat is under consideration by the National Marine Fisheries Service (NMFS). The potential impact that such a designation by the federal government may have upon the Resort is unknown and, therefore, the matter is unresolved. The NMFS has extended the deadline for comments on the proposal indefinitely and it is not known when the agency may eventually act on the proposal.

Compatibility with Land Use Plans and Policies

As it is implemented, the Proposed Action will be reasonably compatible with all existing land use plans and policies. Table ES-4 at the end of this Executive Summary summarizes how the Draft SEIS addresses the content requirements of Section 11-200, Hawaii Administrative Rules.

Figure ES-2: Compatibility of the Proposed Action with Land Use Policies and Plans

Land Use Policy or Plan	Status
FEMA National Flood Insurance Program	Will conform
Hawaii State Plan (Chapter 226)	Compatible to applicable goals/objectives
State Functional Plans	Compatible to applicable goals/objectives
State Ocean Resources Management Plan	Compatible
State of Hawaii Water Plan	Compatible
Ko`olau Loa Watershed Management Plan	Compatible
State of Hawaii Historic Preservation Act	Will conform
O`ahu General Plan	Compatible
Ko`olau Loa Sustainable Communities Development Plan	Compatible
Revised Ko`olau Loa Sustainable Communities Development Plan	Compatible
Complete Streets	Compatible
Hawaii Coastal Zone Management Program	Compatible
Special Management Area Ordinance	Compatible
Hawaii Environmental Protection Act	Compatible

Required Permits and/or Approvals

The SEIS Lands are contained within the State Urban District. No adjustments to the State Land Use district are anticipated.

The SEIS Lands were zoned for resort development in the mid-1980s. As discussed above, at the time of the writing of the DSEIS, it has not been determined whether the implementation of the Proposed Action will require adjustments to be made to the boundary lines of any existing zoning district. If, and to the extent such adjustments do become necessary, TBR will apply for administrative zoning district boundary amendments.

The Resort is operating under an existing Special Management Area (SMA) Use Permit granted by the Honolulu City Council in 1986 pursuant to Resolution No. 86-308. The Proposed Action may require a minor modification to the existing SMA Use Permit to address the fact that the Proposed Action represents a change to the resort's original master plan.

Implementation of the Proposed Action will require a National Pollution Discharge Elimination System (NDPES) permit approval from the State Department of Health to grade property in excess of one (1) acre, and grading and building permits from the City and County of Honolulu's Building Department.

Restoration activities at Punahoʻolapa Marsh will require approvals from the U. S. Army Corps of Engineers and the Hawaiʻi State Department of Health.

If the restoration of Kawela Stream to its original alignment is implemented as a measure to mitigate regional drainage impacts on the near shore waters of Kawela Bay, approvals from the U. S. Army Corps of Engineers and the Hawai`i State Department of Health will be required.

A Joint Development Agreement will also need to be approved by the City and County of Honolulu.

Comparative Summary of Alternatives

Table ES-3 presents a comparative quantitative summary of the Proposed Action and the Alternatives. All information is projected from 2014 through the year 2025.

Figure ES-3: Comparitive Quantitative Summary of Proposed Action and Alternatives

	Proposed Action	Full Build-Out Alternative	Resort Residential Alternative	Conservation Partner Alternative
Total Construction Spending	$770 million	$1,370 million	$429 million	$370 million
Total Direct Construction Workforce	3,263	5,491	1,843	1,554
Total Indirect/Induced Jobs	5,482	9,225	3,096	2,611
On-Site Jobs at Build Out	1,539	4,598	91	963
Total Daytime Population	4,401	10,380	2,223	3,284
Total Statewide Tax Related Construction Revenue	$73 million	$125 million	$52 million	$35 million
Total County Tax Related Construction Revenue	$5 million	$8 million	$3 million	$2 million
Total Statewide Visitor Spending	$121 million	$855 million	$35 million	$66 million
Total County Visitor Spending	$5 million	$39 million	$1 million	$3 million
Total Real Property Tax Revenue	$50 million	$411 million	$31 million	$31 million
New Community Housing	160 units	90 units	46 units	48 units
Total Potable Water Use	1.2 mgd	1.78 mgd	691,000 gpd	756 gpd
Total Wastewater Generated	598,000 gpd	886,000 gpd	395,000 gpd	405,000 gpd

GLOSSARY:

TERMS, ABBREVIATIONS and ACRONYMS

1985 EIS	1985 Kuilima Revised Final Environmental Impact Statement.
AAQS	Ambient Air Quality Standards.
ACE	United States Army Corps of Engineers (also referred to as 'the Corps' or 'COE').
ACHP	Advisory Council on Historic Preservation.
ACS	American Community Survey (annual survey of a sample of the population). The ACS may be reported in annual, three-year, and five-year increments, with smaller areas reported for the longer periods. ACS data in this report comes from the 2006-2010 surveys. The ACS includes the "long-form" data sets that had been gathered from a sample of the population in the decennial census before 2010.
AIS	Archaeological Inventory Survey.
ALISH	Agricultural Lands of Importance to the State of Hawai'i; a mapping system used by the State to classify productivity in agricultural lands.
BCH	Belt Collins Hawaii.
BMP	Best Management Practices.
BPBM	Bernice Pauahi Bishop Museum.
BTP	Burial Treatment Plan.
BWS	Board of Water Supply, City and County of Honolulu.
BYUH	Brigham Young University – Hawaii.
CCH	City and County of Honolulu.
CDP	Census Designated Place.
Cfs	Cubic feet per second.
Chapter 343	Chapter of the Hawai'i Revised Statutes that addresses environmental assessment.
CIA	Cultural Impact Assessment.
Cm	Centimeter.
CNRMP	Cultural and Natural Resource Management Plan.
Community Housing	Housing units to built in compliance with the Unilateral Agreement to provide affordable housing opportunities at the resort.
Comprehensive Plan	Master Plan for the entire Turtle Bay Resort property, including lands located on the south side of Kamehameha Highway that are not part of the supplemental environmental impact statement.
CSH	Cultural Surveys Hawaii.
CT	Census Tract.
DI	Direct and indirect (in Input-Output Analysis).
DII	Direct, indirect and induced (in Input-Output Analysis).
dBA	A-weighted decibal, a unit of sound measurement.

DBEDT	Hawai'i State Department of Business, Economic Development and Tourism.
DLNR	Hawai'i State Department of Land and Natural Resources.
DNL	Day-night average sound level, also referred to as Ldn.
DOD	United States Department of Defense.
DOE	Hawai'i State Department of Education.
DOH	Hawai'i State Department of Health.
DOT	Hawai'i State Department of Transportation.
DPP	City and County of Honolulu Department of Planning and Permitting.
DRP	Data Recovery Plan.
EIS	Environmental Impact Statement.
Equestrian Center	The stables, corrals, and appurtenant facilities that will provide horse-related activities at the resort.
ESA	Endangered Species Act.
Golf Clubhouse	The clubhouse facility serving the Fazio and Palmer Golf Courses.
Gathering Place	A commercial area proposed to be used as an entertainment venue.
Farmer's Market	A commercial area proposed to used for the sale of farm produce and products.
HAR	Hawai'i Administrative Rules.
HECO	Hawaiian Electric Company.
HEPA	Hawai'i Environmental Protection Act
HFD	Honolulu Fire Department.
HPD	Honolulu Police Department.
HRS	Hawai'i Revised Statutes, as amended.
˚F	Degrees Fahrenheit.
FAA	Federal Aviation Administration.
FHA	Federal Housing Administration.
FEMA	Federal Emergency Management Agency.
FIT	Free and Independent Traveler, a term used in the hospitality industry to denote a visitor who is not part of group tour.
FP	Fibropapillomatosis, a debilitating tumor disease of the skin and internal organs of green sea turtles.
FT	Full-time (used for full-time resort residents, treated as Hawai'i residents).
GIS	Global Information System.
GPD	Gallons per day.
GPM	Gallons per minute.
GPS	Global Positioning System.
HUD	Federal Department of Housing and Urban Development.
KDC	Kuilima Development Company.
KNS	Ko'olau Loa/North Shore combined area (corresponding to the City's Development Plan Areas of the same names.
KNSA	Ko'olauloa North Shore Strategic Alliance.
KNSSPC	Kuilima/North Shore Strategy Planning Committee.

KSCP	Koʻolau Loa Sustainable Communities Plan.
Kuilima EIS	1985 Kuilima Revised Final Environmental Impact Statement, prepared for the Kuilima Resort Expansion project in 1985 by Group 70 (aka "1985 EIS").
Kuilima Estates	Kuilima Estates East and Kuilima Estates West.
Kuilima Hotel	The original hotel developed at Kuilima Resort, now known as the Turtle Bay Hotel.
KV or kV	Kilo-volt.
LCA	Land Commission Award, a land title originally granted by the Kingdom of Hawaiʻi.
LEED	Leadership in Energy and Environmental Design.
M	Meter
MGD	Million gallons per day.
MHI	Main Hawaiian Islands.
MLCD	Marine Life Conservation District.
MOA	Memorandum of Agreement.
MSL	Mean sea level.
MW	Mega-watt.
M/yr	Meters per year.
N	Nitrogen.
NMFS	National Marine Fisheries Service.
NWHI	Northwestern Hawaiian Islands.
NW-SE	Northwest-Southeast, refers to the directional alignment of an aircraft runway.
NTU	Nephelometric Turbidity Units, named after the device used to measure turbidity in water.
NWS	National Weather Service.
Oaktree Capitol	The former owner of the Turtle Bay Resort.
OEQC	State of Hawaiʻi Office of Environmental Quality Control.
OHA	State of Hawaiʻi Office of Hawaiian Affairs.
OIBC	O`ahu Island Burial Council.
OR&L	Oʻahu Railway and Land Company.
PCC	Polynesian Cultural Center.
PPM	Parts per million.
PM	Particulate matter.
Property	The term "the property" refers to all the lands owned by Turtle Bay Resort.
Proposed Action	The development activities within the SEIS Lands that are the subject of the SEIS.
PT	Part-time (used for part-time residents and second homeowners, treated as visitors to Hawaiʻi in economic analyses).

Revised Master Plan	The current revision of the master plan first discussed in the 1985 EIS. The Revised Master Plan is distinguished from the Comprehensive Master Plan in that the former focuses on the existing hotel and the surrounding grounds that are used by resort guests and visitors, while the latter is an expanded version of the plan that also includes the agricultural lands on the mauka side of Kamehameha Highway, and Kuilima Estates.
SAIS	Supplemental Archaeological Inventory Survey.
RFEIS	Revised Final EIS – another term for the Kuilima EIS.
SCP	Sustainable Communities Plan. The City and County of Honolulu recognizes seven regional planning areas: two Development Plan areas and five SCP areas.
SCS	U. S. Soil Conservation Service.
SF	Square feet.
SIA	Socio-economic impact assessment.
SEIS	Supplemental environmental impact statement.
SEIS lands	Land area covered by the SEIS for Turtle Bay Resort; smaller than the TBR landholdings, but also including portions of right-of-way along Marconi Road (aka, the Project Area).
SEISPN	Supplemental Environmental Impact Statement Preparation Notice. For Turtle Bay, the SEISPN was prepared by Lee Sichter LLC and published via the Environmental Notice on August 23, 2011.
SHPD	State Historic Preservation Division of the State of Hawai`I Department of Land and Natural Resources.
SIHP	State Inventory of Historic Places.
SLUC	Hawai‘i State Land Use Commission (also referred to as LUC).
SMA	Special Management Area.
SPS	Sewage pump station.
TBR	Turtle Bay Resort, LLC.
TBR Project Team	The staff of TBR and the consultants who were retained for the purpose of preparing the SEIS.
TheBus	Municipal bus service operated by the City and County of Honolulu.
The Resort	The Turtle Bay Resort.
TMK	Tax Map Key, the method of land mapping employed by the State of Hawai‘i and the City and County of Honolulu for the purposes or real property assessment.
TP	Total phosphorus.
UA	Unilateral Agreement (an instrument of conditional approval signed by the developer, in connection with the approved zoning ordinance adopted by the City and County of Honolulu for the Kuilima Resort, now known as the Turtle Bay Resort. The Kuilima UA (No. 86-99) was recorded with the Bureau of Conveyance in September 1986, meaning that its requirements are tied to the land, regardless of who owns the property.

UIC	Underground injection control.
Ug/l	Micrograms per liter: equal to one millionth of a gram.
U.S.	United States.
USFWS	United States Fish & Wildlife Service.
USGS	United States Geological Survey.
VA	Federal Veterans Administration.
v/c	Volume-to-capacity ratio.
WCA	Waialua Community Association.
WW II	World War Two (also World War II).
WWTP	Wastewater treatment plant.

GLOSSARY OF HAWAIIAN WORDS

ʻaʻama	A large, black, edible crab
ahu	alter
ahupuaʻa	land division usually extending from the uplands to the sea
ʻāina	land, earth; elder sibling; root meaning: that which feeds
ʻakiʻaki	seashore rush grass; a coarse grass growing on sandy beaches
ʻakoko	Endemic shrubs and trees with jointed stems, opposite leaves, and milky sap. Buds and leaves of one species were chewed for debility
akua	God, goddess, spirit, ghost, devil, image, idol, corpse
aliʻi	chief
ali ʻi ʻai moku	lower chief
ali ʻi nui	high chief
ʻamaʻama	striped mullet
ʻanae	mullet
ʻau or ʻaukai	swimming
ʻaumakua	family or personal gods, deified ancestors who might assume the shape of plants, animals, or other natural phenomena
ʻauwai	irrigation systems for the loʻi
ʻāweoweo	bigeye, glasseye fish
ʻEwa	Place name west of Honolulu, used as a direction term
haʻahaʻa	humility
hala	pandanus; sin or fault
hālau	meeting house for hula instruction
hānai	traditional Hawaiian practice of adoption
Hanakaʻīlio	work [of] the dog
hāʻukeʻuke	An edible variety of sea urchin
Haumea	Earth
heʻe	octopus
heʻe nalu	to ride a surfboard; surfing

heʻe waʻa	canoe racing
heiau	pre-Christian place of worship, shrine; religious temples
heiheiau	ancient sport of competitive swimming
hīhīmanu	stingray
hilinaʻi	trustful
hōʻailona	symbol or sign
hōʻihi	respectful
honu	sea turtle
hoʻolapa	ridge
hoʻomau	continuity
ʻīlioholoikauaua	seal
iwi kūpuna	human burial remains; burials
kaha nalu	body surfing
kahawai	streams
kahu	spiritual guide
kahuna	priest
kahuna lāʻau lapaʻau	herbal medicine healer
Kahuku	the projection
kai	ocean
kaiaulu	local community
Kalakala	rough or craggy
kālai kiʻi	wood carving
kalo	taro
kamaʻāina	native born
kānaka	Human being, man, person, individual; younger sibling
kānāwai	laws
kapu	laws or restrictions; prohibitions
Kawela	the heat
kinolau	body-form
kō	sugarcane
koa	a valuable lumber tree
koa haole	a common roadside shrub or small tree
konohiki	land manager
kukui	candlenut tree; large tree in the spurge family bearing nuts containing white, oily kernels which were formally used for light
kula	plains
kuleana	responsibility, privilege, obligation
kupuna	grandparent, ancestor, relative or close friend of grandparent's generation; ancestors
kūpuna	plural of kupuna; elders
lāʻau	Medicine, medicinal drug, medication
lāʻau lapaʻau	herbal healing

lānai	porch
lapaʻau	herbal healing; Medical practice; to treat with medicine, heal, cure
lauhala	pandanus leaves
lei	garland, wreath; necklace of flowers
limu	seaweed
loʻi	taro pond-fields
loʻi kalo	taro terraces
lūʻau	Young taro tops; Hawaiian feast
mahalo	appreciation
maiʻa	banana
makahiki	ancient festival
makai	towards the ocean
mākia	purposeful
mālama	take care of, preserve, protect, save or maintain
mālama ʻāina	to care for the land
mālama i na iwi kupuna	care for ancestral remains/bones
mana	supernatural or divine power, miraculous power, spiritual power
manaʻo	thoughts or wisdom
maʻu	Same as *ʻamaʻu*, a native genus of ferns
mauka	upland, towards the mountain
mauka-makai	upland to ocean
moku	regional; land district
mokupuni	islands
moʻolelo	stories
nā iwi	ancestral bones
nā kūpuna	plural of kupuna
naupaka kahakai	succulent shrub found on coasts
niu	coconut
noni	the Indian mulberry
noʻonoʻo	thoughtful
ʻohana	family, relative, kin group
ʻōhelo kai	a shrub
ʻōlelo	Language; statement
ʻōlelo noʻeau	Proverb, wise saying, traditional saying
ono	wahoo
ʻōʻō	digging stick
ʻoʻopu	General name for fishes included in the families Eleotridae, Gobiidae, and Blennidae
ʻopa	the squeeze
ʻōpelu	mackerel scad, a highly prized fish
paʻakai	sea salt
paeʻāina	archipelago

papa heʻe nalu	surboard
pāpio	a fish
pōhaku	Rock, stone
pono	consistency, balanced, righteous
puaʻa	Pig
pule	prayer, incantation, blessing, grace
Punamāno	shark spring
puna paʻakai	brackish spring
ʻuala	sweet potato
ʻuhane	spirit
ʻulaʻula	A native variety of taro
ʻulu	breadfruit
wai	fresh water
Wakiu	northwest wind sound
Wauke	paper mulberry
wiliwili	Hawaiian leguminous tree

DIACRITICAL GUIDE FOR PLACE NAMES

ʻEwa

Hanakaʻīlio

Hanakaʻoe

Hauʻula

Hawaiʻi

Kaʻaʻawa

Kāneʻohe

Koʻolau

Koʻolau Loa when referring to the location

Koʻolauloa when referring to Hawaiian Civic Club or Neighborhood Board

Ko ʻOlina

Lāʻie

Mokulēʻia

Oʻahu

ʻŌʻio

ʻŌpana

Punahoʻolapa

Pūpūkea

Waikīkī

Figure ES-4: Content Checklist

SEIS Compliance	11-200-17 Content requirements for Draft EIS (applicable to SEIS per 11-200-28)		
	A	The Draft EIS shall contain at a minimum the information contained in this section (11-200-17)	
Exec. Summ.	B	Summary Sheet with the following	
Exec. Summ.		1	Brief description of the Proposed Action
Exec. Summ.		2	Significant beneficial/adverse/cumulative/secondary impacts
Exec. Summ.		3	Proposed mitigation measures
Exec. Summ.		4	Alternatives considered
Exec. Summ.		5	Unresolved issues
Exec. Summ.		6	Compatibility with land use plans/policies; listing of permits/approvals
TOC	C	Table of Contents	
Chap. One, Sec. A	D	Statement of Purpose/Need for the Proposed Action	
Chap. Three, Sec. B	E	Project Description with enough detail to evaluate environmental impacts	
Figures 1-6, 2-22 & 2-23		1	Detailed map (USGS topo, FIRM, or floodway boundary)
Chap. Two, Sec. A		2	Statement of objectives
Chap. Three, Sec. B		3	General description of action's characteristics:
Chap. Three, Sec. B.2, B.3 & B.4		a	technical
Chap Three, Sec. B.2, B.3 & B.4		b	social
Chap, Three & Sec. B.2, B.3 & B.4		c	environmetal
Chap. Three, Sec. B.10		4	Use of public funds or lands for the action
Chap. Three, Sec. B.11		5	Phasing and timing of the action
Chap. Three, Sec. B.2, B.3 & B.4		6	Summary technical data, diagrams etc. for evaluation of potential impacts
Chap. One, Sec. G & Chap. Two, Sec. B		7	Historic perspective
Chap. Four	F	Rigorous exploration and objective evaluation of alternatives	
Chap. Four, Sec. A.3.c		1	No action
Chap. Four, Sec. B.3		2	Different nature with similar benefits and different environmental impacts
Chap. Four, Sec. A		3	Alternate designs or details
Chap. Four, Sec. A.3.b		4	Postponing the action
Chap. Four, Sec. A.2		5	Alternative locations
Chap. Four, Sec. C		6	Comparative evaluation of benefits, costs, risks of reasonable alternatives
Chap. Two	G	Existing environmental setting	
Chap. Two		1	Local
Chap. Two, Sec. E.1, E.7 & E.8		3	Rare or unique environmental resources
Chap. Two, Sec. F.3.a		4	Related projects in area contributing to possible cumulative effect
Chap. Two, Sec. F.3.d		5	Area's population/growth characteristics & assumptions used to justify the action
Chap. Two, Sec. F.3.j(2) & j.(3)		6	Secondary population/growth characteristics
Chap. Six	H	Relationship of Proposed Action to land use plans, policies and controls	
Chap. Six		1	For conflicts, extent to which conflict has been reconciled and reasons for proceeding
Chap. Three, Sec. B.12		2	List of necessary approvals and status of each
Chap. Five	I	Statement of probable impacts	
Chap. Five		1	Consideration of all phases
Exec. Summ. & Chapter Five, Sec. B.6.c		2	Direct/indirect
Exec. Summ. & Chap. Five, Sec. D		3	Interrelationships and cumulative impacts of Action and other related projects
Chap. Five, Sec. D.		4	Secondary impacts
Chap. Five, Sec. B.6.a		5	Estimated population impacts
Chap. Five, Sec. B		6	Effects of population change
Chap. Five, Sec. A.5, A.6, A.9 & B.2		7	Direct or indirect sources of pollution
Chap. Five, Sec. G	J	Relationship between local short-term uses of environment and maintenance/enhancement of long-term productivity	
Chap. Six, Sec. C.1		1	Trade-offs/short-term & long-term gains/losses
Chap. Six, Sec. C.2		2	Extent to which Proposed Action forecloses future options
Chap. Six, Sec. C.3		3	Narrows range of beneficial uses
Chap. Six, Sec. C.4		4	Poses long-term risks to health and safety
Chap. Six, Sec. C.6		5	Environmentally signficant consequences
Chap. Five, Sec. F & Chap. Six, Sec. D.6	K	Irreversible/irretrievable commitments of resources	
Chap. Six, Sec. D.1		1	Unavoidable impacts
Chap. Six, Sec. D.2		2	Use of non-renewable resources
Chap. Six, Sec. D.3		3	Curtails range of benefical uses
Chap. Six, Sec. D.4		4	Possibility of environmental accidents resulting from any phase of Proposed Action
Chap. Six, Sec. D.5		5	Loss/destruction of natural/cultural resources
Chap. Five, Sec. E	L	All probable adverse environmental effects that cannot be avoided	
Chap. Five, Sec. G		1	Rationale for proceeding with Action, notwithstanding, adverse effects

SEIS Compliance	11-200-17 Content requirements for Draft EIS (applicable to SEIS per 11-200-28)		
Chap. Six, Sec. E		2	Other governmental policies that offset adverse environmental effects
Chap. Four, Sec. C		3	Ability of reasonable alternatives to achieve countervailing benefits to avoid adverse effects
Chap. Five	M	Mitigation measures	
Chap. Five		1	Basis for determining mitigations reduce impacts to insignificant levels
Chap. Five		2	Timing of mitigations/commitments to assuring mitigation
Chap. Six, Sec. F	N	1	Summarize unresolved issues
Chap. Six, Sec. F		2	How they will be resolved prior to implementing action or overridding reasons for proceeding without resolution
Chap. Eight	O	1	Consulted parties
Chap. Seven		2	Disclosure of preparers
Chap. Eight	P	1	Reproduction of all substantive comments and responses
Chap. Eight, Sec. B		2	List of parties consulted who had no comments

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CHAPTER ONE: Statement of Purpose and Need

A. **Purpose of the Proposed Action** 1-1
B. **Need for the Proposed Action** 1-2
C. **New Guiding Principles for Resort Development and Operation** 1-2
D. **The Landowner and Accepting Authority** 1-5
E. **Definition of the Proposed Action** 1-6
F. **Regional Setting** 1-11
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CHAPTER ONE:

STATEMENT OF PURPOSE AND NEED

A. Purpose of the Proposed Action

The purpose of the Proposed Action is to expand facilities and operations at the the Resort in compliance with land use approvals and permits previously granted for the resort. The proposed expansion of the Resort will provide new and much needed employment opportunities to the Koʻolau Loa/North Shore (KNS) region. It will contribute to the strengthening of the visitor industry on the island of Oʻahu, as envisioned in the Hawai`i State Plan and the Oʻahu General Plan. It will provide significant new tax revenues to the State of Hawaiʻi and the City and County of Honolulu.

The Proposed Action is presented in this document in accordance with the requirements of Hawaiʻi's Environmental Protection Act ("HEPA"), Chapter 343 of Hawaii Revised Statutes as amended ("HRS"), and Chapter 11-200, Hawaii Administrative Rules ("HAR"), the rules governing the Office of Environmental Quality Control ("OEQC").

This Supplemental Environmental Impact Statement (SEIS) is intended to supplement the environmental impact statement (EIS) that was approved by the City and County of Honolulu's Department of Land Utilization in 1985 for the Kuilima Resort Expansion project (Revised Final Environmental Impact Statement, Kuilima Resort Expansion, 7 October, 1985; hereinafter "the 1985 EIS).

As set forth in Section 11-200-28, HAR:

> ***"The contents of the supplemental statement shall be the same as required by [these rules] the EIS and may incorporate by reference unchanged material from the same; however, in addition, it shall fully document the proposed changes from the original EIS, including changes in ambient conditions or available information that have a bearing on a proposed action or its impacts, the positive and negative aspects of these changes, and shall comply with the content requirements of section 11-200-16 as they relate to the changes."***

This SEIS updates the 1985 EIS to disclose proposed changes to the action described in the 1985 EIS, as well as changes to the environment since 1985. In those instances where there have been no substantive or significant changes, the SEIS employs the term "Incorporated by Reference" to alert the reader. The 1985 EIS can be viewed on line at:

http://oeqc.doh.hawaii.gov/Shared%20Documents/EA_and_EIS_Online_Library/Oahu/1980s/1985-10-OA-REIS-KUILIMA-RESORT-EXPANSION-VOL-I.pdf

The SEIS also presents new subject matter that was not presented in the 1985 EIS (primarily due to changes in governmental laws and regulations). For example, in 1985 a Cultural Impact Assessment (CIA) was not specifically required, however in 2000, Act 50 Hawai'i Session Laws was adopted which set forth guidelines for the consideration of impacts of a proposed action on cultural resources. Thus, the SEIS contains an extensive CIA, including ethnographic interviews of cultural practitioners, mo'olelo or stories of the area, and archival research documenting the historic uses of the area.

B. Need for the Proposed Action

The Proposed Action will provide new employment opportunities to the KNS region. In so doing, it will improve the quality of life of area residents by creating well-paying construction and operational jobs, new affordable housing opportunities, and by reducing the need for workers to commute to Honolulu for work. The expansion of the Resort as envisioned in the Proposed Action will improve economic vitality in the region by stimulating new business growth while maintaining a rural character on the majority of the resort. It will provide much needed tax revenues to the State and to the City and County of Honolulu, without requiring substantial public investment in facilities, infrastructure, or public services. It will also improve the sustainability of resort operations in a culturally sensitive manner.

The Proposed Action includes the development of new hotel units, resort residential units, community housing units, and appurtenant facilities and infrastructure to support them. Hotel units are planned to be developed as time-share units and the residential units are planned to be sold to individual buyers.

The real estate markets and buyer's perception of value have undergone significant changes since the original EIS for the Resort was completed in 1985. As such, the highest and best development opportunity for resort residential and hospitality development at the Resort has changed significantly. TBR's market analyst/consultant concludes that the Full Build-Out of the Resort envisioned in 1985 is currently NOT a financially viable scenario due to changes in market conditions. The density of development and the total number of units in the Full Build Out scenario were predicated upon creating sufficient mass for the development to create economies of scale. But comparable projects completed elsewhere in Hawai'i since 1985 have demonstrated that success can be achieved at a reduced scale.

The Proposed Action will create a palate of resort unit densities, unit types, and visitor attractions and amenities to achieve the optimal balance of economic, social, and cultural vitality for the resort, while maintaining the rural character of the resort coastline for the enjoyment of the resort's guests and the community at large.

C. New Guiding Principals for Resort Development and Operation

The Hawaiian cultural renaissance that began in the 1970s with a renewed interest in Hawaiian language, music, and dance has successfully merged with contemporary land use policy during the past decade. Today, a growing interest in sustainability has heightened public awareness of the applicability of traditional Hawaiian land use and cultural practices to modern economic

activities. This has led to the TBR project team's exploration of the *ahupuaʻa* natural resources management system to provide a basis for the master planning process.

> ***"In traditional Hawaiian life, an ahupuaʻa[1], or land division, was a complete ecological and economic production system that provided all the resources to sustain the community living within its boundaries. Ahupuaʻa boundaries were the natural geographic formations such as mountain ridges, gulches, and streams, and ahupuʻa were typically wedge-shaped, extending from the top of the mountain into the outer edge of the ocean reef. Fish and marine resources were harvested from the ocean, kalo (taro) and ʻuala (sweet potato) were raised in the lowlands, and upland areas provided trees and other forest products.***
>
> ***The ahupuaʻa concept is a holistic approach to land management that recognizes the connections between land-based and marine-based natural resources and the dependent relationships between ecological functions. Resources were managed for the collective good of all living within the ahupuaʻa, based on the principal that activities in one part of the ahupuaʻa affected all other parts. The ahupuaʻa concept is used as the organizing basis for land use planning and natural resource management in Koʻolau Loa." (Koʻolau Loa Sustainable Communities Plan, Public Review Draft, October 2010)***

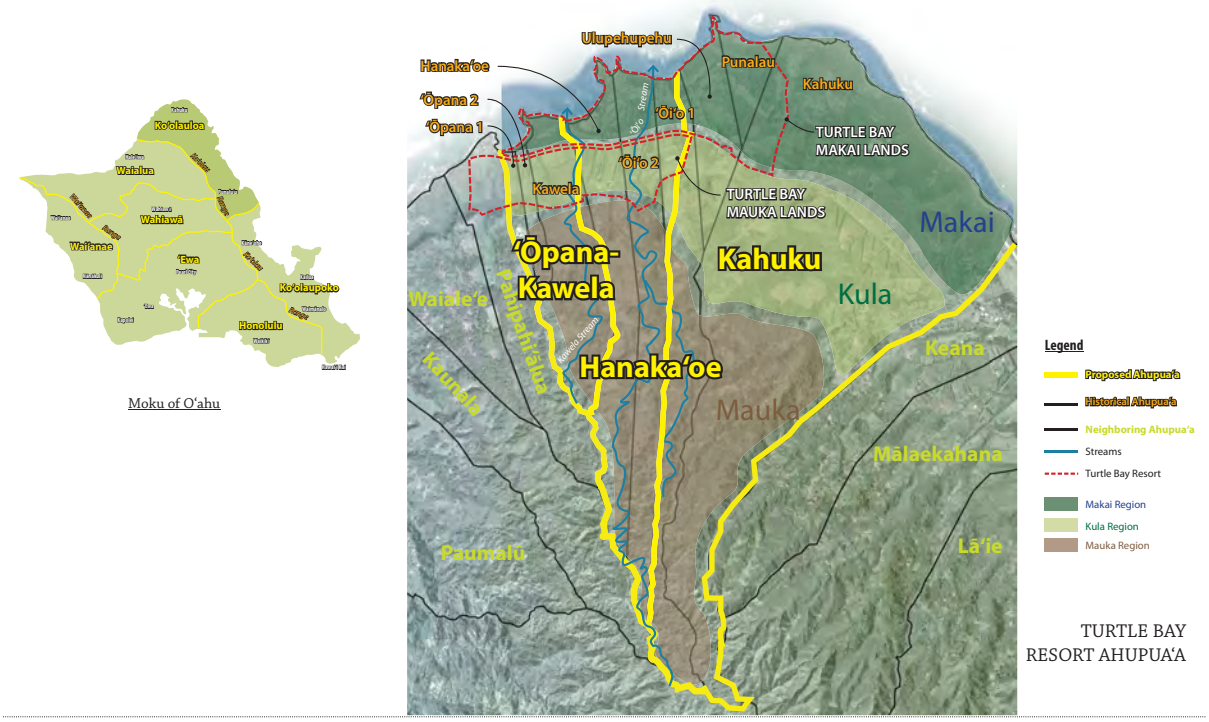
This SEIS, and the Proposed Action it presents, embrace the spirit, meaning, and intent of the *Ahupuaʻa* concept. To that end, an innovative approach has been developed to guide the proposed expansion of the facilities and amenities at the Resort: *Nana I Mua, Nana I Hope* – Looking Forward, Looking Back.

The Resort properties include portions of seven *ahupuaʻa* (in order from west to east): ʻŌpana, Kawela, Hanakaoe, ʻŌʻio, ʻUlupehupehu, Punaluʻu, and Kahuku. See Figure 1-1. Exploring the history of these *ahupuaʻa* has renewed an understanding that the qualities inherent to them are still relevant and can be translated to guide the decisions affecting the long-term responsible use and management of the land into the future. This new understanding has led to the formulation of the project team's concept called *Tomorrow's Ahupuaʻa*, which has become the guide for this planning process. *Tomorrow's Ahupuaʻa* strives to learn from the traditions, values, and aspirations of the host culture to develop a sustainable community platform that celebrates the balance of its environmental, socio-political, economic, and cultural resources. The project team looks to the wisdom of the past to provide sound guidelines to build a common sense approach to a new more balanced future.

The efforts that have been undertaken to produce this SEIS are informed by the concept of *Tomorrow's Ahupuaʻa*. The SEIS presents new studies of the Resort, including a Cultural Impact Assessment (CIA) and a Supplemental Archaeological Inventory Survey (SAIS).

[1]Note: A glossary of Hawaiian words and terms is provided after the Table of Contents of the SEIS.

Figure 1.1: Turtle Bay Resort Ahupua'a



Between 1977 and 2006, no less than 21 separate reports have been prepared documenting the archaeological resources at the Resort. Nearly 30 years of work has culminated in an approval by the State Historic Preservation Division of the Department of Land and Natural Resources of an Archaeological Mitigation Plan in 2007. However, the resort owner, Turtle Bay Resort, LLC (TBR), voluntarily elected to prepare the SAIS, in part due to community concerns over potential *iwi kūpuna* (human remains) in areas designated for new development, but more importantly because it was the right thing to do. To that end, the SAIS was conducted to supplement the previous archaeological work. The land use plan presented in this SEIS is based upon an exhaustive subsurface investigation of the Resort to determine the presence of any cultural resources.

Tomorrow's Ahupua'a honors the important aspects of the traditional *ahupua'a*; understanding and maintaining lands from mauka to makai; recognizing and stewarding the unique elements and resources of each *ahupua'a* in order to strive for a path towards higher sustainability; and creating a management framework inspired by the traditional *ahupua'a* to care for the natural and cultural resources. The *Tomorrow's Ahupua'a* concept is a dynamic and evolving planning approach that is summarized in the document, A Cultural Approach to Sustainability, which is presented as Appendix A of this SEIS.

As a conceptual framework, *Tomorrow's Ahupua'a*, has led to the formulation of a revised master plan for the Turtle Bay Lands, called the Comprehensive Plan. The Comprehensive Plan is

intended to guide design of the proposed expansion of the resort, its approach to sustainability and environmental stewardship, and the resort's future day-to-day operations.

In 2011, Hawai'i's Governor signed into law Act 181 amending Chapter 226, HRS (The Hawaii State Plan) to add a new definition for 'Sustainability' and provide new priority guidelines and principles to promote sustainability. Under state law,

"Sustainability means achieving the following:

- ***Respect of the culture character, beauty, and history of the State's island communities;***
- ***Striking a balance between economic, social, community, and environmental priorities and***
- ***Meeting the needs of the present without compromising the ability of future generations to meet their own needs.***

The Comprehensive Plan and the *Tomorrow's Ahupua'a* concept incorporate this definition into their core principals.

D. The Landowner and The Accepting Authority

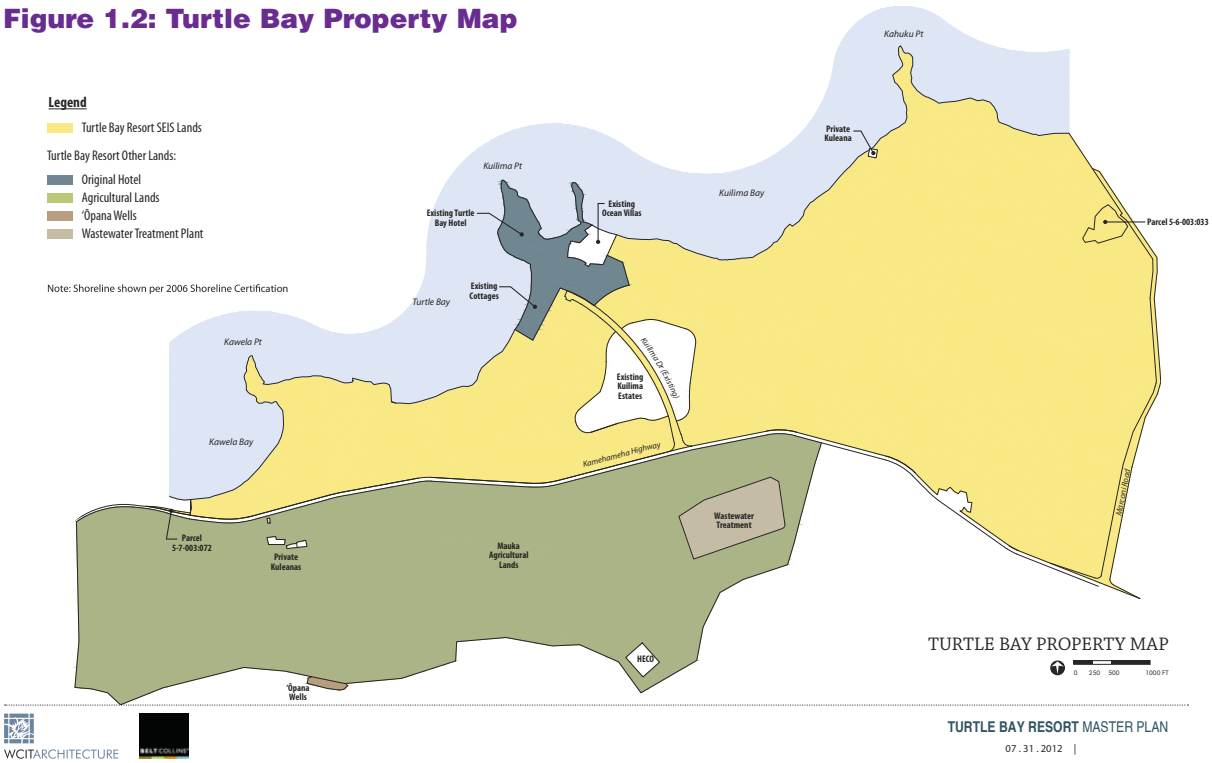
TBR and its related companies are the current owners of approximately 1,300 acres of land on the northern tip of O'ahu roughly situated between Kawela Bay and Kahuku Point, both *mauka* and *makai* of Kamehameha Highway. These lands shall hereafter be referred to as the "Turtle Bay Property". See Figure 1-2. The Turtle Bay Property includes the Turtle Bay Hotel, two golf courses (Palmer Course and Fazio Course) operated as Turtle Bay Golf along with the remaining undeveloped land and land under agricultural use. The existing development *makai* of Kamehameha Highway that includes the existing hotel and its ancillary facilities, together with the golf courses, are commonly referred to as the Resort.

TBR and or its successors will be the applicant of record for any development related approvals or permits required in the foreseeable future for the Turtle Bay Property and is ultimately responsible for the content of this SEIS.

TBR is generally responsible for the overall management of the Resort and assets. The day-to-day management of the Turtle Bay Hotel has been contracted to Benchmark Management LLC.

The Accepting Authority for the SEIS is the City and County of Honolulu's Department of Planning and Permitting (DPP). Pursuant to Chapter 343, HRS, the Accepting Authority must determine whether the Final SEIS complies with the requirements of the law. That determination is not a judgment on the merits of the Proposed Action. Rather, it is a judgment as to whether or not the SEIS fulfills the content and process requirements specified in Section 11-200 HAR, and whether or not all substantive comments received have been adequately addressed by the applicant.

Figure 1.2: Turtle Bay Property Map



E. Definition of the Proposed Action

TBR has for the past two (2) years engaged in the master planning process to develop a new master plan for the Turtle Bay Lands. The new plan, hereinafter referred to as the Comprehensive Plan, is discussed in this SEIS document. The term "Proposed Action" refers to the proposed expansion of the Resort, guided by the Comprehensive Plan and the *Tomorrow's Ahupua'a* concept, and discussed in the SEIS. Formulation of the Comprehensive Plan represents the latest milestone in a process that began approximately 25 years ago when the then-owners of the Turtle Bay Hotel decided to seek land use approvals for the expansion of the Resort from a single hotel to a visitor destination area with multiple hotels and visitor-related amenities. The 1985 EIS was subsequently prepared and published to disclose the anticipated impacts of the proposed expansion. As an expansion project, the project proposed in the 1985 EIS did not include the facilities that had already been built: the hotel and adjacent beach cabanas (some of the Cabanas are now known as the Ocean Villas), or the neighboring Kuilima Estate West and East condominiums.

Subsequent to the completion of the 1985 EIS, land use approvals for the proposed expansion were granted by the State Land Use Commission and the Honolulu City Council between 1986 and 1988, allowing the addition of 3,000 new resort hotel units distributed among five (5) new hotel sites and 1,000 new resort-residential units among three (3) new resort-residential sites.

During the ensuing years, ownership of the Turtle Bay Lands changed hands a number of times, additional properties were acquired, and the cyclical nature of the economy thwarted

the subsequent owners' efforts to implement the approved expansion plan (a more detailed explanation of the resort's history is provided below in Section G). Eventually, a legal challenge to a proposed subdivision of the property by TBR's predecessor, Kuilima Resort Company, led to a decision by the Hawai'i State Supreme Court that the 1985 EIS was no longer valid and that a Supplemental EIS was needed to be prepared.

Given this determination, the current owner decided to actively engage the community and government agencies and revisit the original expansion plan. As discussed above, an extensive community outreach program and application of *Tomorrow's Ahupua'a* guidelines have resulted in a substantial revision to the plan. The scope of the resulting Comprehensive Plan is much broader and affects more property than was discussed in the 1985 EIS. Thus, it is important that the reader understands the following: because this SEIS document is intended to supplement the 1985 EIS, it focuses on that portion of the Turtle Bay Lands that were discussed in the 1985 EIS, and, as a result, only a portion of the entire Comprehensive Plan.

For example, because the existing hotel, the Kuilima Estates, and the Ocean Villas were excluded from the original 1985 EIS, they are not included in the scope of the SEIS. Similarly, because the resort property in 1985 included neither the agricultural lands on the *mauka* side of Kamehameha Highway, nor the 'Ōpana wells that were subsequently developed on the *mauka* side of Kamehameha Highway, these *mauka* properties are also excluded from the SEIS. The 1985 EIS did, however, contemplate the inclusion of Marconi Road as a new access road for the resort. For that reason, and despite the fact that some of the lots that make up the Marconi Road right-of-way (ROW) are owned by others, the SEIS includes the Marconi Road ROW. Collectively, all the properties addressed in the SEIS are hereinafter referred to as the "SEIS Lands".

Figure 1.3: Scope of Comprehensive Plan

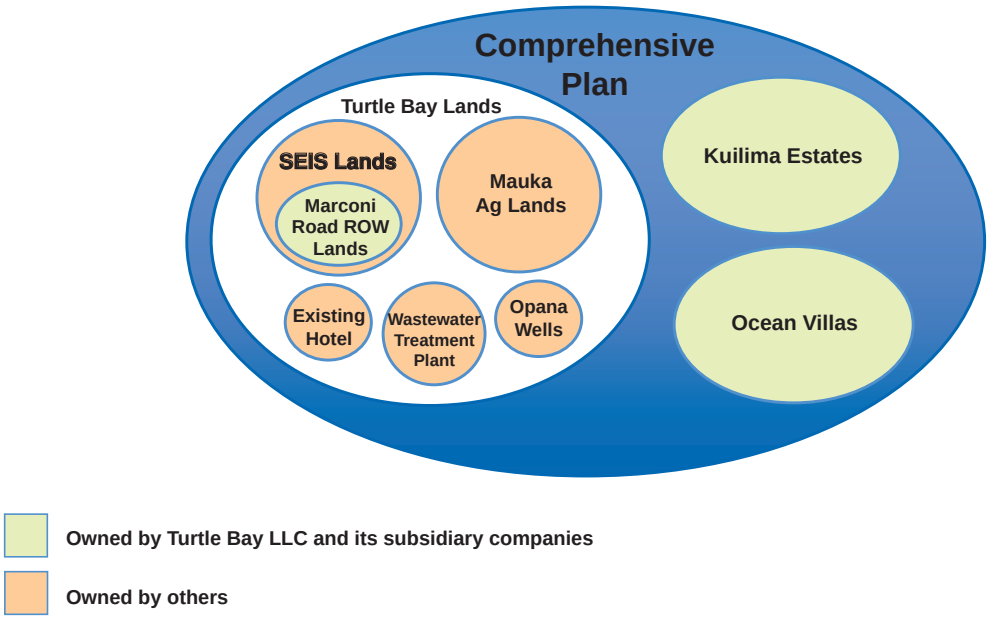


Figure 1-3 illustrates the scope of the Comprehensive Plan and the place of the SEIS within it. Figure 1-4 below, depicts the extent of the SEIS lands.

As illustrated by Figure 1-3, while the Comprehensive Plan addresses all the components of the Resort, including those owned by the resort and those owned by other individuals or entities, the lands covered in the SEIS constitute only a portion of the entire resort. Therefore, for the purposes of the SEIS, the Proposed Action is the development of new land uses, activities, and facilities proposed as part of the Comprehensive Plan within the SEIS Lands. The SEIS Lands include the lands owned by the resort and proposed for resort expansion as well as the Marconi Road right-of-way that is not owned by the resort. The Comprehensive Plan provides the context in which resort expansion will be implemented. As discussed in Section C above, the Comprehensive Plan presents a dramatic new approach for both the expansion and the day-to-day operation of the Resort.

Figure 1.4: SEIS Lands

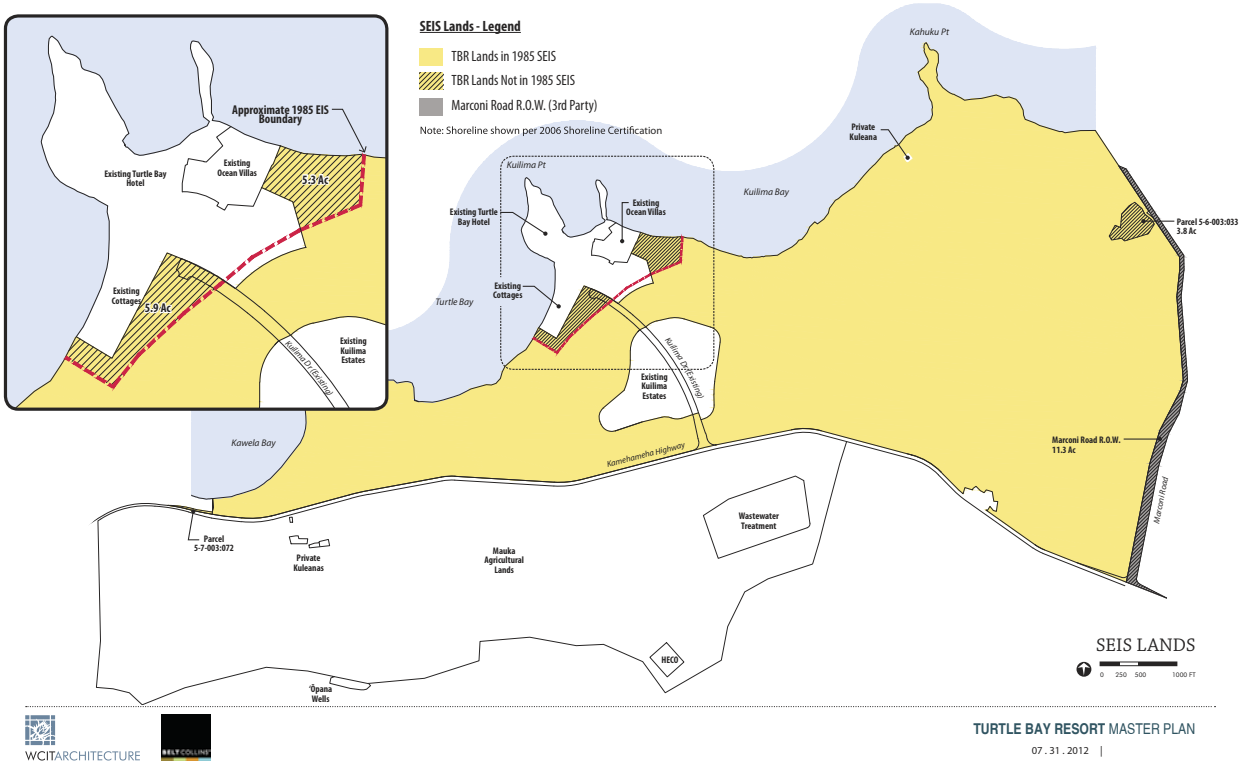
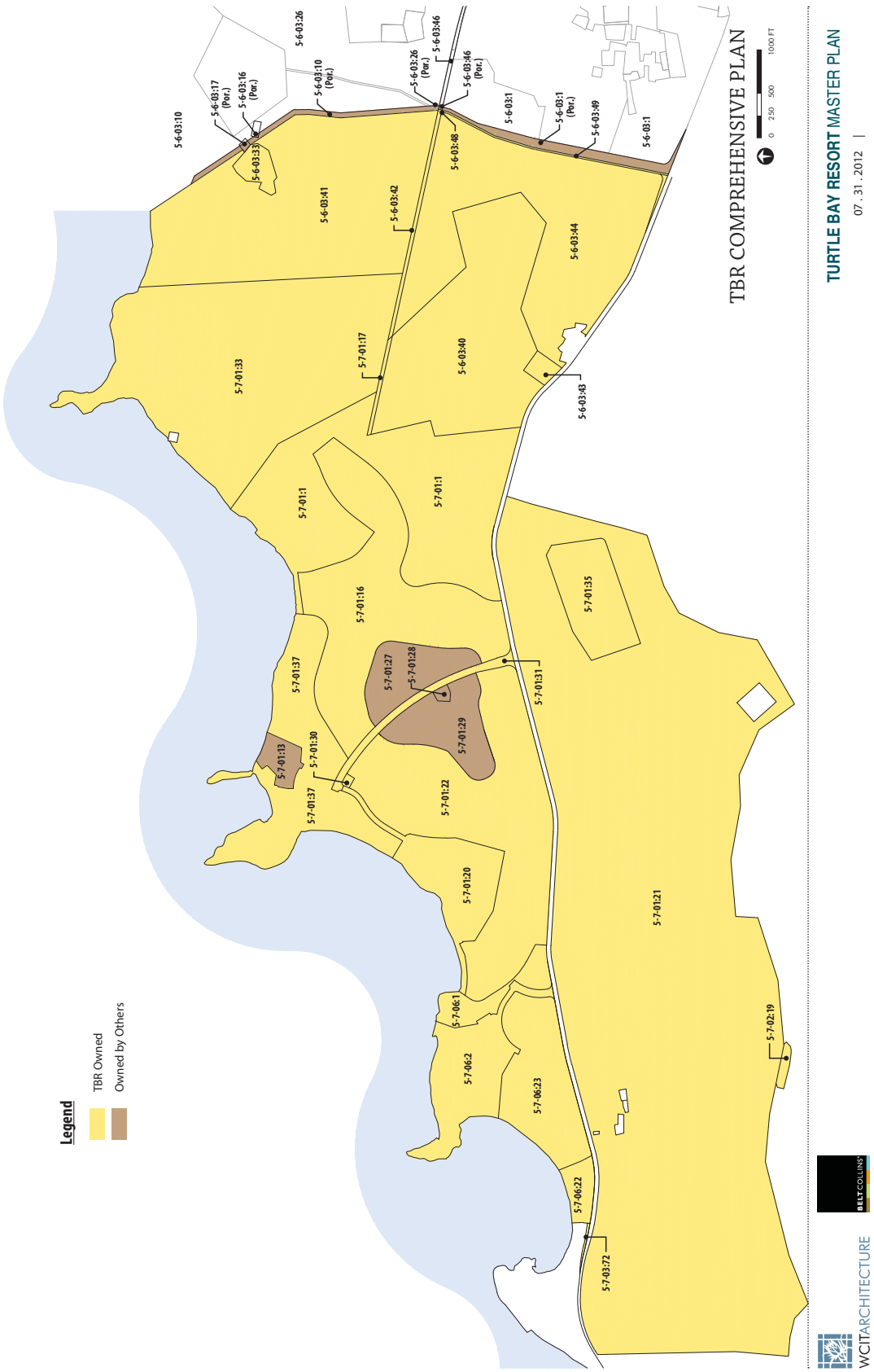


Table 1-1 presents a listing of the tax map parcels included in the SEIS Lands. Figure 1-5 on the next page presents a map of the tax map parcels.

Table 1.1: SEIS Lands' Tax Map Key Numbers

TMK	Parcels	Acreage	Owner	Description
(1) 5-6-003:	001	Por. of 35.730	Estate of J. Campbell	Por. of Marconi Rd ROW
	010	Por. of 74.824	Makai Ranch LLC	Por. of Marconi Rd ROW
	016	Por. of 0.275	Makai Ranch LLC	Por. of Marconi Rd ROW
	017	Por. of 0.239	Makai Ranch LLC	Por. of Marconi Rd ROW
	026	Por. of 165.077	OBR LLC	Por. of Marconi Rd ROW
	033	3.917	Turtle Bay Resort	Por. of Palmer Course
	040	77.048	Turtle Bay Resort	Por. of Palmer Course
	041	110.087	Turtle Bay Resort	Por. of Palmer Course
	042	2.421	Turtle Bay Resort	Por. of OR&L railroad
	044	89.907	Turtle Bay Resort	Por. of Palmer Course
	046	2.190	OBR LLC	Por. of Marconi Rd ROW
	048	0.018	Makai Ranch LLC	Segment of Marconi Road
	049	1.235	Makai Ranch LLC & OBR LLC	Segment of Marconi Road
(1) 5-7-001:	001	90.898	Turtle Bay Resort	Por. of Palmer Course
	016	72.777	Turtle Bay Resort	H4 + Por. of Fazio/Palmer
	017	1.035	Turtle Bay Resort	OR&L ROW + Por. Palmer
	020	26.653	Turtle Bay Resort	H3 + Por. of Fazio
	022	83.333	Turtle Bay Resort	Por. of Fazio
	030	0.310	Turtle Bay Resort	Golf Clubhouse
	031	5.185	Turtle Bay Resort	Kuilima Drive
	033	132.039	Turtle Bay Resort	Por. H5, P2, RR1-3, Palmer & Marsh
(1) 5-7-003:	072	0.200	Turtle Bay Resort	Remnant @ Kawela near Kamehameha Highway
(1) 5-7-006:	001	8.493	Turtle Bay Resort	Por. Kawela
	002	25.690	Turtle Bay Resort	H2 & Kaihalulu Dr. ROW
	022	4.800	Turtle Bay Resort	P-1 site
	023	30.100	Turtle Bay Resort	H1 site

Figure 1.5: TBR Comprehensive Plan



The total acreage of the SEIS Lands is 767.714 acres. However, this total requires some explanation:

1. The acreages pertaining to Marconi Road presented in the table above represent the total acreage of each parcel. But only a portion of TMK 5-6-003 parcels 1, 10, 16, 17, 26, and 46 are located within the Marconi Road right-of-way. The total acreage of the Marconi Road right-of-way is approximately 11.300 acres, but a metes and bounds survey of each affected parcel has not yet been done in order to allocate the area of each parcel contained within the right-of-way.

2. The total area of the resort (excluding the Marconi Road right-of-way) is approximately 858.672 acres. However, the metes and bounds survey applied to the 2006 shoreline survey of the same area totals 840.567 acres; approximately 18.105 acres less than what the City's Tax Map Keys indicate. The difference is attributed to coastal erosion and mapping error over the past several decades.

3. When the acreage associated with the existing hotel and the Kuilima Estates is removed from the 840.567 acres discussed above, the net area is approximately 756.414 acres. The total acreage of the SEIS Lands is determined by adding the Marconi Road right-of-way (11.300 acres) to the net acreage, for a total of approximately 767.714 acres.

Thus, for the purposes of the SEIS, the total acreage of the Resort is considered to be approximately 840 acres, and the total acreage of the SEIS Lands within the Resort is approximately 768 acres.

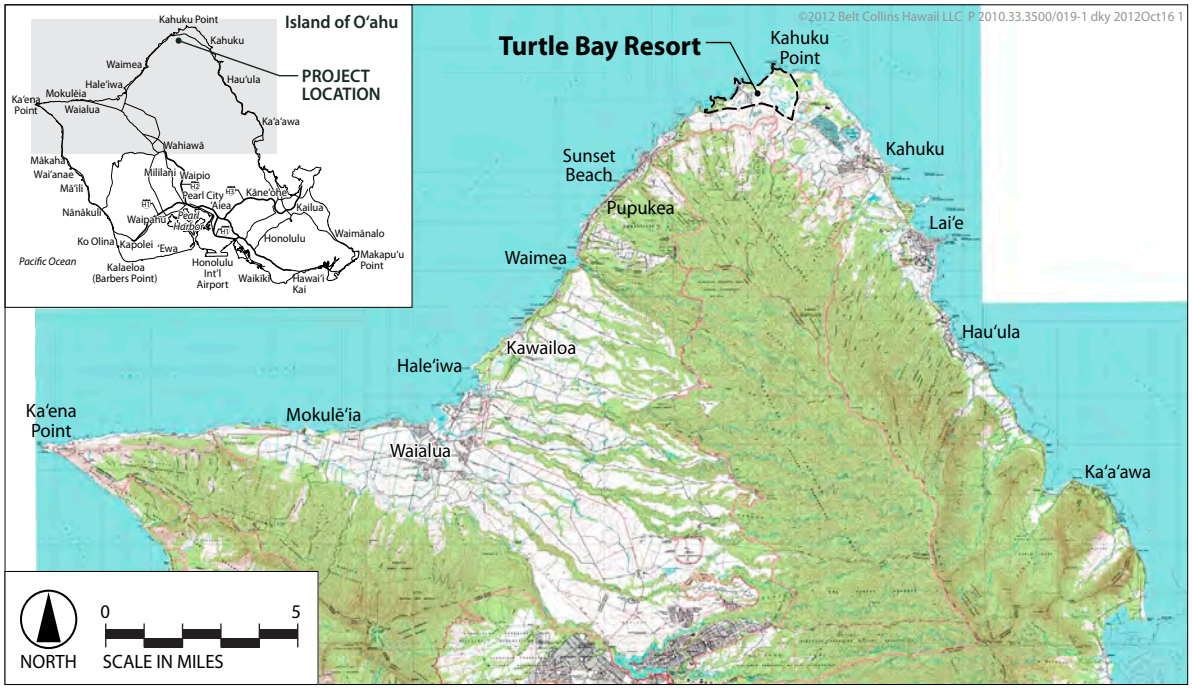
F. Regional Setting

The Resort is situated at the northern most point of the island of Oʻahu and is accessed by Kamehameha Highway (FAP 83). The Resort lands are generally located on a broad coastal plain extending seaward from the foothills that constitute the northern terminus of the Koʻolau mountain range. See Figure 1-6.

The Resort is located at the far western end of the Koʻolau Loa Sustainable Communities Plan (SCP) area, approximately one mile east of the SCP's western boundary. To the east of the Resort, the nearest communities are Kahuku Village (3.8 miles), Lāʻie (6.2 miles), Hauʻula (9 miles), Punaluʻu (10.9 miles), Kaʻaʻawa (15.7 miles), and Kaneʻohe (29.6 miles). To the west, the nearest communities are Sunset Beach (4.3 miles), Pūpūkea (4.9 miles), Haleʻiwa (12.3 miles), Waialua (14.8 miles), and Wahiawa (21.2 miles). The Resort is approximately 42.9 miles from Honolulu (via the shortest route across the Central Oʻahu plateau).

Three (3) bays generally front the Resort, which extends from Kawela Stream east to Marconi Road: Kawela Bay to the west, Turtle Bay in the center, and Kuilima Bay (sometimes called Kaihalulu Bay) to the east. Kawela Point separates Kawela Bay from Turtle Bay. Kuilima Point

Figure 1-6: Regional Map



separates Turtle Bay from Kuilima Bay and is the location of the existing Turtle Bay Hotel. Kahuku Point marks the eastern end of Kuilima Bay. The shoreline to the southeast of Kahuku Point is known as Hanakaʻīlio Beach and extends just over a mile to Kalaeuila Point, which is situated a few hundred free to the east of the Turtle Bay Lands' eastern property boundary. See Figure 1-2.

G. Contemporary Historical Perspective

With the general exception of the beaches *makai* of the sand dunes fronting the bays, the SEIS Lands can be generally characterized as a developed area that has been subjected to periodic development and redevelopment since the late 1700s. The first written descriptions of the area date back to 1779 when Captain Charles Clerke and Lieutenant James King of the HMS Resolution described the area of Kahuku Point as fine and fertile and occupied by a large village. [Beaglehole: 1967] Subsequent to the decline of the Hawaiian population, the SEIS Lands were converted to a sheep and cattle ranch.

In 1873, records indicate that Kahuku Ranch included all of the SEIS Lands and scattered remains of the ranch have been found in the vicinity of Punahoʻolapa Marsh. [Rechtman: 2009] By the 1880s the land was transformed from cattle ranching to sugar cane cultivation.

In 1889, construction of the Oahu Railway and Land Company's railroad linking Kahuku to other parts of Oʻahu began The rail line was officially opened in 1899 and its right-of-way eventually crossed the SEIS Lands, passing through a portion of Punahoʻolapa Marsh.

The coastal plains around Kahuku Point were again dramatically transformed during the course of World War II. Land modification activities included the construction of concrete bunkers, asphalt runways, and large soil/sand revetments along with barracks and numerous other buildings. After the war, beach cottages were constructed along the shoreline, especially in the area of Kawela Bay and Kawela Point. The portions of the SEIS Lands cultivated in cane eventually turned fallow with the closure of the Oahu Sugar Company.

In 1972, the current Turtle Bay Hotel was opened by Kuilima Development Company ("KDC") as Kuilima Resort together with an 18-hole golf course, and followed shortly thereafter by two (2) condominium townhouse projects, Kuilima Estates East and Kuilima Estates West (together "Kuilima Estates"). In 1977, the Mayor of Honolulu approved the Oʻahu General Plan that provided, in part, that lands surrounding Kuilima Resort and Kuilima Estates, and extending generally from Kawela Bay to Kahuku Point on O 'ahu's North Shore, be designated as a 'Resort Area' for 'intensive resort and residential development'.

On October 30, 1985, the City and County of Honolulu's Department of Land Utilization (the predecessor to the current Department of Planning and Permitting), acting as the Accepting Agency, approved a Revised Final Environmental Impact Statement (the "1985 EIS") for the expansion of Kuilima Resort, as it was then known. As mentioned above, the 1985 EIS did not include the hotel that existed at that time, the area immediately surrounding it including the site of the beachfront cabanas including those that were replaced by Ocean Villas, or Kuilima Estates.

A 236-acre portion of the Turtle Bay Lands, then leased by KDC, was reclassified in 1986 from the State Agricultural District to the State Urban District. In 1986, KDC executed a Unilateral Agreement with the City and County (and other parties including the Estate of James Campbell) with respect to a portion of the Turtle Bay Lands (the "Unilateral Agreement"), and the City and County then rezoned portions of the Turtle Bay Lands to A-1 (Low Density Apartment), B-1 (Neighborhood Business) and Resort. See Figure 1-7. Among many other terms and conditions, the Unilateral Agreement provided that a total of 4,000 units could be developed on the lands subject to the Unilateral Agreement. This total included the existing Kuilima Resort at the time (500 units), but excluded Kuilima Estates (368 units). The Unilateral Agreement was amended in 1988 to add Kuilima Estates and additional portions of the Turtle Bay Lands. The Unilateral Agreement is presented in the SEIS as an attachment (Appendix B).

In the late-1980s, the residential cottages along Kawela Point and the eastern half of Kawela Bay were demolished, structural fill was brought in, and construction of the foundations for a new multi-story hotel structure began. The structure was never completed, but underground utilities and numerous concrete piles remain today. At that time the 18-hole Palmer Golf Course was built and the Fazio Golf Course was reduced to 9-holes. Punahoʻolapa Marsh was enhanced by

Figure 1-7: Existing Zoning Map

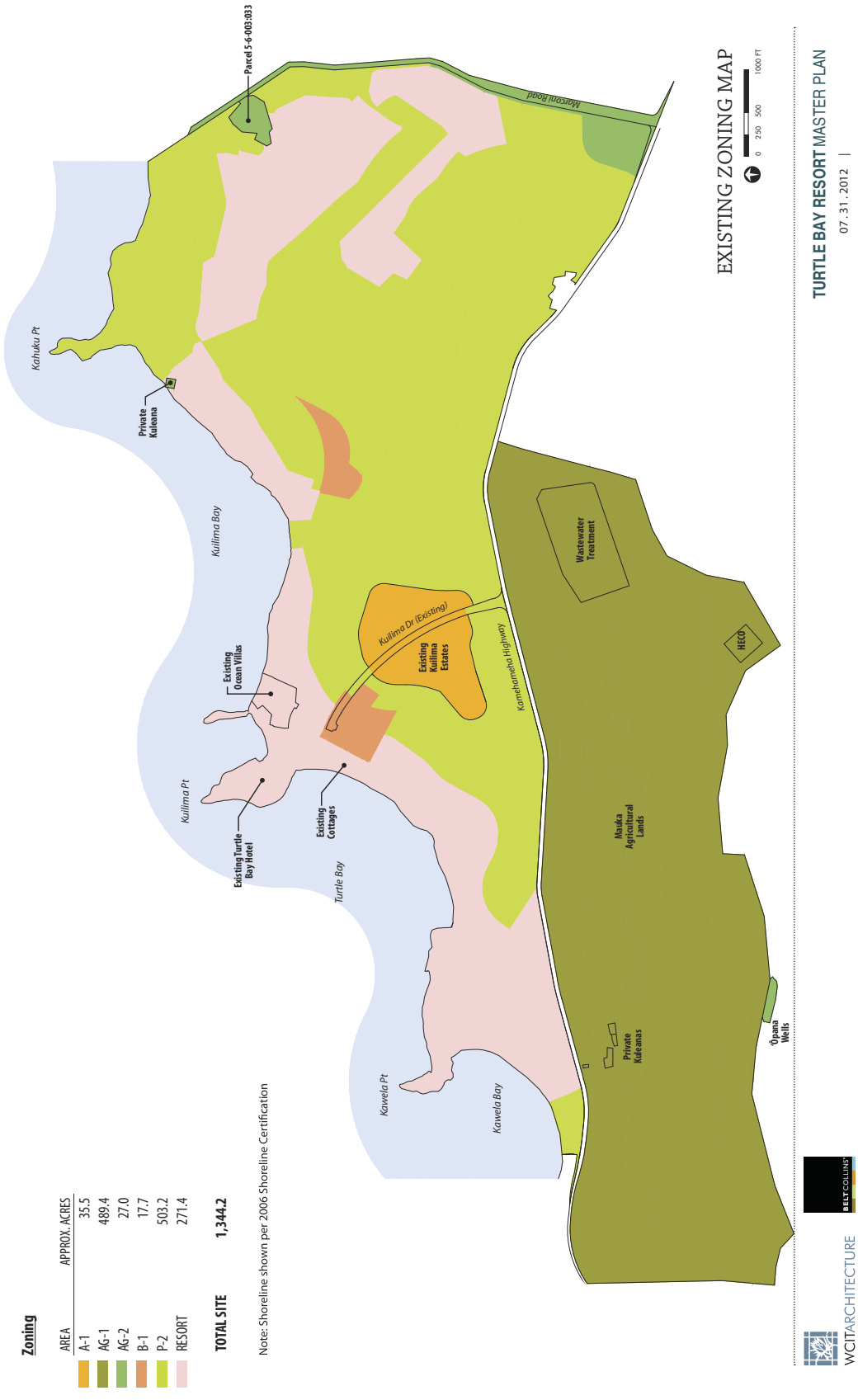
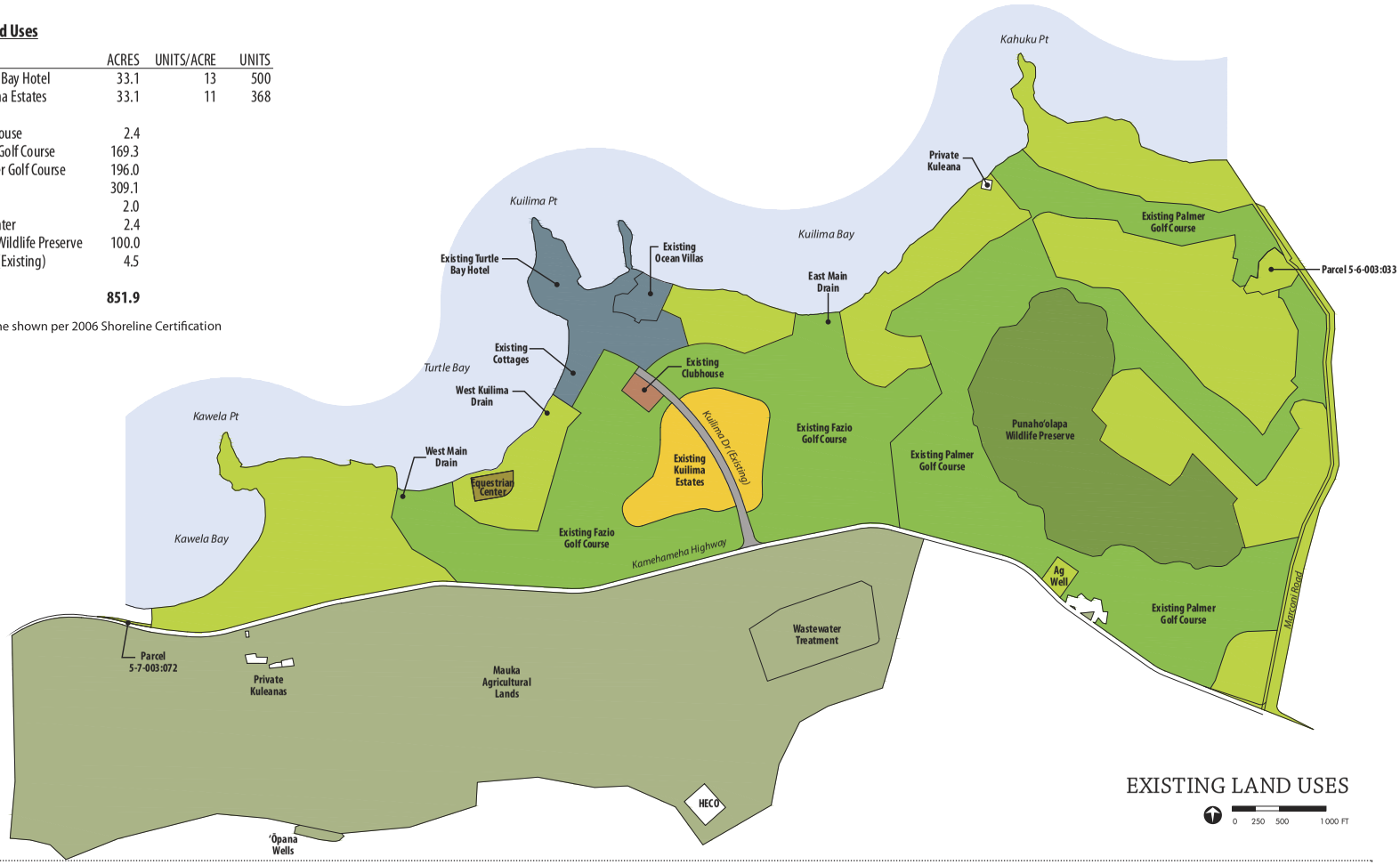


Figure 1-8: Existing Land Uses

Existing Land Uses

AREA	ACRES	UNITS/ACRE	UNITS
Existing Turtle Bay Hotel	33.1	13	500
Existing Kuilima Estates	33.1	11	368
Existing Clubhouse	2.4		
Existing Fazio Golf Course	169.3		
Existing Palmer Golf Course	196.0		
Open Space	309.1		
Ag Well	2.0		
Equestrian Center	2.4		
Punahoolapa Wildlife Preserve	100.0		
Kuilima Drive (Existing)	4.5		
TOTAL SITE	**851.9**		

Note: Shoreline shown per 2006 Shoreline Certification



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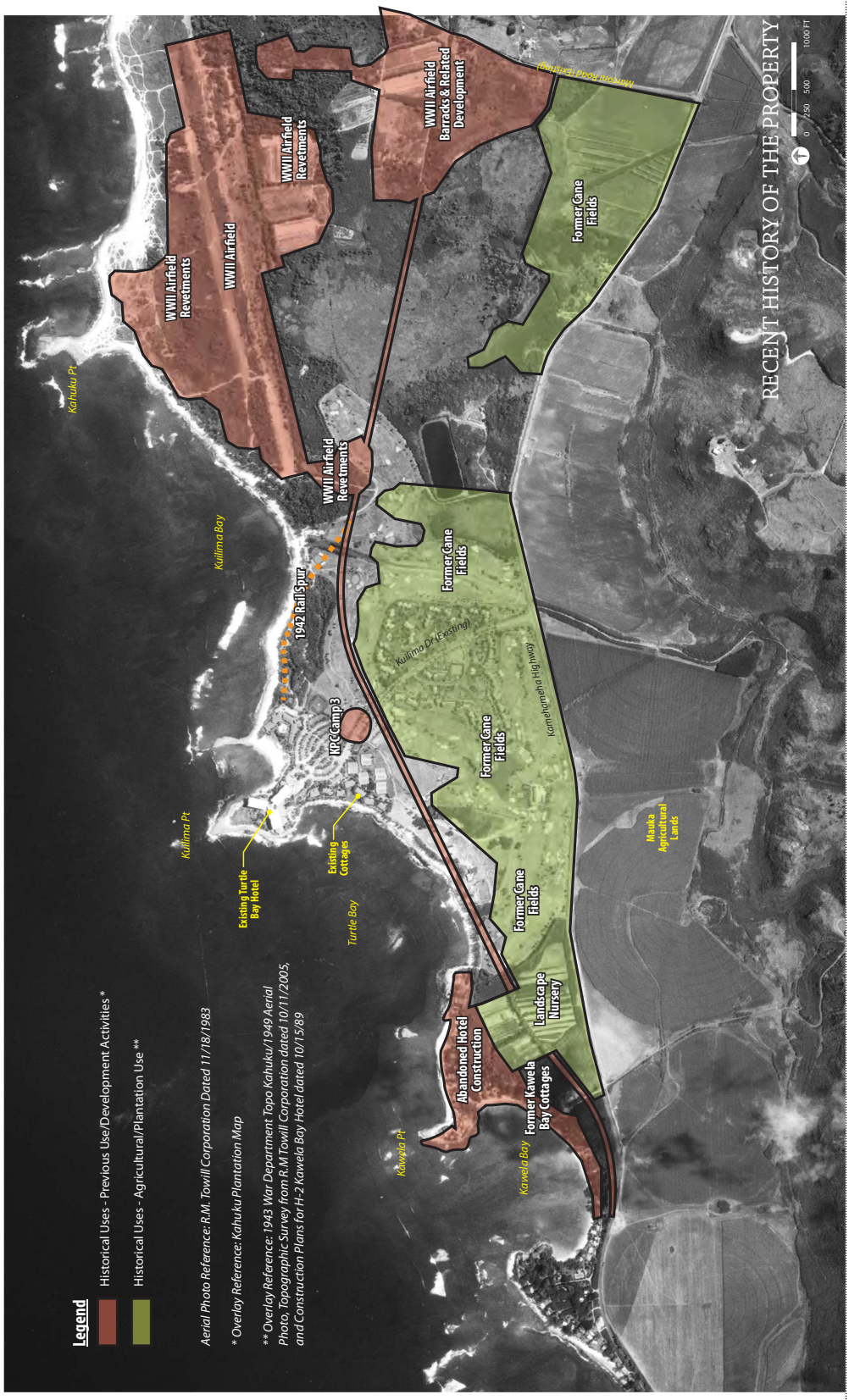
TURTLE BAY RESORT MASTER PLAN
07.31.2012 |

Figure 1-9: Recent History of the Property



TURTLE BAY RESORT MASTER PLAN

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the construction of a moat around much of its perimeter. The original wastewater treatment plant was decommissioned after a more modern facility was constructed *mauka* of Kamehameha Highway. In 2001, the Fazio Golf Course was reinstated back into an 18-hole golf course. In 2008, Kuilima Drive was widened. Figure 1-8 depicts the existing land uses at the Resort.

In 2006, Kuilima Resort Company ("KRC"), the successor in interest to KDC, received tentative approval from the City and County for a bulk lot subdivision impacting approximately 700 acres of lands subject to the Unilateral Agreement.

Figure 1-9 illustrates the extent of previous disturbances on the SEIS Lands.

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CHAPTER TWO:

ENVIRONMENTAL SETTING

A. Goal Statement and Objectives

The Goal of the Comprehensive Plan for the Resort is to develop and manage the Turtle Bay Property in a holistic manner drawing inspiration from the traditional ahupuaʻa model of sustainability and respect for the environmental, cultural, social, and economic elements.

The expanded Resort will be developed and managed in a manner sensitive to its unique location on the northern tip of Oʻahu. Many people are drawn to the recreational, scenic, cultural and social experience of Koʻolau Loa and the North Shore. The Resort will provide a limited number of quality accommodations and resort homes for those wanting to stay a few days or much longer.

The proposed expansion of the Resort, as set forth in the Comprehensive Plan for Turtle Bay, and described in the SEIS as the Proposed Action, will be guided by a series of overarching development objectives.

I ***Manage design, development, construction, and operations sustainably in a manner that embodies the spirit of long-established traditional ahupuaʻa system of planning and proactive resource management.***

II ***Integrate the Resort into the fabric and daily activities of the local community.***

III ***Create a balance of economic, social and cultural vitality while maintaining the rural character of the Resort's coastal area by focusing critical development mass within the ahupuaʻa of Hanakaʻoe (around the existing hotel).***

IV ***Operate the Resort as a place that will be equally welcoming to residents from neighboring communities as to visitors from afar.***

V ***Provide enhanced access to the shoreline for residents, visitors and residents from nearby communities, and cultural practitioners including fishermen and gatherers, by the provision of additional parks, shoreline access points and a shoreline trail interconnecting them.***

VI ***Enhance and protect the environment with specific attention to Punahoʻolapa Marsh, Kawela Bay, and the Agricultural lands.***

VII ***Ensure the long-term preservation of the Agricultural Lands through the implementation of a conservation easement on the Agricultural Lands.***

VIII ***Assist with local housing needs by providing additional housing units affordable to members of the local community beyond what is presently required.***

B. Historical Setting

The following discussion is derived from archival research conducted for the Resort by Haun and Associates (see Appendix C), and over 30 years of archaeological inventories conducted within the Turtle Bay property.

It is known that in late prehistory the Kahuku Point vicinity was well populated and extensively cultivated. There were permanent residences scattered along the coast. Larger settlements were present in areas such as Kahuku and Kawela Bay where sheltered ocean access was available. Temporary habitation probably associated with agricultural activity and natural resource use occurred in inland overhangs, caves, and walled shelters. Fishponds were present in sheltered areas and salt was collected from depressions along the shore. Fishing shrines and rock formations of legendary and probably ritual significance were scattered along the coast.

Heiau were sited on prominent topographic features overlooking the coast. Sand dunes and cliff face caves were used for burial. Agricultural use included cultivation of taro in pond fields wherever topographically suitable locations could be provided with sufficient freshwater. The abundance of fresh water around Punahoʻolapa Marsh provided ideal conditions for wet taro cultivation with minimal labor investment compared to pond field development of stream drainages. Dry-land gardens were present around the coastal residences and on the lower volcanic slopes. Upland areas were also cultivated. Food remains from archaeological excavations include dog, pig, birds, and a wide variety of fish and marine invertebrates, documenting technologies for fishing, collecting, hunting, and animal husbandry. Radiocarbon dates for the area indicate settlement by at least the A.D. 1000s to 1200s with the most intensive use occurring after A.D. 1400.

Observations of Captain George Vancouver in the mid 1790s and early 1800s missionary censuses suggest depopulation affected the region shortly after European contact (Nakamura -1981). Some depopulation undoubtedly occurred as a result of introduced diseases following the onset of more frequent visits by whalers and missionaries in the early 1800s. However, the disparity in the initial descriptions of a flourishing well-cultivated settlement at Kahuku from Captain Cook's expedition in 1779 and those from Vancouver's fifteen years later in 1794 of a much diminished state of cultivation and population probably predates the onset of disease-inducted population decline. Captain King, who reported the observations during Vancouver's expedition, conjectured that the decline was the result of internal warfare. According to Haun & Associates, another explanation might be that the region was struck by a tsunami. While this would have resulted in a dramatic decline in cultivation of the coastal plain, the effects would

rapidly diminish, allowing the area to return to a high level of settlement and cultivation as indicated by mid-Nineteen Century land claim testimony.

More than 100 Land Court Award (LCA) claims were awarded in the mid-1800s in the area spanning the region from Kawela to Kahuku. Thirty-five LCA claims with at least 24 house lots were awarded in the project area. The LCA testimonies refer to numerous *loʻi* and cultivated plots of bananas, sweet potatoes, *wauke*, sugar cane, bitter melon, *noni* and an orange tree. Other named plants are *hala* groves and *koa* trees for canoes. A brackish spring and a fishery also are mentioned in the testimonies.

Charles Hopkins purchased 8,000 acres at Kahuku in 1850-1851 from Kamehameha III and established the Kahuku Ranch. Forests were cleared for pasture for free-ranging herds of sheep and cattle, which soon plagued the small Hawaiian farms that were scattered throughout the area, eventually displacing many of the farmers.

By 1856, a carriage road had been completed between Honolulu and Kahuku. The ranch changed ownership several times during the 1860s and 1870s. By 1873 the ranch consisted of 15,000 acres including the lands of Kaunala, Pahipahiʻāula, ʻŌpana 1 and 2, Kawela, Hanakaʻoe, Ōiʻo, Ulupehupehu, Punalau, Kahuku, Mālaekahana, Keana, and part of Lāʻie. In 1874, the ranch was sold to Julius Richardson, who then sold it to James Campbell in 1876 by which time it encompassed nearly 25,000 acres with 3,000 head of cattle and herds of sheep and horses. In 1889, most of the ranch was leased to Benjamin Franklin Dillingham who chartered the Oahu Railway and Land Company (OR&L) railroad in the same year. Dillingham then subleased the lands to James Castle who chartered Kahuku Plantation Company in 1890.

The Kahuku Plantation began commercial production of sugarcane relying on water from springs, streams and rain for irrigation, but these sources were soon considered insufficient and artesian wells were drilled to augment the irrigation water supply. The first sugarcane crop from 2,800 cultivated acres was harvested in 1892. By 1899, the OR&L railroad line extended from Honolulu to Kahuku to get the cane to market. By the early 1900s there were train stations at Kawela and Kahuku Ranch. Marconi Station was located at Punamanō Marsh. By 1935, 4,490 acres were cultivated in sugarcane and the plantation employed over 1,100 workers. A plantation camp was established on the Resort property to house plantation workers by at least 1932.

In addition to sugarcane, pineapples were also cultivated beginning in the 1930s at Kahuku Plantation and on lands leased by the OR&L including small tracts leased to Japanese farmers. When the farmers' leases expired Kahuku Plantation leased large tracts of land to the California Packing Corporation (CPC), driving out the smaller farmers. The CPC became Del Monte Corporation in 1967.

The U.S. Army established Kahuku Army Airfield in the area in 1942. The airfield encompassed runways, taxiways, revetments, bunkers, emplacements, barracks and support facilities. The facility served as an auxiliary field used for flight training and coastal defense. Use of the airfield was short-lived and military use ended shortly after the end of World War II (September, 1945).

The April 1946 tsunami devastated much of the facility shortly after the Army abandoned it. Subsequent use of the airfield runways included civilian aircraft and auto racing.

Sugarcane cultivation continued until 1971 when the Resort and golf course were constructed. Some inland portions of the property continued to be used for vegetable faming until the late 1980s. Private beach cottages lined the east shores of Kawela Bay until 1990 when the parcels were acquired and the area was cleared and preliminary construction for a hotel at Kawela Bay began, but was abandoned in 1991.

C. Hawaiian Traditions and the Natural Environment

To help achieve Objective I, the proposed expansion of the Resort draws its inspiration from the host Hawaiian culture.

Hawaiian traditions include a spiritual and familial relationship with the natural environment and the resources that sustained life in these islands. Every aspect of nature was believed to be alive, and every form of nature was a *Kinolau* (body-form) of one of the numerous Hawaiian gods, deities, or other creative forces. The land, ocean, rain, and winds all were manifestations of the gods and they were revered for both their spiritual qualities as well as their physical ability to provide life-sustaining resources.

In a reciprocal relationship that is central to most aspects of traditional Hawaiian culture, man cared for nature (and its associated gods), and nature and the gods provided for man. Land, in particular, was revered as if a nurturing elder sibling because of its ability to sustain life. Land's supremacy over man is affirmed in the traditional Hawaiian saying, *He aliʻi ka ʻaina, He kauwa ke kanaka*: The land is a chief, Man is a servant.

C. 1. Traditional Land Tenure in Hawaiʻi

Hawaiʻi is the most isolated landmass on Earth. Over 2,200 miles from the nearest populated area, Hawaiʻi is a remote outpost in the middle of the world's largest ocean. Approximately 2000 years ago, voyagers from central Pacific islands arrived on these shores. Archaeological evidence suggests that the descendants of these original settlers navigated back and forth between Hawaiʻi and their home islands until about 500 years ago. At about the same time, the great chief Umi-a-liloa divided the largest of the Hawaiian Islands into the four political regions that remain today as the four counties of the State of Hawaiʻi: Kauaʻi, Oʻahu, Maui, and Hawaiʻi. These four *mokupuni* (islands) were further divided into *moku* (districts) and subdivided into *ahupuaʻa*.

Each land division was governed by an *aliʻi* (chief) of a particular rank. Islands were governed by *aliʻi nui* (high chief); *moku* were governed by *aliʻi ʻai moku* (lower chief); and *ahupuaʻa* were governed by *aliʻi ʻai ahupuaʻa*. Land in ancient Hawaiʻi was controlled by these chiefs who held them in trust for all of the people, a central principle of early (pre-1846) land tenure in Hawaiʻi was the *kuleana* (privilege and responsibility) of these chiefs to care for and employ the resources of the land in a *pono* (balanced) manner.

C. 2. Elements of the Ahupuaʻa

Of the three major land divisions, the *ahupuaʻa* was particularly important because it represented the scale at which land and its natural resources were most efficiently employed in order to sustain a pre-Western contact population of up to a million people.

The term, *ahupuaʻa*, was derived from the words *ahu* (alter) and *puaʻa* (pig). A stone alter was erected and topped by a carved image of a pig's head. These *ahu* served as a gathering area for the collection of tribute as well as a boundary marker between neighboring *ahupuaʻa*. They were often placed at the intersection of the *ahupuaʻa* boundary and the walking path that ran around most islands.

Ahupuaʻa contained nearly all the resources Hawaiians needed to survive. Through a system of *kapu* (prohibitions) and *kānāwai* (laws), the *ahupuaʻa* was managed by the *konohiki* (agent of the *aliʻi ʻaiahupuaʻa*) who was responsible for the day-to-day operations of the district and combining its natural and human resources in a manner that best served the land, the people it fed, and the chief who governed it.

Although *ahupuaʻa* varied in size between hundreds and thousands of acres, in most instances they were complete lands sections defined by valleys with boundaries extending from the mountains out into the ocean. Their regions included *mauka* (upland), *kula* (plains), and *makai* (ocean) areas. Fresh water, animal and fish protein, wild and cultivated food and fiber crops, as well as building and tool materials were available in most *ahupuaʻa* making them largely self-sustaining. Use of these resources was the exclusive privilege of those residing within the *ahupuaʻa*, although trade between *ahupuaʻa* was common enough that regular markets were established in some areas.

D. The Ahupuaʻa of Turtle Bay Resort

The owners and stewards of the Resort believe the elements and orientations of the traditional *ahupuaʻa* can be employed as a guide to contemporary land use and development. *Tomorrow's Ahupuaʻa* is a concept developed by the project team that incorporates many of these attributes along with modern best practices to serve as a framework for the implementation of the Resort Comprehensive Master Planning process and operating principles. (See Appendix A)

The Resort Comprehensive Master Planning Process encompasses eight small *ahupuaʻa* that, over time, have been consolidated into three large *ahupuaʻa*. The Turtle Bay Property includes the *makai* and *kula* lands of Ahupuaʻa O ʻŌpana-Kawela and Ahupuaʻa O Hanakaʻoe, and a portion of the *makai* lands of Ahupuaʻa O Kahuku. Following is a general description of these three *ahupuaʻa* which contain portions of the SEIS Lands. (Chapter Three of the SEIS presents a description of the Proposed Action using the same format; elements of the Proposed Action are described according to the *ahupuaʻa* in which they are located.)

D. 1. Ahupuaʻa O ʻŌpana-Kawela

The portion of the SEIS Lands contained within Ahupuaʻa O ʻŌpana-Kawela consists of approximately 63 acres situated *makai* of Kamehameha Highway, extending from the eastern

end of Honokawela Drive east to the Resort's West Main Drain, a distance of approximately 4,700 feet or roughly nine tenths of a mile as measured along the coastline. At the Resort's western boundary, the property extends inland from the shoreline approximately 200 feet to Kamehameha Highway. At the eastern boundary of the *ahupua*'a, the property extends approximately 1,125 feet from the shoreline to Kamehameha Highway. See Figure 1-1.

The property generally fronts the eastern half of Kawela Bay and the western third of Turtle Bay. The headlands known as Kawela Point constitute the extreme eastern point of Kawela Bay and are situated about midway along the lateral extent of the 'Opana-Kawela shoreline.

Kawela Bay is a roughly symmetrical horseshoe-shaped bay with a wide sandy beach. The eastern half of the *ahupua'a* shoreline consists of calcareous sediments chemically bound together into shelves of what is commonly referred to as beach rock. Portions of the beach rock are covered with sand while other areas are exposed. Kawela Bay is somewhat unique among the three bays that front the SEIS Lands in that the embayment is formed through a break in the beach rock shoreline. Both headlands that jut out into the ocean on the west and east sides of the bay are faced with beach rock shorelines. But the sand beach between the headlands is deep and not perched upon a hard substructure as are the other beaches along the property shoreline.

D.1. a. Historic Context

According to Pukui, *'Ōpana*, which is perhaps related to *'opa* translates as "the squeeze". *Kawela* is translated as "the heat" which is also the name used to describe the coastal portions of the land bordering Kawela to the west. The shoreline at Kawela was referred to as *Wakiu* meaning "northwest wind sound" (Clark 1977: 132). A fishpond of the same name was reportedly once located inland from this beach.

Kahuku and Kawela were designated as Crown Lands of King Kamehameha III during the Great *Mahele* of 1846 that reorganized land tenure throughout the Hawaiian Islands. As presented in the Cultural Impact Assessment prepared for the SEIS (Appendix D), of the thirty-five land commission awards (LCA) resulting from the *Mahele* that are located within the boundaries of the SEIS Lands, eleven are located in Kawela. House lots are mentioned in twenty-four of the thirty-five claims. There are thirty-six *lo'i* (pond-fields) described in the claims with three claims specifically mentioning *kalo* (taro). Testimonies refer to cultivated bananas, sweet potatoes, *wauke*, sugar cane, bitter melon, *noni*, and orange tree. Other named plants are *Pandanus* trees or *hala* groves and *koa* trees cultivated for canoes. One claim mentions a *puna pa'akai* or brackish spring and on mentions a fishery.

Specific pre-historic settlement patterns at 'Ōpana-Kawela are unknown, but *'olelo* cited in Appendix D suggest the Kewela Bay supported a resident population. Land Court Awards granted in the mid-1800s provide greater insight. As presented in the Appendix D, eight Land Court Awards (LCA) were awarded within the SEIS Lands contained within `Ōpana-Kawela and another seven were granted in the same region, but on properties outside of the SEIS Lands. (Appendix D, Pacific Legacy 2012: Table 1)

In the early 1850s, 8,000 acres at Kahuku, including Kawela and the remainder of the SEIS Lands, were purchased from Kamehameha III and converted to a sheep and cattle ranch that was named Kahuku Ranch. The ranching venture had immediate adverse impacts on the landscape.

As discussed earlier, in 1889 Benjamin Franklin Dillingham chartered the Oʻahu Railroad and Land Company (OR&L) and leased the Kahuku lands for the cultivation of sugarcane. By 1899, the railroad line extended from Honolulu around the west side of Oʻahu to Kahuku. A 1906 train schedule indicates the train ran from the Waimea Station to Kahuku in 24 minutes with no stops. A 1930 USGS map depicts the railroad extending through the Resort property with stations at Kawela and Kahuku Ranch. A 1932 USGS map shows sugarcane fields extending to the coast and a line of houses fronting Kawela Bay. A 1954 map depicts a series of houses or beach cottages present along the side of Kawela Bay.

Subsequent to the rezoning of the property in 1987 for the then proposed Resort expansion, the cottages along the eastern half of Kawela Bay were demolished to make way for the construction of a hotel. Much of the property was grubbed and graded, structural fill material was imported to the site, and several dozen concrete pilings were driven into the earth for the proposed hotel's foundation. Underground utilities were also installed. By the early 1990's, the Japanese economic crisis let the Resort's Japanese owner to abandon hotel construction at Kawela Bay.

D.1. b. Existing Conditions

The SEIS Lands within the Ahupuaʻa O ʻŌpana-Kawela are vacant and generally overgrown with scrub vegetation. The remnant concrete pilings remain in place; some erect and some toppled by erosion.

There is no resident population within the SEIS Lands of Ahupuaʻa O ʻŌpana-Kawela.

D.1. c. Topography

From a regional perspective, the topography of the SEIS Lands within ʻOpana-Kawela is characterized as a coastal plain created by changes in sea level over thousands of years. As the topography of the SEIS Lands has not changed since it was described in Part IV Section A of the 1985 EIS, it included by reference pursuant to Section 11-200-28, HAR.

D. 2. Ahupuaʻa O Hanakaʻoe

Approximately 271 acres of the SEIS Lands are contained with Ahupuaʻa O Hanakaʻoe. Within the SEIS Lands, the boundary of Hanakaʻoe extends east from the West Main Drain to the East Main Drain which enters the ocean at the approximate mid-point of Kuilima Bay. See Figure 1-1.

Within the SEIS Lands, Hanakaʻoe includes the approximate eastern two thirds of Turtle Bay, all of Kuilima Point, and the western half of Kahuku Bay. The length of the coastline fronting the *ahupuaʻa* is approximately 1.36 miles or just over 7,000 feet.

At its eastern boundary along the East Main Drain, the property extends inland approximately 0.46 miles from the shoreline to Kamehameha Highway, or about 2,453 feet.

D.2. a. Historic Context

No *ʻolelo* pertaining specifically to this *ahupuaʻa* have been identified. However, given its location between Kawela and Kahuku, it is likely that it supported a resident population. As discussed in Section B above, the large scale changes to the land resulting from the establishment of a cattle ranch, and later a sugar plantation, transformed the land, and in so doing, erased any surface features that might have informed us of the area's history.

As presented in the Appendix D, four Land Court Awards (LCA) were awarded within the SEIS Lands contained within the Hanakaʻoe *ahupuaʻa* and another three were granted in the same region, but on properties outside of the SEIS Lands. (Appendix D, Pacific Legacy 2012: Table 1), suggesting an active community engaged in plant cultivation and fishing.

D.2. b. Existing Conditions

Ahupuaʻa O Hanakaʻoe contains the activity center of the Resort and includes 500 Resort units and 368 residential condominium units (366 are privately owned and 2 are operated as manager's units). The Resort units consist of three components: the existing seven-story Turtle Bay Hotel containing 401 Resort units; 57 Ocean Villa Resort condominium units abutting the hotel on its east side are; and 42 Beach Cottages abutting the hotel to the west. Average daily occupancy of the 500 Resort units averages approximately 80%. The residential condominium units comprise two adjacent developments south of the hotel's parking lot; Kuilima Estates East and Kuilima Estates West. The average daily resident population of Kuilima Estates is estimated to be about 223 persons.

D.2. c. Topography

From a regional perspective, the topography of the SEIS Lands within Hanakaʻoe is characterized as a coastal plain created by changes in sea level over thousands of years. As the topography of the SEIS Lands has not changed since it was described in Part IV Section A of the 1985 FEIS, it included by reference pursuant to Section 11-200-28, HAR.

D. 3. Ahupuaʻa O Kahuku

Approximately 506 acres of the SEIS Lands are contained within Ahupuaʻa O Kahuku. The *ahupuaʻa* extends east from the approximate alignment of the East Main Drain to the eastern boundary of the Resort, as delineated by Marconi Road. The shoreline of Ahupuaʻa O Kahuku extends approximately 8,230 feet and includes the eastern half of Kuilima Bay, all of Kahuku Point and about 3,000 feet of shoreline east of the point. See Figure 1-1.

The eastern boundary of the *ahupuaʻa* extends inland approximately 6,280 feet, or about 1.18 miles, from the shoreline to Kamehameha Highway.

D.3.a. Historic Context

Of the three *ahupuaʻa*, Kahuku is most frequently identified in *ʻolelo* and legend. The name Kahuku appears to be used not only as the name of an *ahupuaʻa* and village, but as a district or place name for the area roughly between ʻŌʻio and Keana Ahupuaʻa. Of the seven historic *ahupuaʻa* originally identified in the project area, Kahuku has the most extensive traditional and mythological background.

According to Pukui et al. (1974:67) Kahuku literally translates as "the projection" and is the name of a village, land division, northernmost point, golf course, ranch, schools, forest reserve, as well as surfing beach on Oʻahu. Several other landmarks within the *ahupuaʻa* have traditional names, such as Punamanō, the spring-fed wetland which translates as "shark spring" John Clark (2003:310). Hanakaʻīlio ("work [of] the dog") is a sandy beach located between Kalaeokaunaʻoa and Kalaeuila Points (2003:92). Kalakala ("rough" or "craggy") is the name of the two semi-submerged linear outcrops of limestone that roughly parallel Kahuku Point to the east (Ibid:149).

Traditional accounts of natural resources and environmental conditions are relatively abundant for the *ahupuaʻa* of Kahuku. Traditional land use in Kahuku is also made apparent through legend. The landscape of Kahuku appears to have had several configurations, from the pre-European contact era to the present. During Hawaiian settlement prior to the arrival of Europeans, many parts of the landscape were used for traditional agriculture, habitation, and ceremony, varying from intense to moderate. In the initial Contact period, a good portion of the land lay fallow due to severe population decline and was overgrown in some areas with exotic plant species.

As discussed earlier, the subsequent creation of Kahuku Ranch, followed by cultivation of the land in sugar cane as part of Kahuku Plantation permanently altered its physical characteristics and use.

D.3. b. Existing Conditions

There are no persons residing with the portion of the SEIS Lands contained within the Kahuku ahupua`a, however it includes land designated as the MacKenzie *kuleana.*

D.3. c. Topography

From a regional perspective, the topography of the SEIS Lands within Kahuku *ahupuaʻa* is characterized as a coastal plain created by changes in sea level over thousands of years. As the topography of the SEIS Lands has not changed since it was described in Part IV Section A of the 1985 FEIS, it included by reference pursuant to Section 11-200-28, HAR.

E. Contextual Natural Environment

Following is a discussion of the natural environment within which the Resort is located. A discussion of the Proposed Action's impacts on the natural environment is presented in Chapter Five of the SEIS.

E. 1. Marine Resources

As discussed above, three bays generally front the SEIS Lands: Kawela Bay to the west, Turtle Bay in the center, and Kuilima Bay (sometimes called Kaihalulu Bay[1]) to the east. Kawela Point separates Kawela Bay from Turtle Bay. Kuilima Point separates Turtle Bay from Kuilima Bay and is the location of the existing Turtle Bay Hotel. Kahuku Point marks the eastern end of Kuilima (Kaihalulu) Bay. The shoreline to the southeast of Kahuku Point is known as Hanakaʻilio Beach and extends just over a mile to Kalaeuila Point, which is situated a few hundred feet to the east of the Turtle Bay Lands' eastern property boundary.

Each of these bays and shorelines have widely different physical characteristics that impact both the normal quality of the water and the benthic habitats that support the algae, coral, invertebrates, fish, sea turtles, and monk seals that frequent the coast.

The following discussion of the project's marine resources is derived from a study prepared by Oceanit and presented in Appendix E. Oceanit's analysis and recommendations are based upon over 25 years of data collection and monitoring that has been conducted at the Resort. The discussion begins with general regional characteristics and then continues with a discussion of each of the three bays.

E.1. a. Overview of Coastal Geology and Subsurface Hydrology

From a regional perspective, the Kahuku coastline (which contains the Resort Shoreline) consists of a relatively narrow, flat coastal plain backed by steep hills with steep valleys holding small flashy streams. Much of the character of the coastline is the result of past sea level elevation changes. During periods of lower sea levels, the primary streams carved channels through what now exists as a shallow reef area. One such 400-foot wide channel can be clearly seen in aerial photographs cutting through the reef from the east end of Turtle Bay in (Figure 2-1) from Marine Report. Such channels can provide excellent conduits of storm water flow to the open ocean bypassing more sensitive near shore reef systems.

During periods of higher sea levels coral grew seaward from the abrupt coastline at the base of the mountain range and formed what is now the flat coastal plain that constitutes the SEIS Lands. The sediments that cover the coastal plain are a mixture of ancient marine deposits combined with alluvial deposits from the streams. Numerous portions of the plain are at low elevations and groundwater emerges at the ground surface to form wetlands, some of which are tidally influenced.

The shoreline along much of the Kahuku coastline is hardened by a natural formation of lithified calcium carbonate sand commonly called "beach rock." When calcareous sediments along a

[1] Preliminary information suggests that Kaihalulu is actually the name of the beach extending east from Kahuku Point and that the name is sometimes applied to the offshore water area. Note: the resort's SMA Use Permit referred to the beach east of Kakuku Point as Hanakaʻilio Beach.

Figure 2-1: Large channel through the reef near the West Main Drain

shoreline are exposed to alternating fresh and salt (ocean) water tidal flows, the pH differences in these waters cause the sand particles to bind together into a hard cement-like material. These calcareous formations often form abrupt shoreline faces several yards high, but in sheltered coves can support perched sand beaches.

The sand dunes behind the Kahuku coastline typically accrete to elevations at least several feet higher than much of the inland coastal plain and this sand dune structure can lead to drainage problems. During heavy or prolonged rainfall events when the shoreline sand blocks surface flows, dunes, ponding and flooding can occur in low-lying areas.

The calcareous nature of much of the coast subjects it to the formation of karst cave systems. The low pH of fresh groundwater dissolves underground tunnels through which the fresh water flows to the ocean. These cave systems result in concentrated areas of freshwater flow to the ocean and form conduits through which part of the runoff from the mountains enters the sea. Much of the surface water also percolates into the groundwater and discharges into the ocean as diffuse flow.

During periods of heavy rainfall the infiltration capacity of the soil and the capacity of the karst conduits are insufficient to carry the surface sheet-flow. Under these conditions significant flooding problems can result. Because the majority of the Kahuku coastline is higher than

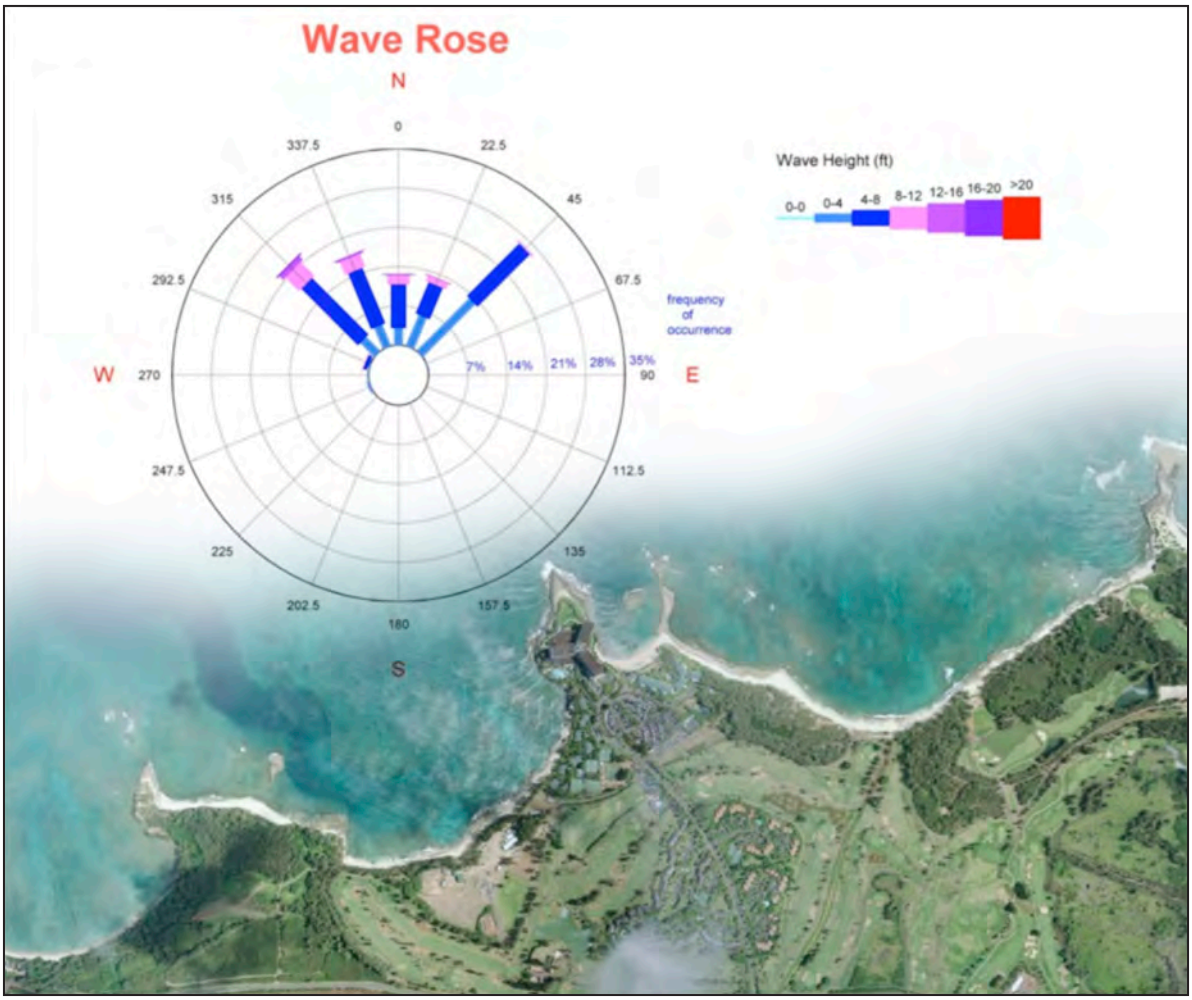
inland areas of the plain, storm water tends to pool and cause flooding until the shoreline dune perimeter is breached and the storm water discharges into the ocean. When the capacity of the soil infiltration and karst system is exceeded the additional storm water floods low-lying areas on both sides of the Kamehameha Highway.

E.1. b. Oceanographic Overview: Coastal Waves, Tides and Currents

Waves, tides, and currents are important to the ecology of a coastal site and are not generally impacted by coastal developments. Understanding the wave climate helps determine the fate of sediments, nutrients, and other substances brought into the near shore ocean from land sources.

Wave conditions for the entire shoreline were determined from existing offshore wave statistics (North Pacific Marine Advisers Data Set: NOAA) to define the distribution of wave heights and direction. Figure 2-2 is a graphical representation termed a "wave rose" that displays directions

Figure 2-2: Project Coastline Showing Dominant Wave Directions



and wave heights from which waves will strike the Turtle Bay Shoreline. The wave exposure for the Resort Shoreline is from the north between about 315 degrees (NW) to 45 degrees (NE) with other wave directions blocked by the headlands that delineate the study area. The most dominant waves are trade wind generated swells from the NE (45 degrees) and ENE (22.5 degrees) with a dominant wave height of about 5.2 feet and period of about 10 seconds.

The North Shore of Oʻahu is famous for its large winter waves which tend to come from the NW (315 degrees) and NNW (337.5 degrees). These wave trains are commonly in the range of 3 to 10 feet and a period of 8 to 14 seconds with heights greater than 20 feet occurring on an annual basis. As waves approach the shoreline, they undergo deformation from shoaling and refraction. Wave shoaling is caused by bottom friction and refraction is caused by change in depth. During episodes of high surf, water may build up against the shoreline, causing a local rise in sea level by as much as a half-foot. This increased depth allows greater wave energy to cross any shallow reefs, impact the shoreline, and cause increased turbidity from re-suspended sediments. The increased depth of water along the shore also accentuates the speed and volume of currents transporting water away from the coastline through passes in the reef.

Oʻahu is situated within the North Equatorial Current which approaches the island chain from the east. This typically results in a slow but dominate offshore current from east to west along the Resort Shoreline. Near shore currents are more variable as they are largely driven by the twice-daily 2 to 3-foot rise and fall of tides and the flow of seawater to drain and fill the bays with each tide.

E.1. c. Overview of Water Quality

The State of Hawaiʻi has developed a water quality standard for Open Coasts during Dry and Wet seasons that applies to the entire Kahuku coastline. Because each of the three coastal segments within the Resort Shoreline are referred to as "Bays" and each may be subject to significant fresh water inflow, the Oceanit report also included the state's water quality standard for embayments for comparison purposes. The State's water quality standards are shown in Table 2-1.

Water quality data at all three bays has been examined in three separate studies during a period of over two decades with a total of 724 samples analyzed for water quality parameters.

- From 1989 through 1994, surface and mid-water samples were taken at near-shore, mid-shore, and offshore locations in each bay on a quarterly basis. The 232 samples that make up this data set form the basis from which to gage any changes in water quality over time.

- Between 2000 and 2002, studies by the City were undertaken to understand the merits of various storm water outfall locations along the Resort Shoreline. The purpose of these studies was to determine the degree of mixing at each outfall location and to monitor short-term changes in water quality. At each outlet site (Kawela, Turtle Bay, Kuilima Bay) a single meter was installed to record water quality at 0.5-hour

intervals, and six surface water sample sites closely aligned off each outlet site were monitored on a monthly basis for 11 months (198 samples total). Comparing the similarity of the six samples off each outfall to one another gives a good indication of the degree of mixing and ability to assimilate storm water inflow at each site.

- From 2006 to the present, quarterly water quality samples have been obtained from all three bays at stations similar to those used in the 1989-1994 survey. Data from these 294 samples forms the base to examine present day water quality and any changes observed during the past two decades.

Table 2-1:

Hawai'i State Water Quality Standards Applicable to Project Shoreline

Open Coast Dry Season (parameter)	**Geometric Mean**	**Not to Exceed More Than 10% of the Time**	**Not to Exceed More Than 2% of the Time**
Total Nitrogen ug N/L	150	250	350
Nitrate+Nitrite ug N/L	5.0	14	25
Total Phosphorus ug P/L	20	40	60
Chlorophyll-a ug/L	0.50	1.5	3.0
Turbidity NTU	0.4	1.0	1.5
Total Suspended Solids mg/L*	15	25	35
Open Coast Wet Season (parameter)	**Geometric Mean**	**Not to Exceed More Than 10% of the Time**	**Not to Exceed More Than 2% of the Time**
Total Nitrogen ug N/L	200	350	500
Nitrate+Nitrite ug N/L	8.0	20	35
Total Phosphorus ug P/L	25	50	75
Chlorophyll-a ug/L	1.5	4.5	8.5
Turbidity NTU	1.5	3.0	5.0
Total Suspended Solids mg/L*	25	45	50
Embayment (parameter)	**Geometric Mean**	**Not to Exceed More Than 10% of the Time**	**Not to Exceed More Than 2% of the Time**
Total Nitrogen ug N/L	200	350	500
Nitrate+Nitrite ug N/L	8.0	25	35
Total Phosphorus ug P/L	25	50	75
Chlorophyll-a ug/L	2.0	5.0	10
Turbidity NTU	1.5	3.0	5.0
Total Suspended Solids mg/L*	35	45	50

*** TSS standards are from original State WQ standards. This parameter is not included in the present State Standards.**

E.1. d. Description of the Turtle Bay Resort's Marine Resources

Because of their varied character, the Oceanit report presents a separate discussion for each of the three bays that together constitute the Resort Shoreline. Following is a summary of the report's findings. Living marine resources along the very near shore area of the Turtle Bay coastline appear relatively unchanged or improved over the past 22 years. The benthic surveys were restricted to very near-shore waters, less than 300 feet from the shoreline, and were not intended to characterize the quality of the offshore coastal reef system nor the health of the recreational fisheries. The status of recreational and commercial fisheries is challenged around the entire state and was beyond the scope of the survey. Rather, the intent of the surveys was to characterize the benthic resources adjacent to storm water and stream outfalls, as these locations are the most sensitive to potential impacts from land based pollution.

E.1.d. [1] KAWELA BAY

Kawela Bay encompasses a large (~80 acre) relatively shallow bay consisting primarily of a back-reef lagoon with minimal wave impact or influence from coastal currents. While large corals are present in deeper sand channels on both sides of the bay, the benthic community is dominated by a wide variety of macro algae. It is likely that the macro-algae grows well within the bay because of decreased impact from large waves, the relatively high concentration of nutrients (particularly phosphorus) in the bay, and the shallow extent of the bay. Analyses of the benthic surveys showed Kawela Bay to have the highest near-shore coral counts (1.25% cover) and a moderate number of fish.

Inflow from Kawela Stream during large storm events has a long-lasting and adverse impact on water quality in the bay. Removal of this stream flow from this bay and restoration of its flow to Turtle Bay would have a large positive impact on Kawela Bay's ecosystem.

Waves and Currents: Currents within the bay are primarily wind and wave driven but with an important overlay of groundwater inflow. In the main western half of the bay, the overall direction of the current seems to be counter-clockwise where the inward flow occurs on the west side of the bay then exits through the center and at the east corner by flowing along the shore and then out to sea through the center and east portion of the bay. Water circulation in the east portion of the bay is much slower and tends to form a clock-wise gyre with a long residence time. Figures 2-3 and 2-4 show the interpolated current from the field study. Note how this current pattern mirrors the salinity variations shown in Figure 2-5. Fresh water tends to percolate through the beach in the west end of the bay, rise to the surface, and flow out through the center of the bay where it is joined by flow from a spring near the center of the bay (see Figure 2-5).

Water Quality: Water quality has been examined during three separate long-term studies 1989-1994, 2001-2002, and 2006-2011, with collection points as shown in Figure 2-6. The large-scale physical characteristics of the bay such as its bathymetry, current patterns, and salinity profiles are likely stable over a period of decades, but water quality has the potential to change over much shorter time periods in coastal areas.

Figure 2-3: Interpolated Current During Ebb Tide

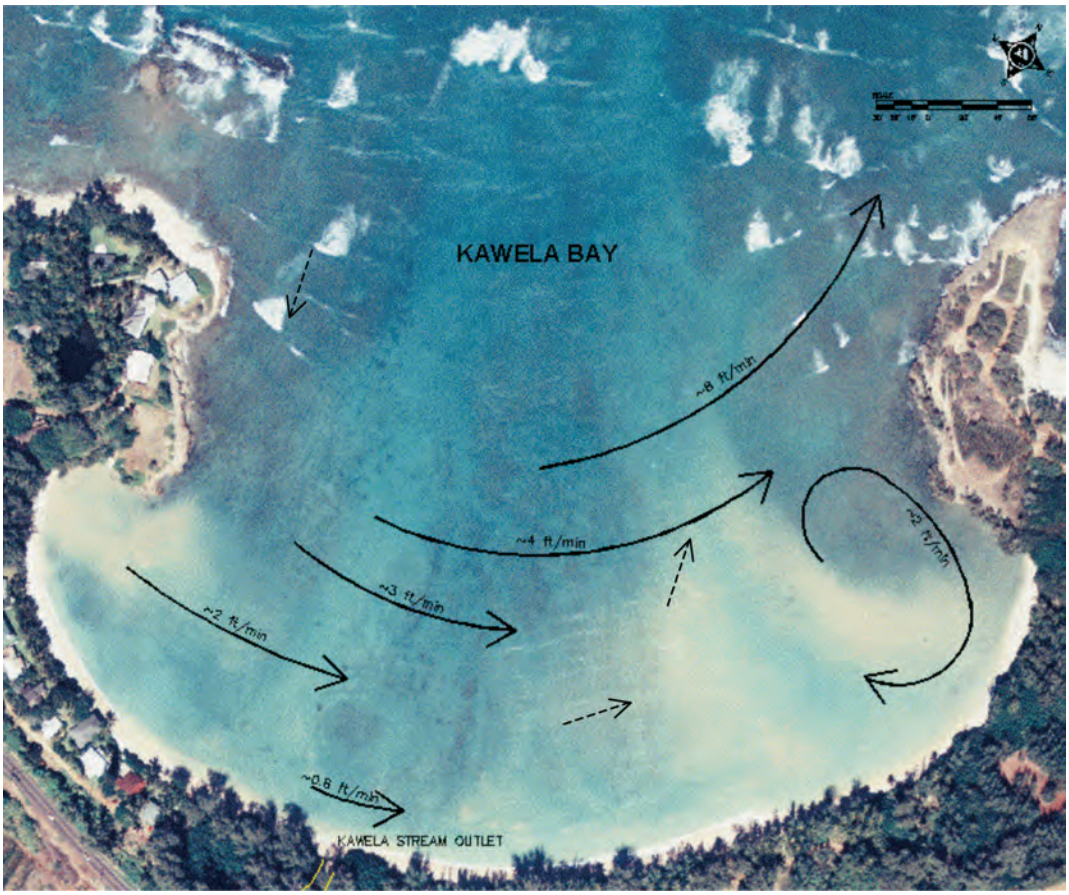


Figure 2-4: Interpolated Current During Flood Tide

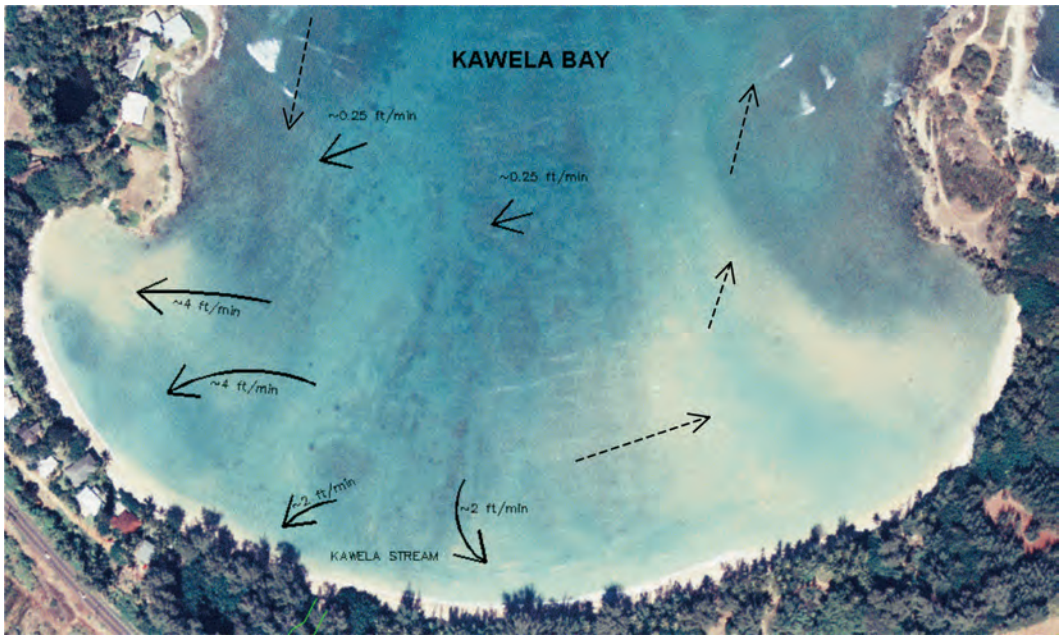
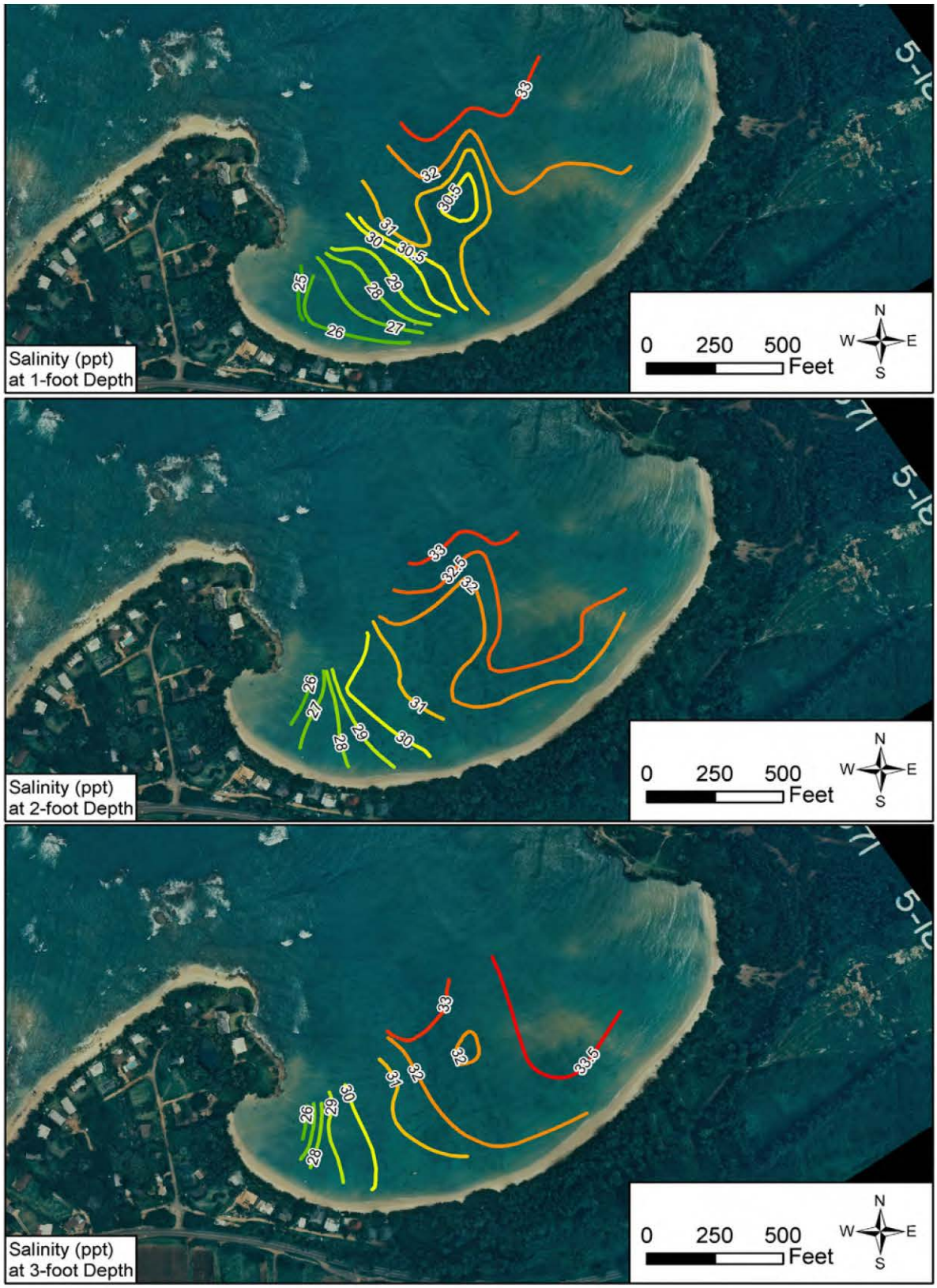


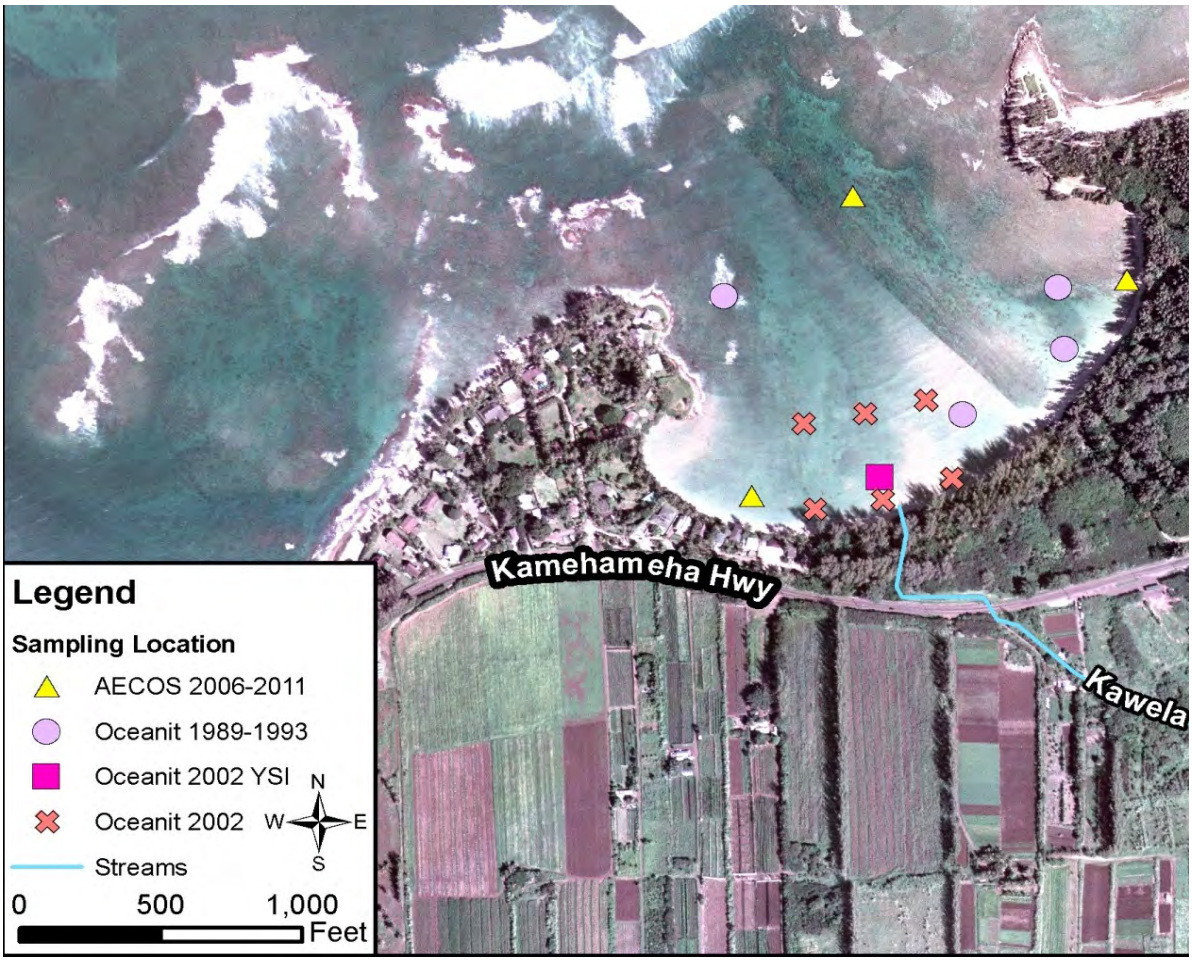
Figure 2-5: Salinity profiles in Kawela Bay



The information in Figure 2-5 was derived from a detailed salinity and bathymetry survey of the bay conducted by Oceanit in 1987. The figure shows a strong groundwater inflow of fresh water from the western portion of the beach. An inflow of approximately 5,000 gallons per minute (Oceanit 1987) of fresh groundwater was estimated as necessary to sustain the observed low-salinity plume. This fresh water rises to the surface and is transported out through the center of the bay with the dominant current. Near the center of the bay, a fresh water spring adds additional water to this flow. It has been confirmed visually and is determined to be still active as of 2011. During low tide, multiple groundwater freshets have also been observed eroding the beach slope as the groundwater flows through the sand beach at the west end of the bay showing the persistence of this groundwater flow. This strong and consistent flow of groundwater into the bay is an important factor in the interpretation of water quality results because the groundwater tends to carry significant quantities of nutrients into the bay.

From June 1989 through December 1993, surface and bottom samples were taken from four locations each quarter (see Figure 2-6) for a total of 152 samples. Three of the sample sites were in the central and east bay surrounding the area exhibiting significant soft sediments and perpetually

Figure 2-6: Locations of water quality sampling stations in Kawela Bay since 1989



high turbidity. The fourth, a control site, was in the west bay at the edge of the sand channel and fringe shelf and was subject to more open ocean waters. This study concluded that the source of the sediment was Kawela Stream due to the high content of non-calcareous and organic particles within the silt sediment, and from observations of the stream outflow into the bay.

For the large majority of time, the flow of Kawela Stream terminates at the sand beach berm and percolates slowly through the berm to the bay. During the infrequent occasions (~3-4 times per year) when the stream flow is sufficient to break through the beach barrier the entire bay is usually extremely turbid for days afterward. Following these stream flow events, water turbidity in the west end of the bay usually clears within a few days, while the east end of the bay often remains turbid for several weeks to a month.

Following a very large storm event in March of 1991 that flooded most of Kahuku, turbidity within the bay ranged from 88 to 4,000 NTU (the State standard not to be exceeded 2% of the time for embayments is 5.0, as presented in Table 2-1). But even when the Kawela Stream is not flowing to the bay, the water quality of the bay rarely meets State Standards for open coastal waters.

Samples taken in the early 1990's and more recently in the past 5 years show that nitrate plus nitrite concentration in samples are highly correlated with groundwater inflow to the bay. High concentrations of total nitrogen and total phosphorus are correlated with high turbidity either as phytoplankton growth or associated directly with eroded sediments from stream flow events. Much of the water within the bay has N:P ratios (by weight) between 4:1 and 10:1, which is ideal for plankton and algae growth.

In the central and western portions of the bay the environment appears to have responded to the combination of high nutrients and high water turnover rates (currents) with abundant growths of macro-algae. In the eastern bay, with its much lower currents and long resident time, these nutrients appear to lead to a perpetual turbidity caused by a combination of suspended terrigenous silt and plankton growth.

The major flood of March 1991 gave rise to plans for improved drainage along the Kahuku coastline and a need to better understand water quality offshore of individual storm water outfall points. During 2001-2002, eleven monthly samples were obtained from 3 near-shore and 3 offshore (300 ft) locations directly fronting the Kawela Stream mouth for a total of 66 samples. During this same period a YSI-datasonde water quality meter was affixed just above the bottom in about 5 feet of water directly off the stream mouth, where it recorded physical water quality data (temperature, pH, depth, salinity, turbidity) at half hour intervals for the entire year.

The 2002 study concluded that turbidity was more than ten times higher than the State standard for dry open coasts, and that high turbidity events could be associated both with stream openings and, to a lesser degree, with high surf events. The closely spaced sample sites off the stream mouth showed that there were differences in water quality between near-shore

and offshore and between east and west along the shoreline. Both nitrogen and phosphorus nutrients were in higher concentrations within the groundwater plume near shore on the west side of the bay and exceeded the State standard for dry open coasts. Total phosphorous (TP) was highest during the summer months. The high levels of TP were correlated with high chlorophyll-a levels, particularly when coupled with total nitrogen concentrations at a ratio of about 1:5. As phosphorus is not normally this high in groundwater (it usually becomes adsorbed to sediments), it may indicate a relatively close source of phosphorus to the groundwater. These sources could include the adjacent agriculture fields or the adjacent home lots. The study concluded that Kawela Bay was not suited to receive enhanced storm water discharge that presently occurs due to the low rate of mixing and transport within the bay.

Beginning in 2006 until the present, four water samples (2 near shore, two offshore) have been taken at three locations within the bay on a quarterly basis for a total of 80 samples (see Figure 2-6). Comparison of the results from these samples indicate the near shore sites show an increase in the concentration of nitrate plus nitrite, total nitrogen, and possibly total phosphorus. (See Figure 2-7)

During 1989-94, the three near shore samples were in the center-west portion of the bay. The 2001 samples were in the center-east portion of the bay, off the stream mouth. The two 2006-2011 sample locations were very close to shore (high groundwater influence) and one was at the west end of the bay within a known groundwater plume. Therefore the relatively small trends seen in the dataset could be merely a function of the location of the samples taken within the bay. This is particularly interesting because the 1989 samples began not long after the last of the residents had moved away from the east end of the bay and septic systems associated with the homes became unused. If cesspools were delivering a significant load of nutrients through the sand berm, one would have expected a decrease in near shore TP concentrations over time in the east end of the bay. However, the expected decrease in phosphorus over time has not been seen. With the exception of a high total nitrogen value, all water quality parameters from the station at the east end of the bay from 2006 to the present are indistinguishable from the samples near this same location taken two decades ago. Long term water quality in Kawela Bay appears to have shifted slightly towards becoming more nutrient enriched during the past two decades, but it is possible that these changes could be the result of shifts in the points from which samples have been taken. However, it remains true that the bay receives more nutrients than is likely appropriate and that this problem is exacerbated by the shallow nature of the bay and its relative low rate of exchange with ocean waters.

The data indicates that the waters of Kawela Bay do not meet State water quality standards of an open dry (or wet) coastline. While a large quantity of nutrients are delivered to the bay in groundwater, the majority of sediments and their associated nutrients enter the bay during infrequent flow events of Kawela Stream. Removal of this source of nutrients and sediments to the bay would greatly improve water quality over a period of years. Given the large quantity of fresh groundwater entering the bay, low circulation and mixing within the bay, and inefficient transport to the open ocean, consideration should be given to minimizing storm water flows to

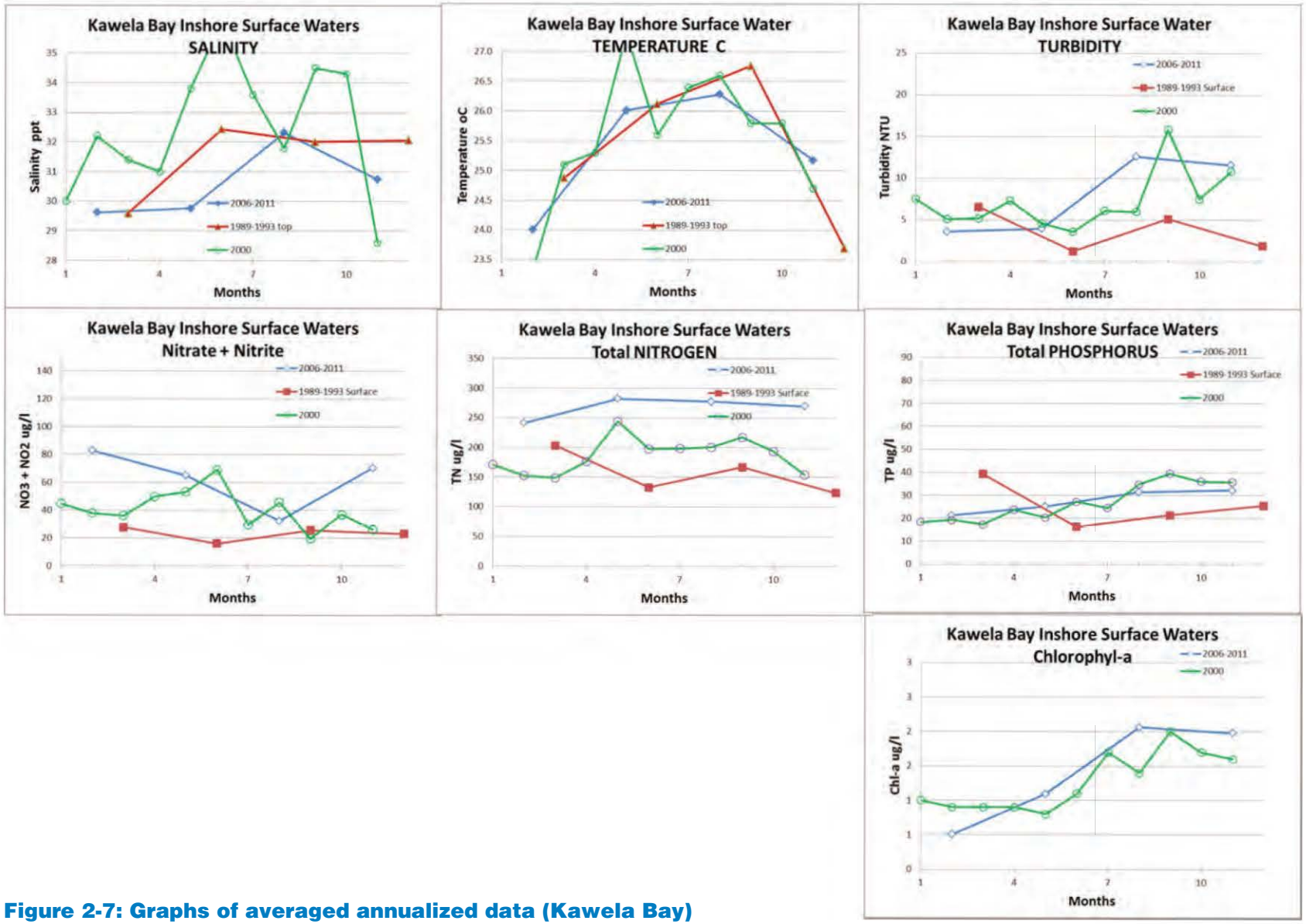


Figure 2-7: Graphs of averaged annualized data (Kawela Bay)

this body of water. And given the physical aspects of the bay and high groundwater inflow, it may be more appropriate to use State water quality standards associated with embayments rather than open coastlines.

Marine Biota: Benthic habitat and water quality surveys of the Kawela shoreline were first conducted by Biengfang and Brock (1981), then over a 5-year period by Oceanit (1994), and again during the winter and summer of 2011. Benthic survey techniques have changed and improved over the years, particularly with the advent of digital underwater cameras and the ability to use computers to assist with photograph analyses. During the winter and late summer of 2011, three 100-foot transects were established, one each in the east bay, central bay (200 feet off shore), and at the edge of the sand channel near the western mouth of the bay (K1, K2, andK 3 respectively in Figure 2-3). The first two sites (K1, K2) approximated survey locations used during the early 1990's and the third survey was able to locate underwater markers and therefore duplicate the third transect from the 1990's. Results of the 2011 fish surveys are presented in Table 2-2 with the benthic survey data presented in Table 2-3 and representative photographs from each transect in Figure 2-8.

Table 2-2: Benthic substrate and benthic biota survey results from Kawela Bay, 2011

	Kaweal Site 1			Kawela Site 2			Kawela Site 3		
	March	Sept	% cover	March	Sept	% cover	March	Sept	
	# Points	# Points	%	# Points	# Points	%	# Points	# Points	%
SUBSTRATE (only)	18	na	3.5	70	77	14.6	104	166	26.0
CORAL	9	na	1.8	0	2	0.2	9	9	1.7
OTHER INVERTEBRATES	0	na	0.0	0	0	0.0	0	1	0.1
CORALLINE ALGAE	34	na	6.7	13	6	1.9	45	18	6.1
TURF ALGAE	449	na	88.0	423	368	78.3	361	275	61.2
NATIVE ALGAE	0	na	0.0	0	4	0.4	13	3	1.5
INVASIVE ALGAE	0	na	0.0	0	40	4.0	0	24	2.3
CYANOBACTERIA	0	na	0.0	0	1	0.1	0	0	0.0
UNKNOWN	0	na	0.0	0	0	0.0	0	0	0.0
TAPE, QUADRAT, SHADOW	0	na	0.0	4	2	0.6	8	4	1.2
TOTAL POINTS	510		100.0	510	500	100.0	540	500	100.0

	Kaweal Site 1			Kawela Site 2			Kawela Site 3		
	March	Sept	% cover	March	Sept	% cover	March	Sept	% Cover
	# Points		%						
BENTHIC SUBSTRATE									
Benthos (BENTH, HARD)	229		45.0	191	129	31.8	395	316	68.6
Boulder (BOULD)(ROCK)	1		0.2	13	8	2.1	1	1	0.2
Cobble (COB)	24		4.7	54	45	9.8	22	1	2.2
Rubble (RUB)	210		41.3	139	192	32.9	44	15	5.7
Gravel (GRAVEL)	8		1.6	36	19	5.5	5	2	0.7
Coarse Sand (CSAND)	11		2.2	46	48	9.3	72	162	22.6
Fine Sand (FSAND)	19		3.7	30	57	8.6	0	0	0.0
Mud (MUD)	7		1.4	0	0	0.0	0	0	0.0
Substrate Total	509		100.0	509	498	100.0	539	497	100.0

Table 2-3: Results of fish surveys from three transects in Kawela Bay, 2011

				Kawela Bay				
			K1		K2		K3	Total
		March	Sept	March	Sept	March	Sept	Fish
Surgeon Fish	Acanthurus leucopareius							
	Acanthurus nigrofuscus	2		2				4
	Acanthurus triostegus	8		3	3			14
	Acanthurus xanthopterus			2				2
Butterflyfish	Chaetodon auriga	2		1				3
Goat fish	Mulloidicthys flavolineatus							
Box fish	Canthigaster jactator	1				1	1	3
	Canthigaster amboinensis					1		1
	Ostracion meleagris					1		1
Wrasses	Coris flavowittata							
	Coris venusta				12	1		13
	Labroides phthirophagus				1			1
	Stethojulis balteata							
	Thalassoma duperrey	3		3	3	6		15
	Thalassoma purpureum							
	Thalassoma trilobatum							
Damselfish	Plectroglyphidodon imparipennis					1		1
	Plectroglyphidodon johnstonianus							
	Abudefduf abdominalis				2			2
	Stegastes marginatus	2				2		4
Triggerfish	Rhinecanthus rectangulus					1		1
	Total Species Count	6	0	5	5	8	1	14
	Total Number Fish	18	0	11	21	14	1	65

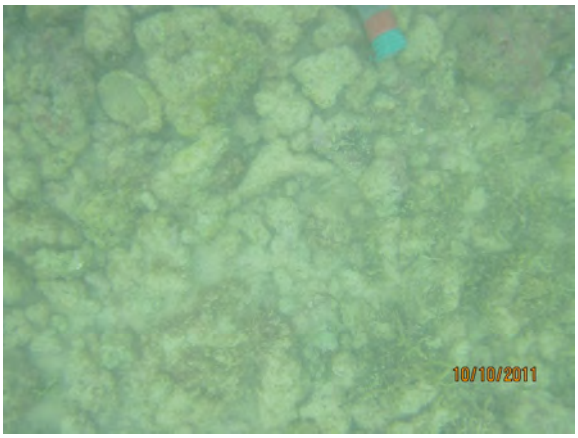
The bay is protected from constant ocean tradewind swells by a fringing reef at the center of the bay and by raised headlands and adjacent shallow limestone benches to the east and west. The bay supports a highly diverse growth of corals, fish, sea turtles and macro-algae. Five principal habitat zones have been identified in Kawela Bay covering a total of about 50 acres. They are depicted in Figure 2-3.

The inner bay (Habitat Zone 1) fronts the beach shoreline and is protected from constant ocean swells and currents by the headlands and shallow central reef. Habitat Zone 1A is primarily sand or hard bottom with low relief at depths from 3 to 6 feet in the west side of the bay. Typically, this biotype has high water clarity, but often with a well-defined fresh water lens at the surface. Habitat Zone 1B is shallower generally 2-4 feet and consists of the inner portion of the finger-and-groove central reef. Finger-and-grooves are formed on a reef in response to wave action and scouring by sand. Sand channels tend to form in line with the wave direction, and corals grow on either side of the channel, each one protected from scouring by the coral

Figure 2-8: Representative photographs from three transects within Kawela Bay

1. Kawela Bay East Transect quadrant photo

1. Kawela Bay East Transect detail photo



2. Kawela Bay Center Nearshore quadrant photo

2. Kawela Bay Center Nearshore detail photo

3. Kawela Bay West quadrant photo

3. Kawela Bay West detail photo

head in front. Over time this forms linear furrows in the reef. Although in this habitat the finger-and-groove formations are indistinct with lower relief and greater quantity of rubble and sand. Small coral colonies within this zone are more numerous on the west side of the zone away from the typically turbid water common on the east side of the bay. Habitat Zone 1C consists of an isolated low point in the bathymetry with depths of up to about 8 feet. This area accumulates soft sediments and is often very turbid. The narrow (20-40 foot wide) steep sand beach constitutes Habitat Zone 1D.

The shallow shelves fronting both headlands (Habitat Zone 2) are divided into very shallow (2A) and slightly deeper (2B) habitats. The benthic substrate in 2A presents itself as a very flat but pitted calcareous substrate supporting a dense growth and broad variety of macro-algae and occasional sea urchins. This substrate is usually swept with waves and may be exposed, or nearly so, during low tides. Slightly deeper, Habitat Zone 2B expresses greater irregularity with the presence of sand patches in depressions, coral rock boulders scattered across the surface, and occasional coral colonies. This slightly deeper habitat appears to be a favorite for grazing by green sea turtles. The bench along the eastern headland has an abrupt edge dropping several feet into a channel. Along the western headland the depth of the bench increases gradually to the edge of the sand channel and supports a variety of coral growth in a surge habitat.

The center of the bay is characterized as a true reef habitat with high cover of several varieties of corals dominated by lobe coral (Porites lobata) but with at least seven other species prevalent (*P. lutea, P. compressa, P. duerdeni, Pavona duerdeni, Montipora flabellate, Pocillopora meandrina*). The inner shallower portion of Habitat Zone 3 displays classic "finger and groove" coral and sand channel formations that extend into Habitat Zone 1 near shore. There is no distinct reef crest, the inner portion of the Habitat Zone displaying a depth of 2-3 feet and then gradually increasing to a depth of 4-6 feet at the outer edge where the finger and groves become deeper and more prominent. The west side of Habitat Zone 3B may either be termed a major groove or a minor channel, strewn with boulder sized lobe coral colonies up to the abrupt ledge forming the outer limits of the shallow benches of Habitat Zone 2B. As the water increases in depth outside the bay, the reef takes on the characteristics of a deeper and wider surge channels that eventually grade into deep patch reefs of Habitat Zone 4.

Habitat Zone 5 is somewhat unique in that it consists of a relatively wide and deep sand channel with about a dozen immense free standing colonies of Porites lutea (*ex. P. evermanni*). These colonies range from about 3-feet to 12-feet in diameter.

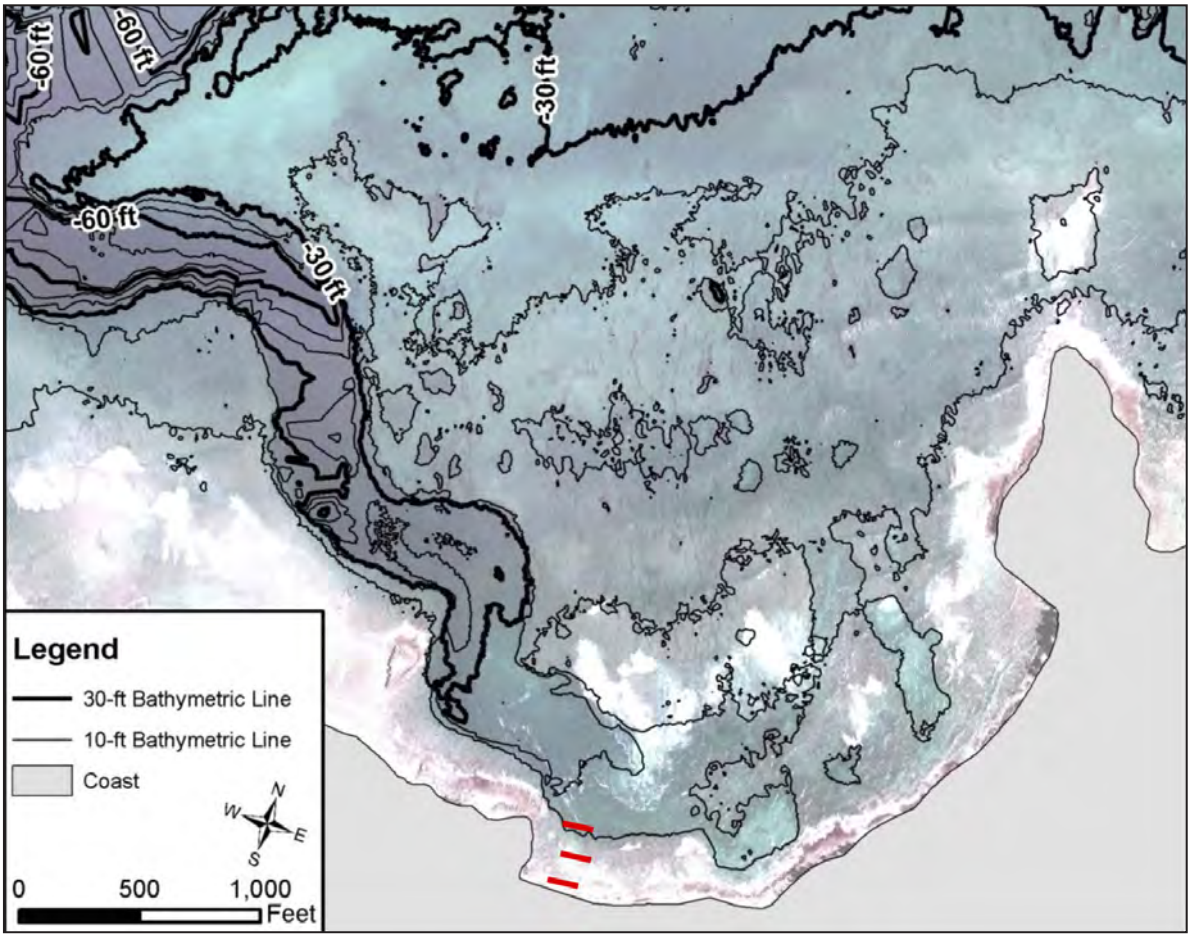
E.1.d. [2] TURTLE BAY

Turtle Bay beach is a half-mile long crescent of white sand beach perched on top of a beach-rock shoreline. Kuilima Point at the east end of the beach blocks most of the trade-wind generated swells from the beach, although these swells do wrap around the peninsula to create a popular surf break in the lee of the Resort. The active reef crest is well off shore from the beach (~2000 feet) with a significant back-reef lagoon between the beach and reef.

Turtle Bay's unique bathymetry has a dramatic impact on water flow and water quality in the bay. During prehistoric times the ocean was as much as 60 feet (17 meters) higher than present, during which time much of the flat coastal plain was formed and upon which the project site now rests. But during times of lower sea levels (by as much as 200-feet) the coastline was much farther out to sea, and coastal streams formed channels across the broad plateau. A remnant of the prehistoric Kuilima Stream channel snakes through the reef from the west end of Turtle Bay in a deep 350-foot wide channel and meets the shoreline about a third of the way along the beach towards the Turtle Bay hotel (Figure 2-9). This channel is a dominant factor in the hydrology of Turtle Bay as described below under waves and currents below.

Because the sand beach is perched on top of a lithified beach-rock shoreline, the toe of the beach sand is either above or, at most, slightly below water line. Along the eastern portion of the bay closest to the main Resort buildings, the near shore displays the characteristics of a shallow back-reef substrate. The bathymetry is relatively flat with depths from 2-6 feet with a coral rubble surface consolidated by a cover of algae and invertebrate growth. Small depressions or ridges filled with coarse sand and rubble are interspersed with small coral rocks thrown back from

Figure 2-9: Turtle Bay Bathymetry



the reef face by past storms. Occasional small corals, more prevalent further from shore, grow on raised outcroppings above the action of the scouring sand. Small fish, primarily damsals, wrasses, and occasional box-fish and trigger fish are associated with the scattered cover provided by ridges, small corals and coral boulders.

The near shore along the western half of the beach provides a significantly different appearance. Here the prehistoric stream channel is roughly parallel to the shore forming a 350-foot wide relatively deep lagoon. At the extreme west end, a narrow (200-ft) apron of hard substrate remains between the shore and the edge of the channel, but this apron is highly ridged or wrinkled and includes scattered boulders presenting a complex substrate. Oceanit's three benthic transects were located over this near shore apron. Closer to the center of the beach the old stream channel crosses the shoreline. The lagoon substrate consists of sand and rubble with boulder debris particularly nearer the shoreline. This more irregular substrate in the near shore with its ample groundwater intrusion provides excellent habitat for the abundant growth of a wide variety of algae along the shoreline at the west end of the beach. The algae, deeper water, and enhanced cover also support a greater variety of fishes in the near shore as compared to the east end of the beach. While the edges of the submerged streambed provide enhanced substrate, the rubble and sand bottom of the bed provide very limited habitat.

Two storm water drains outfall into Turtle Bay, neither of which receives significant flows from mountain streams or inland valleys. The Kuilima Drain consists of two 48-inch culverts placed in a concrete headwall at a cut through the beach-rock shoreline about mid-way along the beach. The Kuilima Drain receives flows from the golf course and the general Resort premises only during heavy rainfall events. During light to moderate rainfall events, the golf course and Resort grounds typically infiltrate the large majority of rainfall.

The West Main Drain is located at the extreme west end of the perched sandy beach against the base of the rocky headland and consists of two 48-inch drains ending at a concrete headwall at the top of the beach with a short channel cut through the beach- rock shoreline to the ocean. During summer, sand from the adjacent perched beach often completely covers these outlets (Figure 2-10) and requires physical sand removal prior to the arrival of winter storms to allow flow to the ocean.

About 600 feet from the beach, the far side of the old stream channel manifests as an abrupt vertical ledge rising to within about 5 feet of the surface. In the lagoon this ledge varies from almost 0-feet to well over 10 feet in height. As one follows the channel seaward, the near vertical face of the old stream bed wall approaches 20-feet in height above a uniform sand and rubble bottom. The reef crest at a depth of 3-5 feet is another 1,000 feet beyond the edge of the channel. White water from the waves breaking over the reef crest dissipates where it crosses into the lagoon channel. No surveys have been conducted over this section of the reef because it is far from the stream and storm drain outfall points. However, qualitative observations show this reef to be typical of other reefs along this windward shoreline. With the exception of the ancient streambed channel the crest of the reef is continuous across the width of the bay and of relatively uniform width and depth.

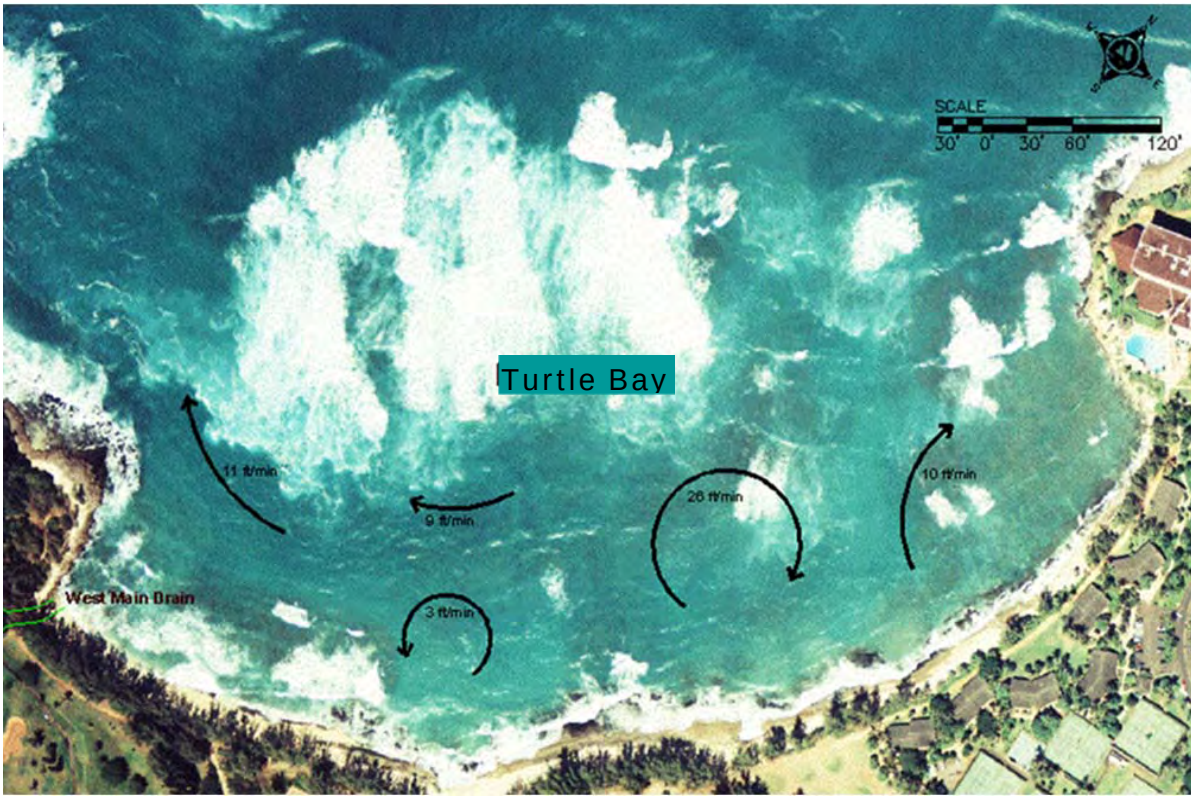
Figure 2-10: West Main Drain Outlet (above) to Turtle Bay

Waves and Currents: Swells from trade winds and direct north swells wrap around the Kuilima peninsula and approach the shoreline as 3-4 foot waves through a minor channel at the east end of the bay. Larger swells from the northwest tend to break over the shallow reef crest and dissipate as white-water moving over the back-reef and into the lagoon. Within the bay, currents are driven by white-water pulsing over the reef and to a lesser degree by wind direction. The overall direction of the current seems to be counter-clockwise where the inward flow occurs on the east side of the bay then exits at the east corner by flowing along the shore then by cutting diagonally across the bay. Figure 2-11 shows the interpolated current from the field study. Both show the current in a counter-clockwise orientation. Under conditions of normal trade wind swells with surf extending across the shallow reef and into the deeper near shore back-reef lagoon, there is a dominant outward current to the sea through the channel at the southwest end of the beach immediately off the outfall of the West Main Drain.

Water Quality: Water quality has been monitored in Turtle Bay during three time periods, semi-annually from 1989-1994, monthly for one year during 2001-2002, and quarterly from 2006 to the present. The location of these samples is shown in Figure 2-12.

Table 2-4 displays the geometric mean value for each water quality constituent collected at each of the sample sites within Turtle Bay for each survey period, and then the whole-bay average during each survey period for each constituent. The graphics in Figure 2-13 present this same data, but with the geometric means expressed by month, to show any seasonal trends in the data. The graphs are all of the same scale as those of Figure 2-7 for Kawela Bay to allow for ease of comparison between bays. Figure 2-14 displays one month of hourly data from the 2002 survey as a data visualization graph for physical water quality constituents only.

Figure 2-11: Water current circulation in Turtle Bay



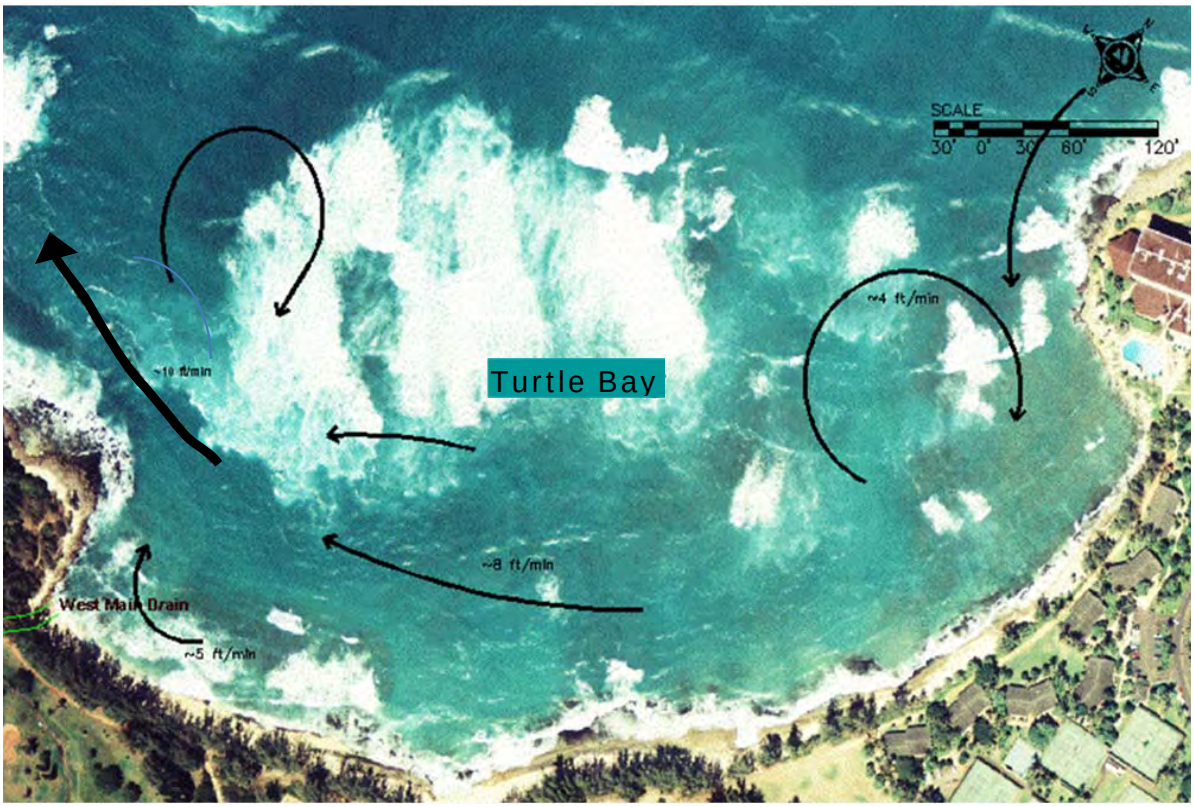


Figure 2-12: Turtle Bay water quality sample locations

Table 2-4: Summary of Water Quality from three surveys over 22 years at Kawela Bay

Turtle Bay Water Quality		Temp. (° C)	Diss. Oxygen (mg/L)	pH	Salinity (ppt)	Turbidity (lab) (NTU)	Total Susp. Solids (mg/L)	Ammonia (ug N/L)	Nitrate + Nitrite (ug N/L)	Total Nitrogen (ug N/L)	Total Phosphorus (ug P/L)	Chlorophyll a (ug/L)	Silicates (ug/L)
1989-1994													
	W1-1 surface	24.5	6.2		31.8	1.5			16.7	181	19.5		
	W1-2 - mid-water	24.6	6.2		32.7	1.8			20.5	186	16.2		
Each Value	W2-1 - surface	24.4	6.4		34.2	0.8			8.3	113	12.0		
Geo Mean of	W2-2 - mid-water	24.3	6.4		34.4	0.7			4.7	104	11.0		
10 semi-annual samples													
	Average	**24.47**	**6.29**		**33.26**	**1.19**			**12.53**	**146**	**14.7**		
2002	West Turtle Bay												
Each GM of	Near Shore (10 ft)	25.12	7.5	8.08	33.63	2.4	7.8		4.1	154	15.9	0.93	
33 samples	Off Shore (300 ft)	25.11	7.5	8.17	35.43	1.7	5.0		2.8	124	11.7	0.47	
	Average	**25.11**	**7.5**	**8.1**	**34.53**	**2.0**	**6.4**		**3.4**	**139**	**13.8**	**0.70**	
2006-2011	East nearshore	26.06	7.2	8.3	33.95	2.3	10.9	2.0	20.9	208	17.9	1.31	967
	Cntr nearshore	25.77	6.8	8.2	34.20	1.5	8.6	1.7	6.2	176	16.7	0.86	559
Each GM of	Cntr 300 ft offshore	25.53	6.7	8.2	34.49	1.1	6.6	1.4	7.3	162	11.4	0.42	451
21 samples	West nearshore	25.49	7.0	8.2	33.02	1.5	8.7	1.7	34.2	208	21.4	1.02	1525
	West 300 ft offshore	25.28	6.7	8.2	34.40	1.1	6.7	1.4	6.5	163	10.5	0.43	495
	Average	**25.62**	**6.88**	**8.23**	**34.01**	**1.50**	**8.32**	**1.64**	**15.02**	**183.37**	**15.59**	**0.81**	**799.50**
Open Coast	Wet Season					0.50	20	3.5	5	150	20	0.30	
State WQ Std	Dry Season					0.20	10	2.0	4	110	16	0.15	

* Measured constituents with a geometric mean greater than the State WQ Open Coast Wet season standard are noted in blue

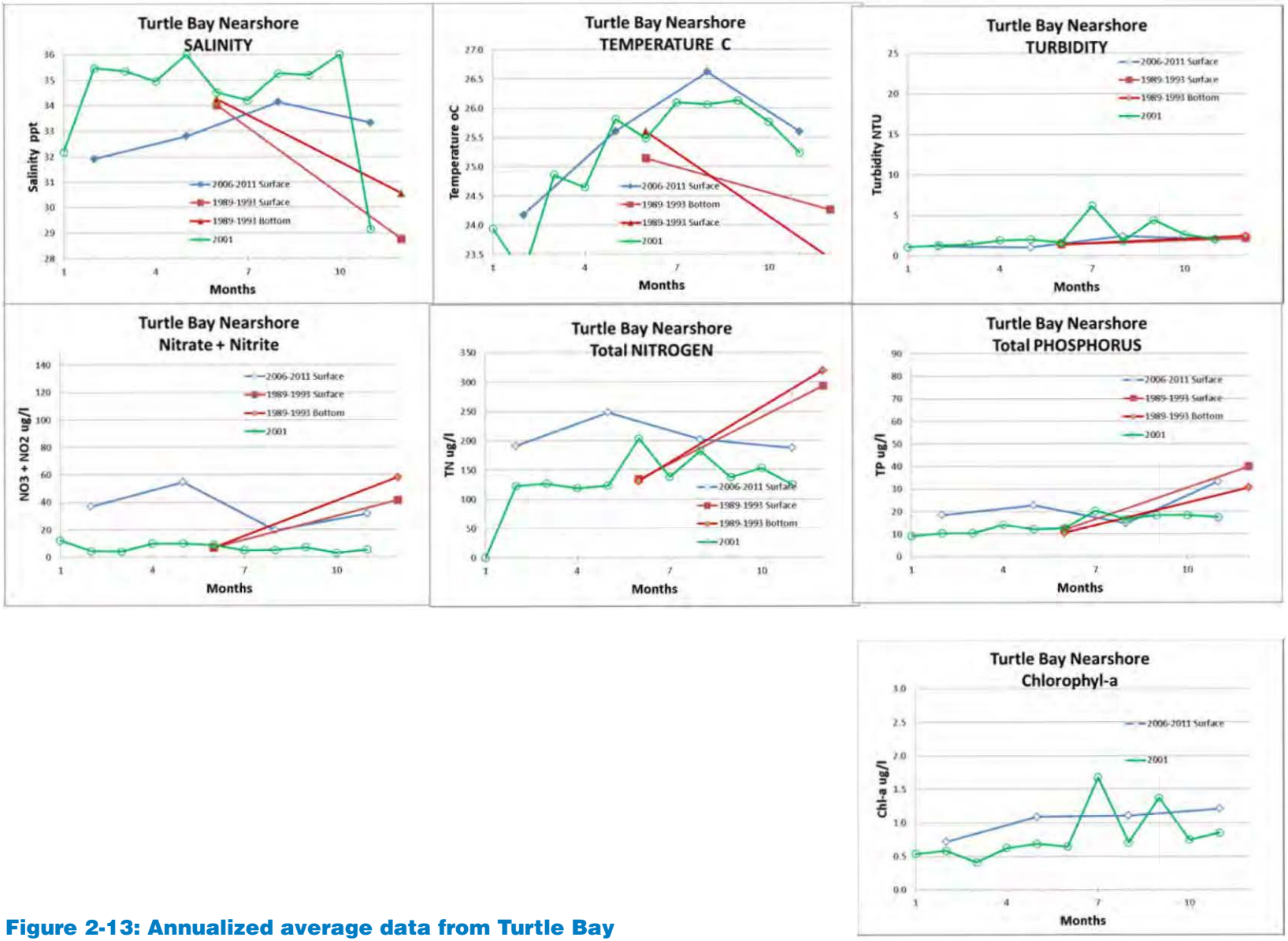
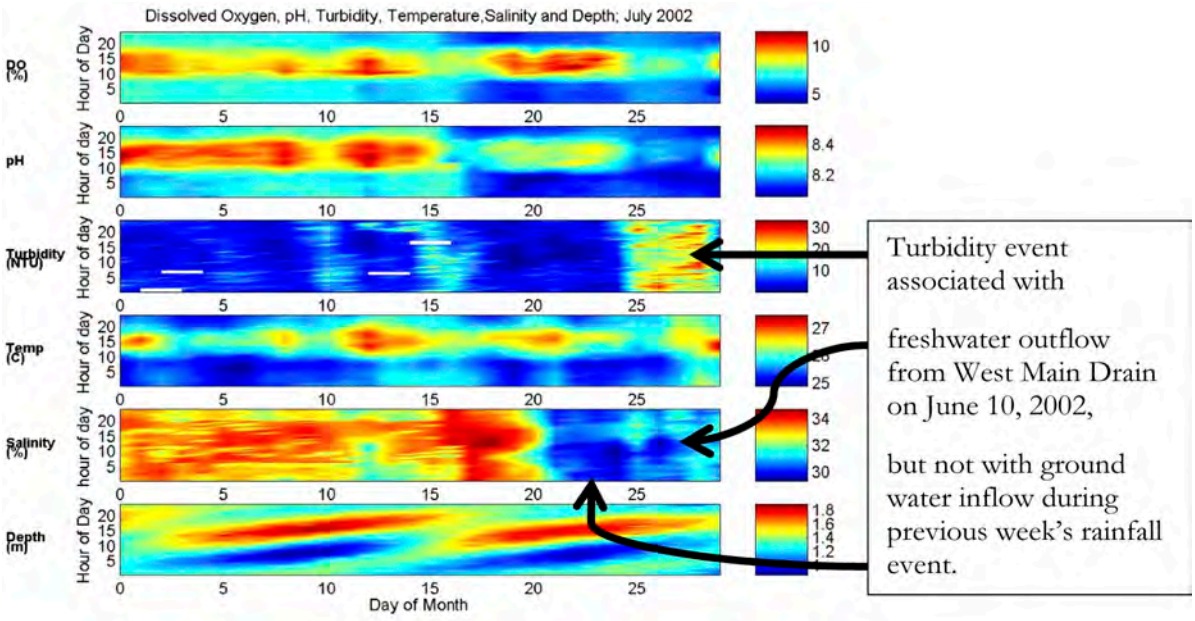


Figure 2-13: Annualized average data from Turtle Bay

Figure 2-14: Data visualization graphic from Turtle Bay June, 2002



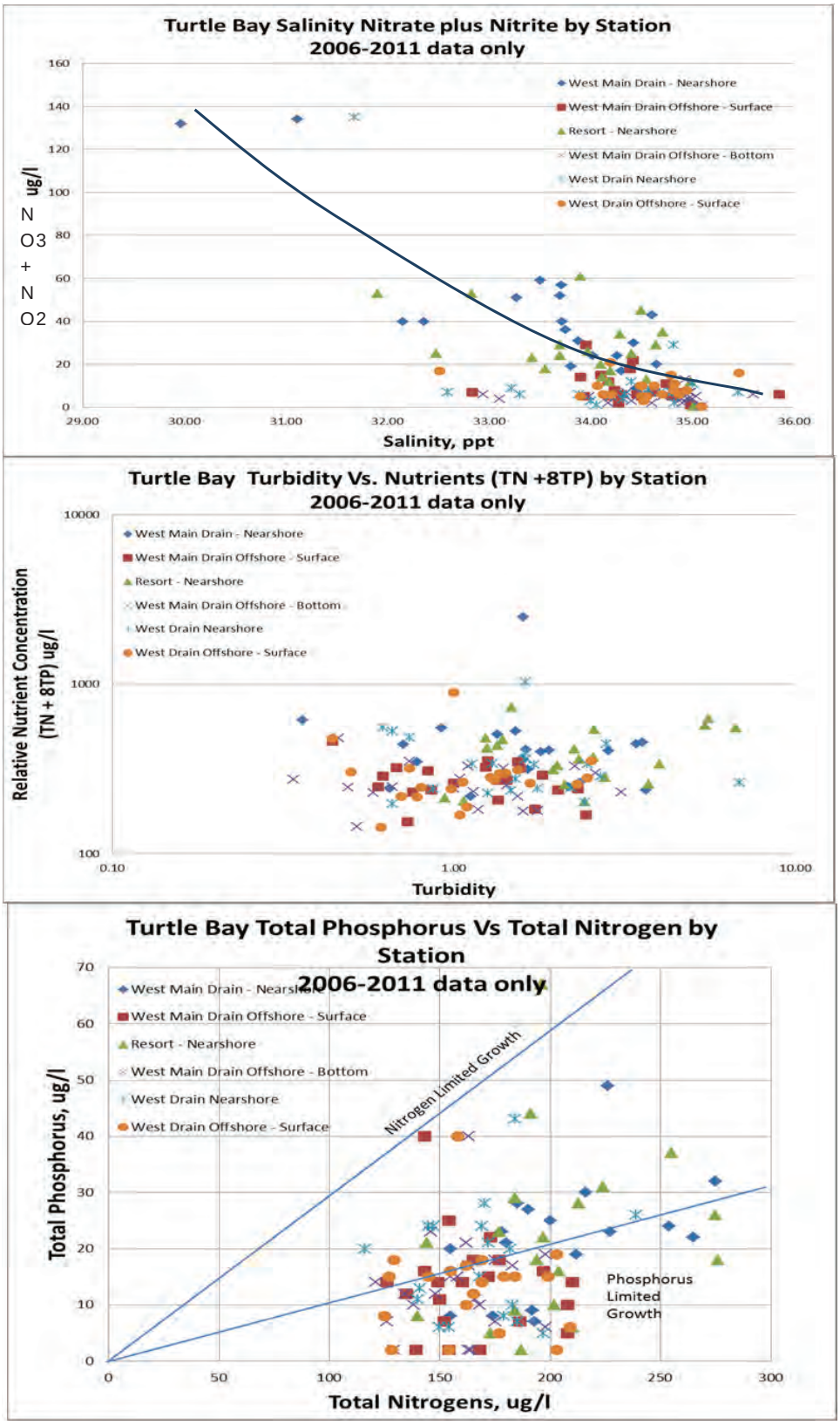
Turbidity values are rarely below the State Water Quality Standard for Wet Open Coasts (0.5 NTU). Turbidity values are typically higher in near shore (~2 NTU) than from offshore sample sites (~1 NTU), but as can be seen from Figure 2-16 there is a great deal of variability in turbidity from day to day and even from hour to hour during a given day. Turbidity appears to be correlated with water outflow events from the West Main Drain, with high wave events, and with summer periods with low waves (and presumably low circulation) causing high chlorophyll-a levels associated with plankton blooms.

Although turbidity levels are higher than state standards, it is unrealistic to assume that this standard is achievable in shallow near shore areas subject to the turbulence of waves and currents. The State previously used a geometric mean of 20 mg/l for Total Suspended Solids as a water quality constituent along near shore open coasts. All of the sample geometric means are well within this standard. There does not appear to be any long-term trend in turbidity levels within Turtle Bay.

Total nitrogen, as well as nitrate plus nitrite levels typically exceeded the State Water Quality standards for these constituents, particularly at the very near shore sample stations. The higher nitrogen concentrations in near shore samples show that these constituents are likely carried to the shore in groundwater. Because of the strong relationship between nitrogen concentration and ground water input (Figure 2-15) the only way to lower nitrogen in near shore waters would be to either lower the nitrogen in the ground water, or to increase the rate of mixing or offshore transport of near shore waters.

Total phosphorous concentration is likely a more important variable than nitrogen concentrations in near shore aquatic environments, because it is typically the limiting nutrient

Figure 2-15: Relation between Salinity and nitrate plus nitrite in Turtle Bay



for plankton or plant growth. In contrast to Kawela Bay where TP concentrations were generally above State Water Quality Standards, in Turtle Bay these concentrations are, with one exception, generally lower than the State Water Quality Standard. Therefore in Turtle Bay, the growth of algae and phytoplankton is generally phosphorous limited and there is not a strong correlation between turbidity (caused by plankton growth) and total nutrient concentration (see Figure 2-15).

Water quality within Turtle Bay appears to be strongly influenced by the rapid exchange of water with the open ocean as it is pumped in across the reef by wave action and exits through the ancient stream bed at the west end of the bay. Nutrient levels within the bay can reach very high concentrations during storm water outflow events through the West Main Drain, but due to the high exchange rate these high concentrations do not persist and water quality rapidly improves. There is no apparent long-term trend in water quality within the bay.

Marine Biota: Benthic marine surveys were conducted in the near shore waters in Turtle Bay off the West Main Drain during March and September 2011. The surveys were conducted along 100-foot transects parallel to shore approximately 50-feet, 100-feet, and 150 feet off the shoreline at the extreme west end of the bay. The near shore survey was over a heavily scoured rough hard substrate in the surge zone just below the beach in about 4 feet of water. The survey 100 feet offshore was still over a hard beach-rock substrate but slightly deeper with slightly less surge, more gravel, and greater vertical relief. Both transects displayed abundant macro algae, calcareous algae, and occasional small corals. The third survey, at 150 feet from shore, was deeper (6-10 feet) and just inshore of the edge of the submerged streambed. Substrate is highly irregular along this outer transect with large cracks and caves in solid substrate and provides a myriad of niches in which fish and invertebrates find refuge. This transect displayed both the highest total fish count (35) and the greatest number of fish species seen (8).

E.1.d. [3] KUILIMA BAY

The shore at the ʻŌʻio Stream outlet consists of a raised beach-rock shoreline supporting a perched sand beach. A 20-foot wide channel has been excavated through the beach rock shore to allow for the passage of storm water from the East Main Drain, but this depression is often filled with sand from the perched beach to either side. The shoreline is a vertical face dropping to a sand and rubble bottom in 6-8 feet of water. The sand bottom extends about 200 feet from shore where it's depth gradually increases to about 12-feet. Beyond this a hard bottom substrate with scattered corals and reef rubble gradually shallows to a depth of 6-8 feet over an indistinct reef crest about 500 feet offshore.

The reef crest is discontinuous near the center of the bay with passes deeper than 10-feet extending from near shore to offshore areas. This deep reef crest allows a significant quantity of wave energy to impact the shoreline, much more than either Turtle Bay or Kawela Bay. The 30-foot depth contour is reached about 2000 feet off shore across multiple hard bottom reef areas.

Waves and Currents: Of the three bays along the project coastline, Kuilima Bay presents the most open shoreline to the ocean waves and currents. The reef directly off of the East Main Drain is not as well formed, as wide, or as shallow as the reef off of Turtle Bay and subsequently allows much more wave energy to pass to the shore. Near shore currents, both during rising and falling tides, were along shore from east to west, directly towards the main Turtle Bay Hotel facility. This is consistent with visual observations during outflow events where the plume of muddy water from the East Main Drain stays relatively close to shore and moves towards the west.

Water Quality: Water quality has been monitored in Kuilima Bay during three time periods, semi-annually from 1989-1994, monthly for one year during 2001-2002, and quarterly from 2006 to the present. The location of these samples is shown in Figure 2-16.

Figure 2-16: Location of water quality samples in Kuilima Bay

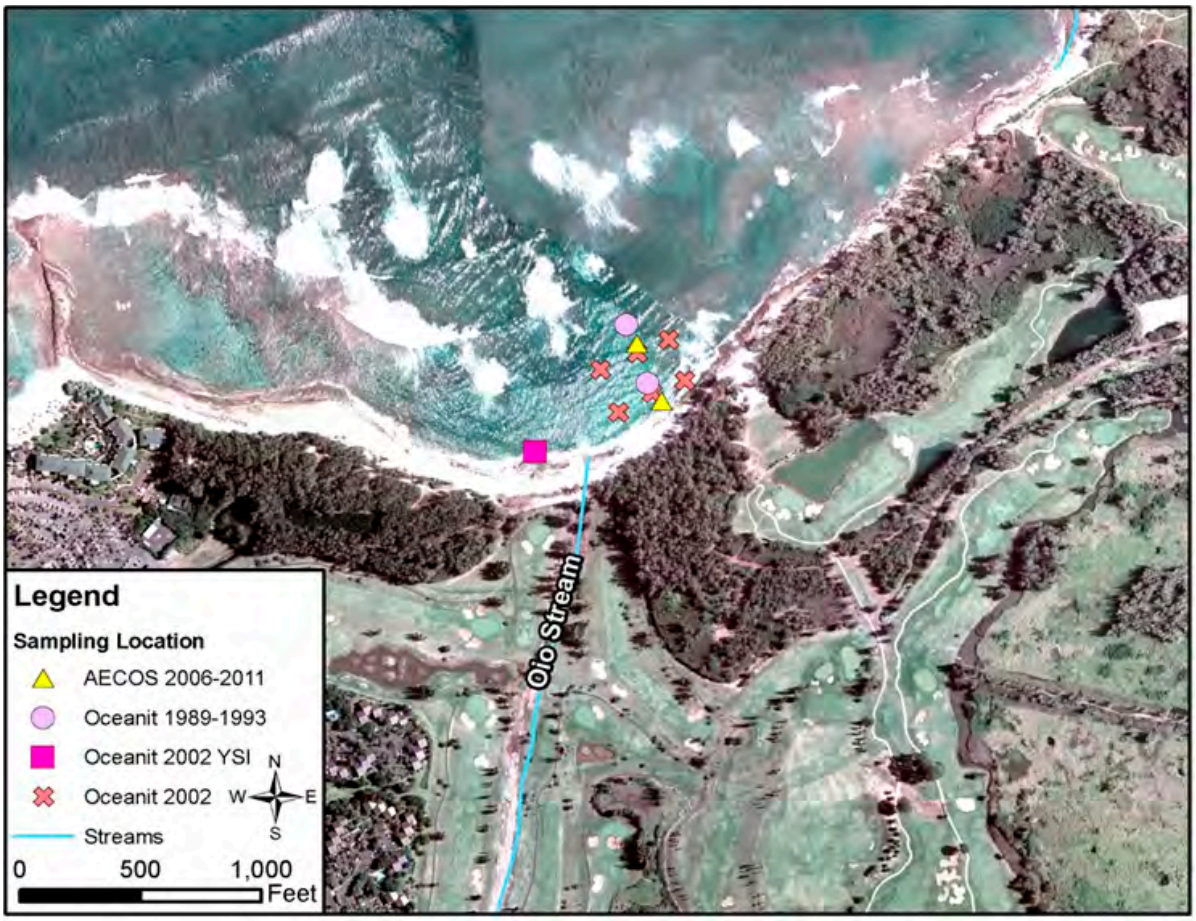


Table 2-5: Summary of water quality from three surveys over 22 years at Kuilima Bay

Kuilima Bay		Temp.	Diss. Oxygen	pH	Salinity	Turbidity (lab)	Total Susp. Solids	Ammonia	Nitrate + Nitrite	Total Nitrogen	Total Phosphorus	Chlorophyll a	Silicates
		(° C)	(mg/L)		(ppt)	(NTU)	(mg/L)	(ug N/L)	(ug N/L)	(ug N/L)	(ug P/L)	(ug/L)	(ug/L)
1989-1994													
	E1-1 surface	24.81	6.0		34.09	1.4			3.06	123.09	12.2		
	E1-2 - mid-water	24.71	6.3		34.43	1.0			1.99	102.36	12.1		
Each Value	E2-1 - surface	24.71	6.5		34.29	0.7			2.11	98.34	9.9		
Geo Mean of	E2-2 - mid-water	24.62	6.4		34.45	0.7			2.7	97.18	12.1		
10 semi-annual samples													
	Average	**24.71**	**6.30**		**34.32**	**0.91**			**2.46**	**105.24**	**11.59**		
2002													
Each GM of	Near Shore (10 ft)	25.12	7.5	8.08	33.63	2.4	7.76		4.06	154.0	15.92	0.93	
33 samples	Off Shore (300 ft)	25.11	7.5	8.17	35.43	1.7	5.05		2.84	123.5	11.72	0.47	
	Average	**25.11**	**7.5**	**8.1**	**34.53**	**2.0**	**6.4**		**3.4**	**138.7**	**13.8**	**0.70**	
2006-2011													
Each GM of	Nearshr Surface	25.94	6.48	8.20	34.44	1.7	9.5	1.61	2.10	172.6	13.2	0.66	415
21 samples	Offshore Surface	25.65	6.61	8.17	34.47	1.3	7.3	1.39	3.51	156.6	10.6	0.38	356
	Offshore Bottom	25.58	6.87	8.18	34.42	1.3	8.0	1.21	3.34	165.1	11.9	0.43	323
	Surface Only	**25.80**	**6.55**	**8.19**	**34.45**	**1.50**	**8.39**	**1.50**	**2.80**	**164.58**	**11.94**	**0.52**	**385.77**
Open Coast	Wet Season					0.50	20	3.5	5	150	20	0.30	
State WQ Std	Dry Season					0.20	10	2.0	4	110	16	0.15	

* Measured constituents with a geometric mean greater than the State WQ Open Coast Wet season standard are noted in blue

Table 2-5 displays the geometric mean value for each water quality constituent collected at each of the sample sites within Kuilima Bay for each survey period, and then the whole-bay average during each survey period for each constituent. The graphics in Figure 2-17 present this same data, but with the geometric means expressed by month, to show any seasonal trends in the data. The graphs are all of the same scale as those of Figure 2-14 for Kawela Bay and Figure 2-14 for Turtle Bay to allow for ease of comparison between bays. Figure 2-18 displays one month of hourly data from the 2001 survey as a data visualization graph for physical water quality constituents only.

Nitrate plus nitrite levels in the ocean waters off the O‘io stream outlet are generally low, consistent with Oceanic or open dry coastline concentrations indicating low groundwater input at this site. The concentrations measured range from 0.5 ug/l. in May and June to 6.5 ug/l. in July 2001 at station E5. However, Total Nitrogen levels are not exceptionally low, being more on the level with nutrient concentrations typical of Wet open coastlines and Estuaries (according to State Standards). There are many potential sources of nitrogen in groundwater including animal feces, fertilizers, cesspool systems, and decayed plant material. The near shore marine environment also adds to these sources with fish and invertebrate wastes and decaying plankton or benthic algae. There does not appear to be a significant source of groundwater with high nitrate plus nitrite concentrations impacting this site.

Total nitrogen levels are lower than both Kawela Bay and Turtle Bay, but still slightly above State Water Quality Standards for Wet Open Coast. There does appear to be a long-term trend

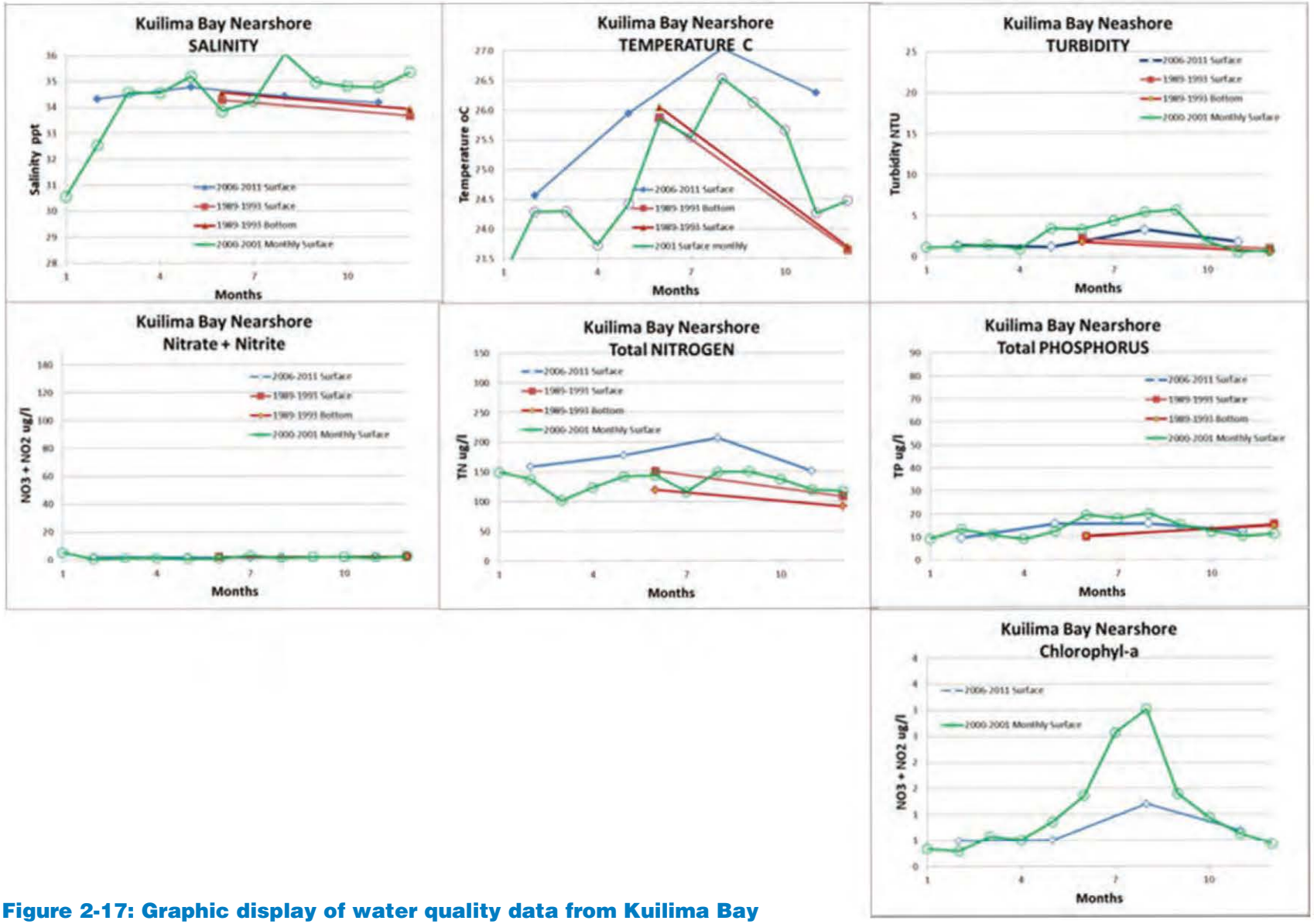
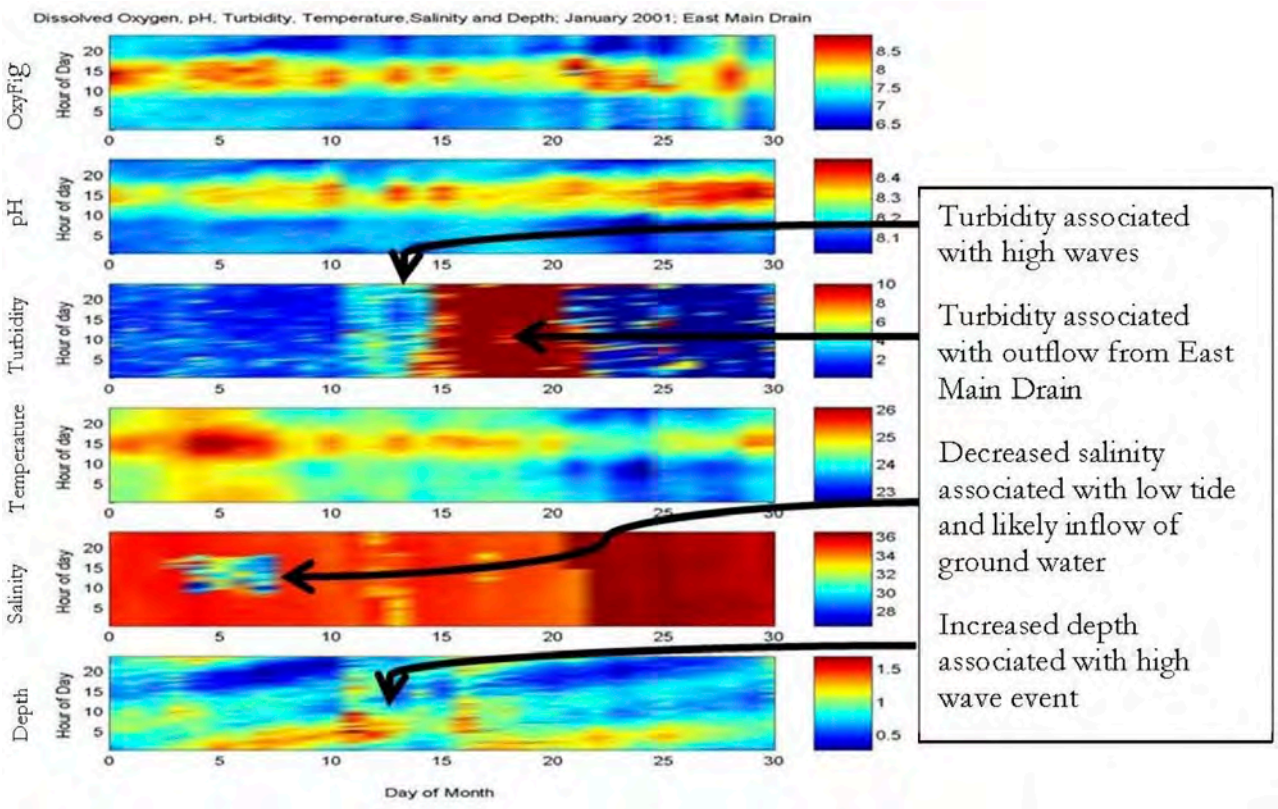


Figure 2-17: Graphic display of water quality data from Kuilima Bay

Figure 2-18: Water quality interpretive graphic from Kuilima Bay



towards increasing total nitrogen in the water during the past 22 years, but the source of this increase is unknown.

Total phosphorous (TP) levels are well below State Water Quality Standards and show no long-term trends over the past 22 years. The monthly sampling conducted in 2001 appears to show a slight trend of increasing TP levels during summer months, but the concentrations typically stay below the 20 ug/l state standard except for individual very near shore samples. The slight increase in summer TP concentrations during 2001 is correlated with both an increase in turbidity and an increase in chlorophyll-a concentrations.

A meter near the shore just west of the East Main Drain outlet in Kuilima Bay recorded physical water quality data on an hourly basis for one year in 2001. One month of this data is shown in Figure 2-20 as data interpretive graphic with colors representing measured values. Examination of the graphic shows a turbidity event beginning on January 12 with a storm and large wave event followed an outflow from the drain to the ocean. The period of turbid water lasted 5 days with significant outflow from the stream occurring over a period of 3 days until water subsided and the ocean closed the stream outlet with sand from adjacent beaches.

Examination of Figure 2-20 is critical as it shows how daily and some times hourly changes in water quality can be significant factors. With the possible exception of total nitrogen concentrations, there do not appear to be any significant changes in water quality during the 22-year period of measurement at this site. The concentration of total nitrogen in Kuilima Bay is lower than in either Turtle Bay or Kawela Bay.

Marine Biota: The near shore benthic habitat changes with distance from the abrupt shoreline out to the reef crest. The intertidal zone consists of the beach-rock surface. Where the surface has been protected by sand it forms a ledge sloping towards the sea with vertical broken edges and cracks exposed to the ocean. The cracks, and biological borings of the exposed surface support the growth of intertidal mollusks and, deeper, boring echinoderms. Where the cracks are too narrow for fish to graze they commonly support a growth of bright green Ulva seaweed, which is often an indicator of fresh water intrusion. At the bottom of the bench and extending 100-200 feet from shore is a relatively flat seascape 6 to 12 feet deep with at least 50% cover of fine to coarse sand and rubble with exposed hard substrate covered with a fine algae turf.

Further from shore the fine sand is replaced by coarse sand and the depth begins to decrease with increasing incidence of raised shelves and reef rubble supporting more algae and an occasional small coral. The most prevalent algae is *Halameda sp, Acanthophora sp.* and *Martensia sp.* Farther than 300 feet from the beach, the backside of the reef is approached, where the water is generally shallower, and the surface relief begins to show more complexity, more reef rubble, occasional reef boulders, a greater predominance of coralline and fleshy algae, and more common corals on the uplifted surfaces.

The crest of the reef, at about 450 feet offshore, displays a complex highly variable surface at depths of 2 to 6 feet without obvious finger and groove formations. The most visibly prevalent corals are lobe coral (Porites. *lobata)* and cauliflower corals (Pocillopora *meandrina).*

Benthic surveys were conducted over 100-foot long transects laid parallel to shore 25 feet, 100 feet and 150 feet off shore. A continuous string of 50 photographs was taken along one side of the transect line and the results tabulated by percent benthic substrate type, and then by percent of biological cover over the substrate (Table 2-6). These surveys are in good agreement with those conducted in 1989-93 and again in 2002 by Oceanit and characterize these near shore areas as being relatively low relief, highly mobile sand and gravel sediments, with little habitat for fish (except at the shoreline), and low percent cover of either coral or fleshy algae.

The characteristics of the benthic habit improve markedly away from the shore to the inner extent of the active reef about 300-400 feet off shore. The reef is highly irregular with a profusion of sand patches, ledges, and uplifted reef sections supporting a healthy growth of corals.

Table 2-6: Benthic survey results from Kuilima Bay, 2011

	1			2			3		
	Kuilima Bay Nearshore			Kuilima Bay Midshore			Kuilima Bay Offshore		
	March	Sept	% cover	March	Sept	% cover	March	Sept	
RESULTS SUMMARY CHART	# Points	# Points	%	# Points	# Points	%	# Points	# Points	%
SUBSTRATE (only)	47	254	30.1	156	136	28.9	175	127	30.2
CORAL	0	0	0.0	1	0	0.1	0	0	0.0
OTHER INVERTEBRATES	0	0	0.0	0	0	0.0	0	0	0.0
CORALLINE ALGAE	19	4	2.3	10	9	1.9	24	12	3.6
TURF ALGAE	402	210	61.2	308	280	58.3	280	277	55.7
NATIVE ALGAE	25	30	5.5	29	70	9.8	12	82	9.4
INVASIVE ALGAE	0	0	0.0	0	1	0.1	0	0	0.0
CYANOBACTERIA	0	0	0.0	0	0	0.0	0	0	0.0
UNKNOWN	0	0	0.0	0	0	0.0	0	0	0.0
TAPE, QUADRAT, SHADOW	7	2	0.9	5	4	0.9	9	2	1.1
TOTAL POINTS	500	500	100	509	500	100	500	500	100
	Kuilima Bay Nearshore			Kuilima Bay Midshore			Kuilima Bay Offshore		
	March	Sept	% cover	March	Sept	% cover	March	Sept	% Cover
CATEGORIES			%						
BENTHIC SUBSTRATE									
Benthos (BENTH, HARD)	274	187	47.0	78	287	37.0	285	355	63.0
Boulder (BOULD)(ROCK)	28	0	2.9	3	0	0.3	0	0	2.8
Cobble (COB)	14	8	2.2	1	4	0.5	4	4	1.8
Rubble (RUB)	19	6	2.5	2	25	2.7	15	8	2.7
Gravel (GRAVEL)	7	3	1.0	1	6	0.7	3	7	1.4
Coarse Sand (CSAND)	147	8	15.8	415	165	58.8	193	122	26.9
Fine Sand (FSAND)	0	280	28.5	0	0	0.0	3	0	0.0
Mud (MUD)	0	0	0.0	0	0	0.0	0	0	0.0
Substrate Total	489	492	100.0	500	487	100.0	503	496	98.6

E.1. e. Presence of Sea Turtles

Sea turtles are common along the entire Resort coastline from the shoreline out to at least the 100-foot bathymetry contour. Hawksbill turtles (Eretmochelys *imbricate)* are endangered. They were listed as Endangered under the Endangered Species Act (ESA) in 1978 (43FR32800). Hawksbill turtles in Hawai'i nest primarily on the Big Island of Hawai'i where approximately 10 to 15 turtle nest annually (Sietz 2010). Hawksbill turtles have been reported from other locations on O'ahu's North Shore, and although there have been no verified sightings from Kawela Bay, Turtle Bay, or Kuilima Bay, this protected species likely inhabits these waters.

Green sea turtles (Chelonia *mydas)* in the Pacific have been listed as Threatened under the ESA since 1978. These turtles are primarily herbivorous in the wild and graze off of macro-algae. Their preferred foraging areas include protected bays, such as Kawela Bay, where a variety of macro-algae proliferate over shallow shelves and reef flats protected from large surf (Balazs et al. 1987). The National Marine Fisheries Service Honolulu office (G. Balazs, pers communication) reports that basking green turtles resting/sleeping on the beach are commonly reported at

Kawela Bay and Turtle Bay and nesting activity is also occasionally reported. There has been no formal documentation of either the success or failure of turtle nest hatching at Kawela or Turtle Bays. (This is not unusual as the nests are notoriously difficult to locate, and beach-goers who may witness a hatching event are not commonly present near midnight when the juvenile turtles emerge to make their escape to the sea.)

PHOTO CREDIT: A. BRUCKNER, NOAA

Figure 2-19: Green Sea Turtle

Oceanit conducted visual surveys of turtle abundance and distribution in Kawela Bay for 5 days per quarter (17 quarters) between December 1989 and December 1993. The methodology for the surveys is discussed in Appendix E.

Between 1989 and 1993 a total of 58 observation days (174 morning, noon, afternoon observation periods) recorded an average of 7 turtles in the bay at any given time. During 18 time periods (~10%) no turtles were observed in the bay. The maximum number of turtles observed (24) were seen on the morning of 9/14/1991. During five winter (March) days in 2011, the average number of turtles observed at any given time was 9. The maximum number of turtles observed in the whole bay during a 2011 wintertime period was 16, and the minimum was 3 turtles. During the five summer (September) days of observation inn 2011 , the number of turtles in the bay at any given time ranged from 10 to 22 with an average of 15. The average number of turtles seen in the bay during 2011 (summer and winter) was 12.

The average number of turtles has increased from a daily average 7 in the early 1990's to 12 this past year and the number of periods when no turtles are observed in the bay has fallen from 10% to 0%. This 50-percent increase in the turtle population in the bay is statistically significant at a 95% confidence interval. There does not appear to be any difference in turtle abundance between the 5 observation zones or between the periods of day when observations were conducted.

NMFS does not undertake standardized in-water monitoring to assess population abundance in this region. The most relevant turtle information from this area comes from the Pacific Islands Fishery Science Center Marine Turtle Research Program (PIFSC MTRP) that records information from turtle strandings. This data set provides evidence that green turtles of all age classes utilize this coastal area, but that it appears most important to juvenile and sub-adult green turtles from 40-70cm straight carapace length (SCL).

Since 1985, the NMFS has recorded a total of 85 turtle strandings from Kawela Bay, Turtle Bay, and the Resort beaches. Forty-nine of the strandings were documented as mortalities, about half of which were of an unknown etiology. Stranding reports include information on turtle size by carapace length. By graphing the length of stranded turtles over the past 25 years, it was noted that the average carapace length of stranded turtles has increased from 50 cm (20-inches) to 62 cm (25- inches). The more recent samples of stranded turtles (2005-2010) show a definite increase in the numbers of larger turtles. This is consistent with the growth and recovery of the population over time since protection by the ESA began in 1978 (Balazs and Chaloupka 2004).

Fibropapillomatosis (FP), a debilitating tumor disease of the skin and internal organs, is the most significant known cause of stranding and mortality in green turtles in Hawaiʻi, accounting for 28% of strandings and 88% mortality rate of stranded turtles (Chaloupka et al. 2008). FP causes large fleshy tumor growths, often around the eyes and mouth of turtles, and typically causing mortality through starvation. While the primary cause of mortality in stranded turtles along the project coastline is unknown, the single known cause of mortality with highest prevalence (18%) in stranded turtles is FP.

E.1. f. Presence of Monk Seals

Hawaiian monk seals (*Monachus schauinslandi)* have been listed as Endangered under the Endangered Species Conservation Act (now ESA) since 1973 and as of 1976 are also protected by the Marine Mammal Protection Act of 1972. About 90- percent of the 1,161 seals estimated to be members of the total population in 2008 (NMFS 2011) live around the Northwestern Hawaiian Islands (NWHI), but a growing sub-population is also found throughout the main Hawaiian Islands (MHI) (Baker, et al. 2011a).

NOAA reports that from the 1970s through 1990, Hawaiian monk seals were present in the MHI but in low numbers and rarely seen. Since 1990, these populations have been increasing with an estimate of 133 individuals noted in 2001 (Baker and Johanos, 2004), and estimated 150 to 200 individual seals in 2011 (C. Littnan, NMFS, pers. comm.). These seals are primarily distributed

around Niʻihau, Kauaʻi, Molokaʻi, and Oʻahu. Although survival rates appear higher in the MHI, NOAA has expressed concerns about the potential of an increased incidence of disease, fisheries interactions and intentional killings of seals as they interact with human populations in the MHI (NMFS 2007).

As part of the NMFS Monk Seal Recovery Program, 21 male seals were removed from the NWHI and released into the waters of the MHI in 1994. These males were moved as part of a successful effort to reduce male aggression and increase female survival at Laysan Island, where males previously outnumbered females by over 2:1 (Johanos et al. 2010, Baker et al. 2011b). Although there have been a few relocations of seals from the MHI to the NWHI for management purposes, the 1994 event is the only relocation of seals from the NWHI to the MHI to date (Baker et al. 2011b), and cannot account for the bulk of the increase in population documented around the MHI. All female seals in the MHI occur here naturally, and the few relocated males that remain are well over 20 years old, nearing the end of their natural life span (T. Johanos, pers. comm. with Oceanit staff).

The increasing population and good condition of pups around the MHI is in positive contrast to the continuing dwindling populations in the NWHI. It is theorized that the lower density of seals in the MHI and the scarcity of large predators that either compete for food or predate seal pups, are key elements of the seals recovery. However, there is concern that as populations increase mortalities due to fisheries interactions (nets, hooks), boating impacts, and potential human borne diseases could adversely impact this population revival.

PHOTO CREDIT: NMFS, 2007

Figure 2-20: Hawaiian Monk Seal

Estimates of monk seal populations along the North Shore of Oʻahu also continue to increase with 18 individually recognized individuals (7 female, 7 male, 4 juveniles) having been sighted from the Resort Shoreline (Kahuku Point – Kawela) between 2002 and 2011 (NMFS, 2012). These eighteen individuals account for 422 of the 543 sightings during this period.

It is difficult to translate "sighting" data into a population abundance estimate, but it is clear that the population trend along this shoreline has definitely increased during the past decade. Of the three aerial surveys conducted by NMFS around the entire Oahu shoreline in 2000, 2001, and 2008, no monk seals were sighted along the Resort coastline.

Three monk seal births were documented on Kaihalulu Beach during the summers of 2006, 2010, and 2011. This compares to a total of 78 pups born in the MHI over the last two decades. It is known that the mother and pub will remain together and in the same general area for the 6 to 7 week nursing period (NMFS, 2012). These births and the increasing trend in sightings indicate that this coastline is an important habitat for Hawaiian monk seals.

As part of the turtle surveys conducted for the Oceanit study, the waters of Kawela Bay were observed for 85 days between 1989 and 1994, and no seals were observed during that period. However, during only 10 observation days conducted in 2011, one seal was observed repeatedly on a single day. This single observation has little mathematical significance, but is in line with NOAA's conclusions that seal populations are increasing around the Main Hawaiian Islands and along the project shoreline.

E. 2. Groundwater Resources

The Resort is situated within the region of the Kawela and ʻŌʻio watersheds that make up a portion of the northern part of the Koʻolau Loa Aquifer system (Koʻolau Watershed Management Plan, p. 2-10). The Koʻolau mountain range that is seen today is a remnant of a deeply eroded shield volcano, similar to Mauna Loa on the Big Island. As molten lava formed the gently sloping shield, some solidified in ground cracks under pressure, creating relatively impervious vertical structures known as volcanic dikes. These dikes control most high-level water in Windward Oʻahu. (USGS Water Resources of Oahu, 1968). The Koʻolau Loa dikes underlie the upper mountainous portions of the watersheds and prevent groundwater from easily moving from the upper part of the watershed to the coastal areas.

Dikes and dike complexes divide the Koʻolau Loa groundwater sources into upper mountain and lower coastal areas. The water stored behind the dikes is referred to as high-level water and is prevented by the dikes from interacting with saltwater. The lower levels are called basal groundwater aquifers. The high-level water recharges basal aquifers, provides stream flow, and provides high quality potable water. (KWMP, p. 2-8)

Basal groundwater is a groundwater body that overlies seawater. Freshwater, which is less dense, floats on top of the denser salt water within the basal formation. The Resort is situated over the basal groundwater aquifer. An important distinction regarding basal water is whether or

not it is confined. Confined water has a caprock that generally prevents basal water from freely flowing into ocean waters. The Koʻolau Loa caprock extends along the coast from Punaluʻu to Kahuku Point. The caprock's low permeability generally limits infiltration and contamination of the aquifer. (KWMP, p. 2-9) By its nature, caprock has a very high range of permeability. Its average vertical permeability tends to be relatively low because of the presence of phenomenon like marsh deposits. But, other units of the caprock-like cavernous limestone derived from coral reefs have extremely high horizontal permeability, meaning that water can flow freely downslope to the ocean.

As discussed in the Oceanit report on marine resources (Appendix E), the same caprock that protects the aquifer contains subterranean caverns and channels that were eroded by streams at the low points of sea level changes over tens of thousands of years. This underground system of caverns beneath the Resort facilitates the rapid flow of percolated water to the ocean.

The regional groundwater flow direction in this area is to the north or northeast and is divided between the shallow caprock flow and the deeper basal discharge. Takasaki and Mink (1985) estimated that the coastal discharge in the Kahuku area was 3.3 million gallons per day (mgd)/ mile, or about 80 cubic feet of fresh water per day per linear foot of coastline. This number includes both the deep bedrock and shallow cap-rock aquifers. Assuming the shoreline is similar to the Ewa plane caprock (Giambelluca, 1986) with a caprock area larger than the development of 2.3 square miles, a recharge of 6.1% of rainfall and 20% discharge to the shallow caprock from deep basal flow, this yields a lower and much more realistic estimate of shallow discharge of about 0.66 million gallons per day per mile, or about 17 cubic feet of freshwater discharge per linear foot of coastline per day.

According to the Board of Water Supply's Koʻolau Loa Watershed Management Plan, the currently used sustainable yield is 36 mgd for the Koʻolau Loa system.[2] The BWS estimates that the likely recoverable yield (that which might feasibly be developed) may approach the sustainable yield (36mgd).

E. 3. Regional Drainage

The Resort was designed to utilize the Fazio and Palmer Golf Courses in conjunction with two major drainage channels, the East and West Main Drains, to provide flood control mitigation for the Resort property.

As discussed previously, the SEIS Lands are comprised of three *ahupuaʻa*. Following is a discussion of the existing drainage features within each the *ahupuaʻa*. This description is then followed by a discussion of the drainage patterns from a more technical engineering point of view.

[2] Section 174C-3 of the State Water Code defines sustainable yield as "the maximum rate at which water may be withdrawn from a water source without impairing the utility or quality of the water source as determined by the [Commission on Water Source Management]."

E.3. a. Ahupuaʻa O ʻOpana Kawela

The watershed that is drained by Kawela Stream is estimated to be approximately 1,327 acres. (Koʻolau Loa Watershed Management Plan, p. 2-17) Kawela Steam originates on the western slope of Mount Kawela, near its summit, at an elevation of approximately 800 feet, approximately 1.9 miles inland from the shoreline. The 1990 Hawaiʻi Stream Assessment classifies the upper reaches of Kawela Stream as a continuously flowing, perennial stream and assigns it ID No. 3-1-04. It is possible that he stream's lower reach is perennial; however, flow in the upper reach through Kawela Gulch is likely intermittent, making this an interrupted stream (Timol & Malciolek, 1978). Based on direct observation at the Resort over the past thirty years, Kawela Stream makai of Kamehameha Highway is intermittent; flowing only when there is significant sustained rainfall.

Kawela Stream enters the SEIS Lands beneath the Kawela Bridge on Kamehameha Highway and terminates behind the shore of Kawela Bay in a *muliwat*: a pond or estuarine feature behind a sand shoreline. Surface waters only reach the bay during heavy rain events when the impoundment is breached.

The present alignment of the stream is thought to be the result of a channelization effort by the Oʻahu Sugar Company circa 1940. Subsequently, the stream's original channel has been covered by sediments. However, a 400-foot wide channel clearly evident in aerial photos of the western end of Turtle Bay is believed to mark the original outfall of Kawela Stream before being rerouted by the plantation to its present location. (see Figure 2-1)

E.3. b. Ahupuaʻa O Hanakaʻoe

Two storm water drains outfall into Turtle Bay within the *ahupuaʻa* of Hanakaʻoe, neither of which receives consistent flows from mountain streams or inland valleys. The Kuilima Drain consists of two 48-inch culverts placed in a concrete headwall at a cut through the beach-rock shoreline about mid-way along the beach, just to the west of the Cottages. Within the Fazio Golf Course, the Kuilima drain exists as grassed swale that receives flows from the golf course and the general Resort premises only during heavy rainfall events. During light to moderate rainfall events the golf course and Resort grounds typically infiltrate the large majority of rainfall. The swale empties into the subterranean culverts that extend from the 9th hole of the Fazio Course to the shoreline.

The West Main Drain is located at the extreme west end of the perched sandy beach against the base of the rocky headland just inside the western boundary of the Hanakaoʻe *ahupuaʻa*. It consists of two 48-inch drains ending at a concrete headwall at the top of the beach with a short channel cut through the beach-rock shoreline to the ocean. During summer, sand from the adjacent perched beach often completely covers these outlets and requires physical sand removal prior to the arrival of winter storms to allow flow to the ocean. The normally dry swale follows around the west edge of the golf course and then parallels the Kamehameha Highway in a broad swale. The swale receives flow partially from the golf course, but primarily through a 2-foot wide culvert beneath the highway fed by the lower slopes of the Koʻolau mountains. The total drainage area of both the Kuilima and the West Main Drains is about 1⁄2 square mile (80 acres).

Kuilima Bay receives outflow from the ʻŌʻio Stream near the center of Kaihalulu Beach less than a mile East of the Resort. The stream outlet is often termed the "East Main Drain." Total stream length is approximately 4 miles up to the top of the Koʻolau Mountains at an elevation of 1200 to 1600 feet. The total direct watershed area is approximately 2.56 square miles. The stream is listed as a perennial stream in the 1990 Hawaii Stream Assessment (State ID No. 3-1-5), but is intermittent in its lower reach across the SEIS Lands.

The alignment of ʻŌʻio stream has been changed several times according to historical maps of the area. Kahuku Plantation maps from the 1890's (State register 1460 Map 3 and Map 4) show this stream ending not far from the foot of the mountains at the "Old Government Road", with no outlet to the ocean. In maps from 1932 (State Topo Survey Map No. 4754) much of the land is designated as "sugar plantation" and the stream mouth is shown out-letting into the small cove just east of Kuilima Point and present location of the Turtle Bay Hotel. During the 1940's when aviation landing strips were constructed across the eastern portion of the area now occupied by the Resort, the mouth of the stream becomes unclear, but by 1952, USGS maps show the stream again out-letting (as Kuilima Stream) at Kuilima Point, with another un-named stream skirting the west end of the Kahuku Airfield and entering the ocean at the present site of the ʻŌʻio Stream.

The present straightened alignment appears to have been constructed as part of the golf course construction in the late 1960's. Once the stream crosses under the Kamehameha Highway onto the Resort shoreline plateau, the elevation is very low and waters from adjacent watersheds may co-mingle under heavy flow events. The stream courses along a relatively straight path from the Kamehameha Highway through the grounds of the Palmer Course, along a primarily grassed, and typically dry, swale. Under heavy rainfall storm-flow conditions adjacent fairways may be flooded and flow direction is dependent upon which stream mouth (ʻŌʻio or Bakahan to the east) is open to the ocean. The mouth of ʻŌʻio stream is confined by a golf course road bridge constructed over three 3-foot diameter drainage pipes leading to the beach. Beach sand that accumulates at the ocean end of these outlets must be mechanically cleared to allow the passage of storm waters.

Others (RM Towill, Aug. 1998) have determined that during heavy rainfall events a 100-year flood would produce a peak storm flow in ʻŌʻio Stream of approximately 5,600 cubic feet per second (cfs). The present three 3-foot diameter pipes can handle only about 2,000 cfs. The City has proposed improvements to the ʻŌʻio stream channel to contain the storm flow including the construction of a 70-foot Kamehameha Highway bridge, and a 100-foot wide approximately 9 foot deep grassed swale across the golf course. Conceptual plans have not yet been developed to modify the outlet structure making it capable of handling the 8,000 cfs flow anticipated from Oʻio Stream and other sources during a 100-year storm event.

E.3. c. Ahupuaʻa O Kahuku

Punahoʻolapa Marsh, which is situated within the Kahuku *ahupuaʻa*, receives runoff from approximately 423 acres within the SEIS Lands, of which, approximately 100 acres make up the

marsh. In addition, the marsh receives runoff from areas across Kamehameha Highway to the south, including runoff from Hoʻolapa Gulch via Hoʻolapa Stream.

E.3. d. Technical Description

The following discussion reflects a more technical description of regional drainage that does not consider the *ahupuaʻa*. A 1985 *Drainage Plan for Kuilima Resort* and an approved 2005 *Drainage Master Plan for the Turtle Bay Resort* constitute the basis for existing and proposed drainage patterns on the Resort property makai of Kamehameha Highway.

The existing drainage patterns through the Resort and Kawela Bay Area are illustrated in Figure 2-21. Figures 2-22 and 2-23 show the existing Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Flood Designations for the Resort. The existing site is subject to both riverine and tsunami flooding as shown on the FIRM. Tsunami elevations range from 17 feet to 12 feet and riverine flooding of 21-feet to 11 feet.

Three sources of intermittent regional drainage enter the property. The primary flooding source is ʻŌʻio Stream, which enters the East Main Drain as shown on Figure 2-24. Hoʻolapa Stream also enters the site at the eastern end of the Resort by culvert and sheet flow over Kamehameha Highway. Kawela Stream enters the western end of the property and presently flows to Kawela Bay. The alignment of Kawela Stream is proposed for restoration to its former route now occupied by the West Main Drain in the future, based on the previously approved Drainage Master Plan.

The existing riverine flooding for the project is shown on Figure 2-24 and the proposed riverine flooding pattern is shown on Figure 2-25. The riverine flooding for ʻŌʻio Stream or the East Main Drain and Hoʻolapa Stream is shown as determined by the United States Army Corps of Engineers (USCOE) Flood Study for Ohia Stream, Hospital Ditch, Kalaeokahipa and Hoʻolapa Gulches (Ohia Stream Study) which updated the findings of the Kahuku Regional Drainage Master Plan (KRDMP). The riverine flooding for Kawela Stream was calculated based on topographic data provided by the Kuilima Resort Company. In the future, the FEMA FIRM Maps from Kawela Stream, ʻŌʻio Stream and Hoʻolapa Gulch, can be modified to reflect the proposed drainage improvements.

For the purposes of the current drainage study and system design, the Resort property is divided into two drainage systems: the East Main Drain subsystem and the West Main Drain subsystem. The former comprises the area east of the existing Kuilima Drive and includes both the East Main Drain and intermittent drainage from Kawela Stream. The latter comprises the area west of Kuilima Drive and includes the West Main Drain and a smaller drainage channel called the West Kuilima Drain. Kuilima Drive constitutes a physical barrier between the two drainage systems because due to its elevation it is difficult for drainage water to cross it.

The buildings of Kuilima Estates West and East along Kuilima Drive are constructed on a site with ground elevations of approximately 12 feet msl or higher. These ground elevations are above the FEMA Flood Elevations.

Figure 2-21: Existing Drainage Plan and Breaks in the Sand Dunes/Sheet Flows

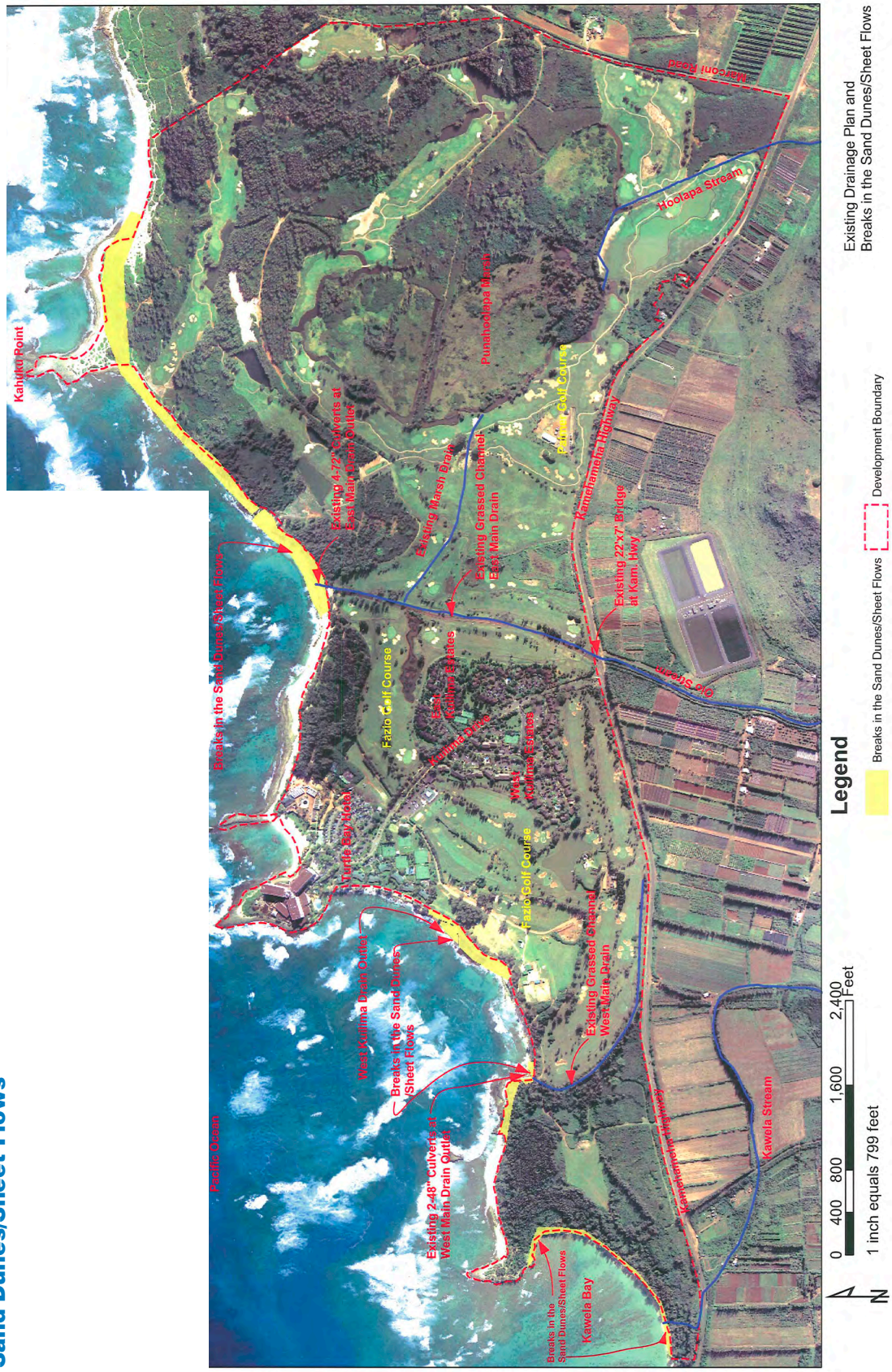


Figure 2-22: Existing FEMA Flood Insurance Rate Map, Part 1 of 2

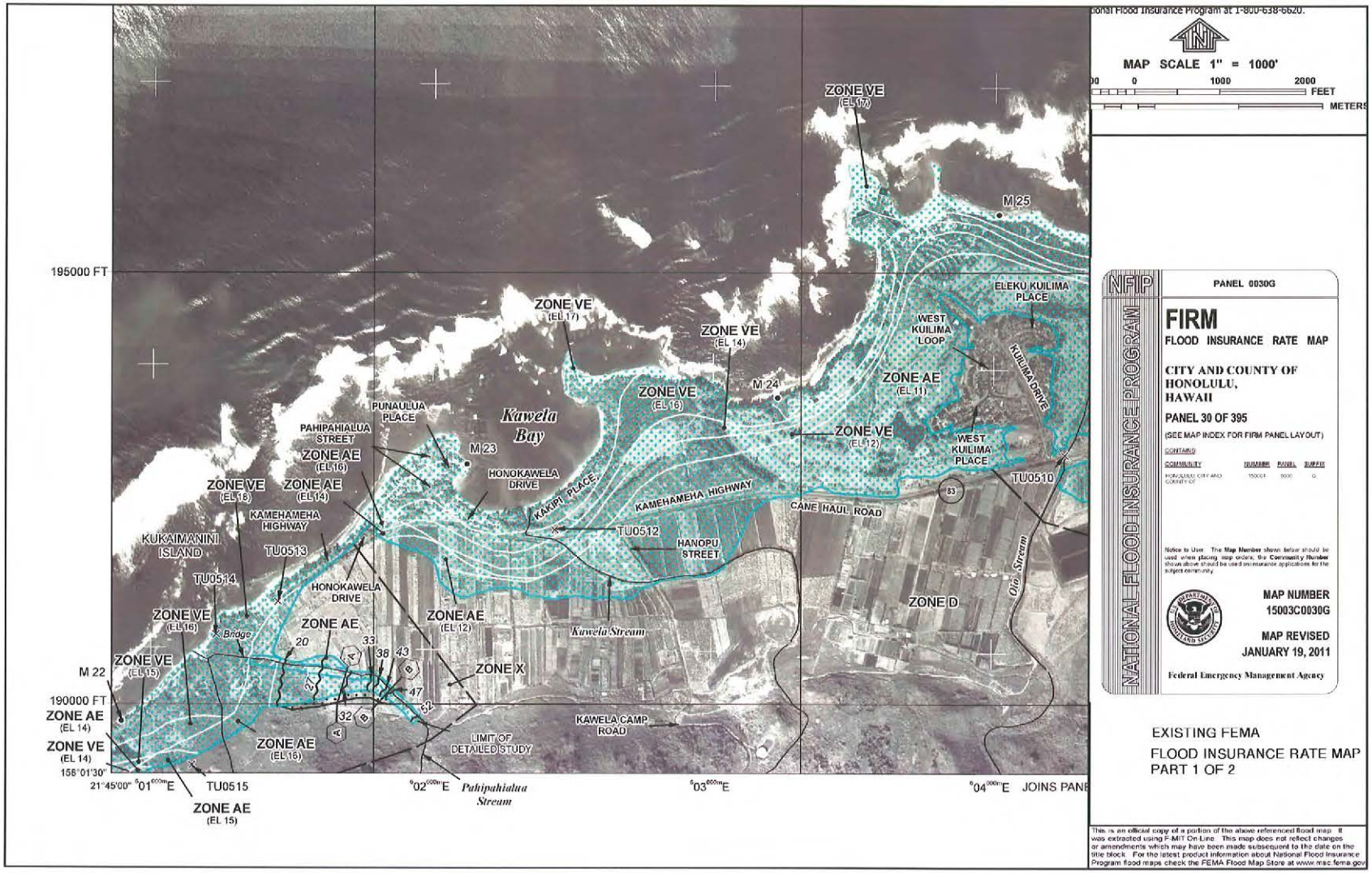


Figure 2-23: Existing FEMA Flood Insurance Rate Map, Part 2 of 2

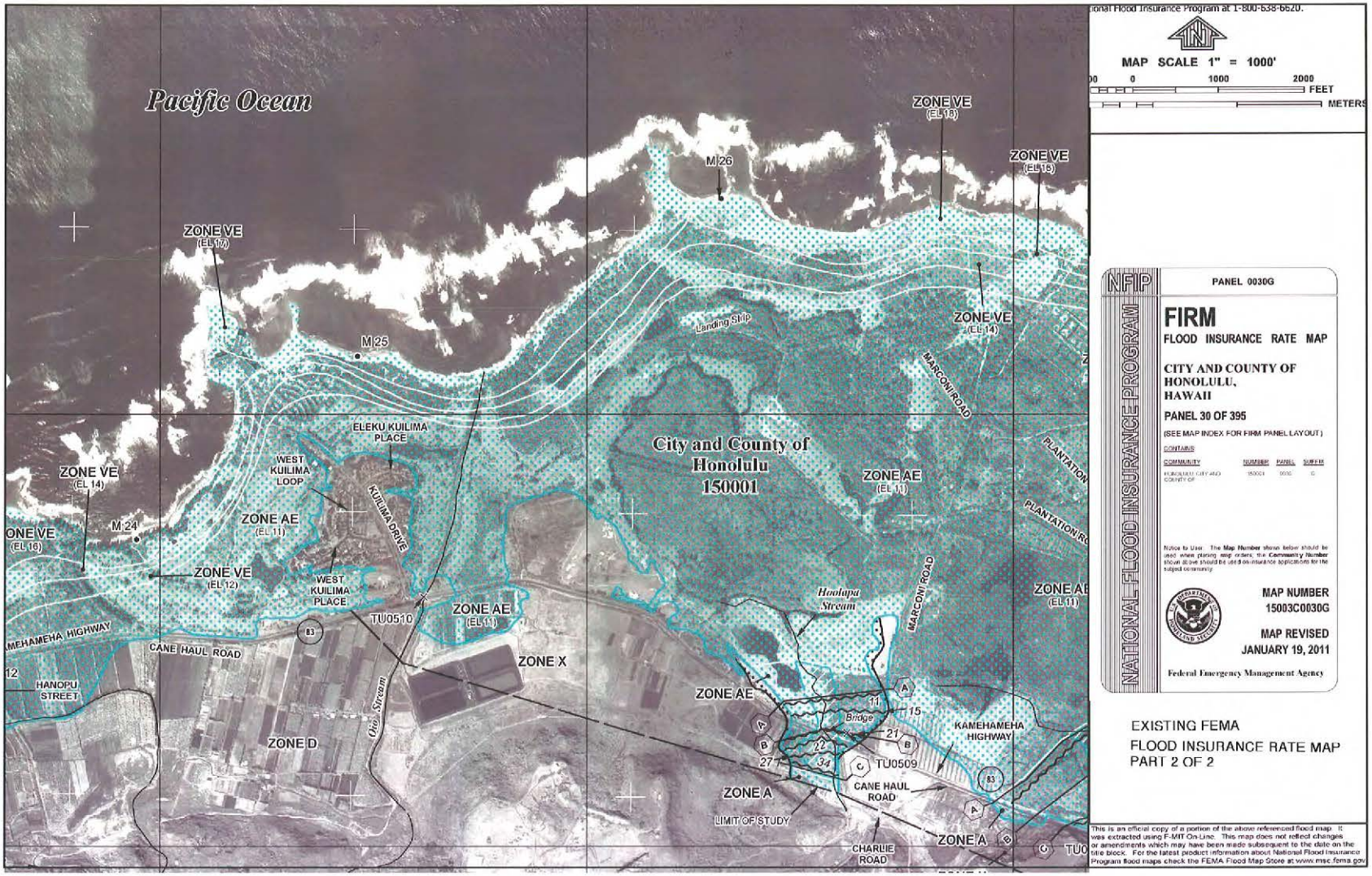
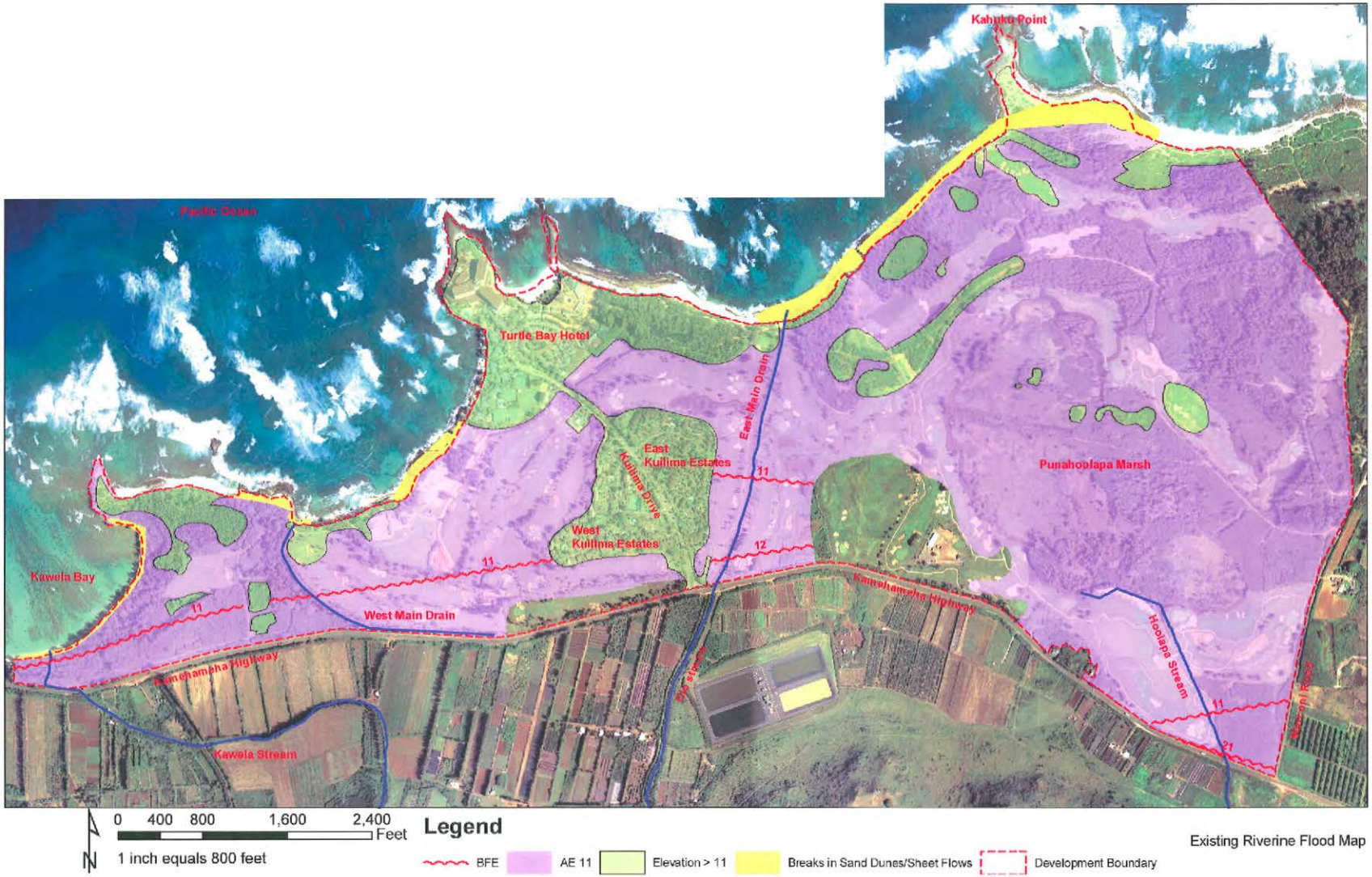
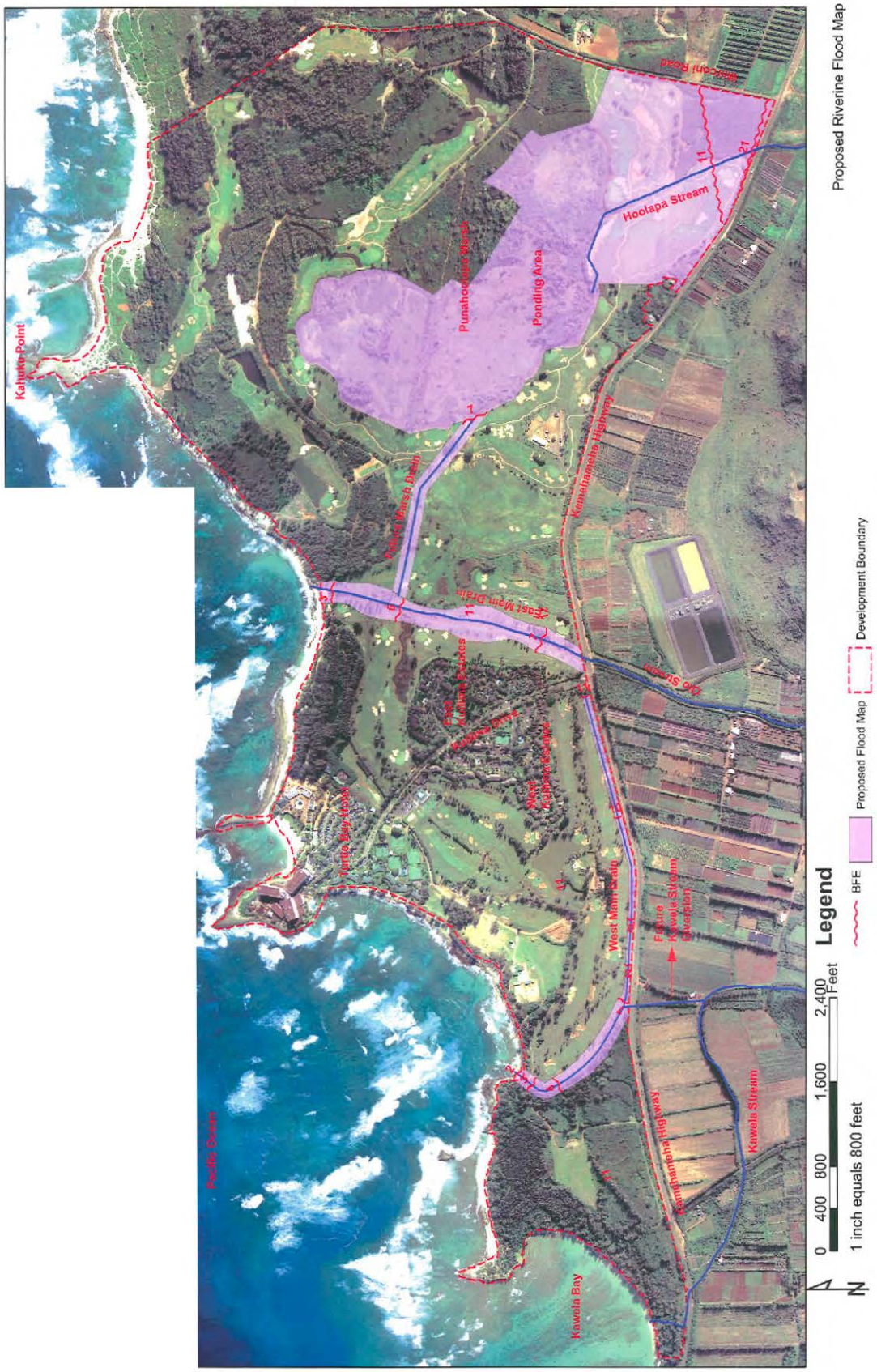


Figure 2-24: Existing Riverine Flood Map



Existing Riverine Flood Map

Figure 2-25: Proposed Riverine Flood Map



E.3.d. [1] EAST MAIN DRAIN SUBSYSTEM

ʻŌʻio Stream presently enters the Resort through a 22-foot long, 7-foot high bridge on Kamehameha Highway and continues in a grassed channel to four (4) - 72-inch diameter culverts near the coastline. The present capacity of the Kamehameha Highway Bridge is approximately 420 cubic feet per second (cfs) at a design hydraulic grade of 9.5 feet msl, with a full flow capacity of 1,617 cfs at a hydraulic grade of 11.5 feet msl, according to the Hydrologic and Hydraulic Report for Kamehameha Highway Intersection Improvements at Kuilima Drive, prepared for the Department of Transportation.

During heavy and/or sustained rainfall events, the Fazio and Palmer Golf Courses receive runoff that primarily sheet flows across Kamehameha Highway. Hoʻolapa Gulch also sheet flows into the East Main Drain subsystem where the centerline grade at the Highway is approximately 21 feet msl. The runoff from ʻŌʻio Stream flows to the East Main Drain and Hoʻolapa Gulch sheet flows across the golf course to Punahoʻolapa Marsh. A small ditch presently conveys runoff from the Punahoʻolapa Marsh to the East Main Drain but the marsh spills out on to the golf course during larger storms. Additional runoff flows from the Palmer Golf Course through breaks in the sand dunes or sheet flow areas as shown on Figure 2-23.

The existing golf courses were designed to accommodate runoff and were constructed at a lower elevation than the existing developments (the Turtle Bay Hotel and Kuilima Estates). The proposed developments are to be constructed at an elevation higher than the golf courses. The 100-year Plate 6[3] flow of 8,000 cubic feet per second (cfs) is conveyed to the ocean primarily by sheet flow.

Approximately 1,200 cfs flows through the existing East Main Drain Outlet and the remainder sheet flows through breaks in the sand dunes or other sheet flow areas to the ocean. The KRDMP and USCOE ʻŌʻio Stream determined flood elevations for the East Main Drain subsystem based on sheet flow through the sand dunes and sheet flow areas to the ocean.

E.3.d. [2] WEST MAIN DRAIN SUBSYSTEM

During heavy and/or persistent rainfall events, the West Main Drain and the west portion of the Fazio Golf Course presently receive the overflow from Kawela Stream that primarily sheet flows across Kamehameha Highway. A grassed lined channel with a 30-foot bottom width conveys runoff to two (2) 48-inch drains near the coastline. Presently, the Kawela Stream runoff flows primarily to the Kawela Stream Outlet, then to the West Main Drain and also sheet flows through the Fazio Golf Course or undeveloped lands to the West Kuilima Drain and through breaks in the sand dunes and other sheet flow areas as shown on Figure 2-23.

Similar to the East Main Drain Subsystem, the runoff that does not go directly to the Kawela Stream Outlet presently flows through the golf course and undeveloped land to the West Main

[3] "Plate 6" refers to a table in the City and County of Honolulu's *Storm Drainage Standards.*

Drain Outlet, the West Kuilima Drain outlet, or sheet flows to the breaks in the sand dunes or other sheet flow areas to the ocean. Until the original alignment of Kawela Stream is restored to the West Main Drain, a significant amount of runoff will still flow to the Kawela Stream outlet.

E. 4. Climate

E.4. a. Existing Conditions

The climate of the Hawaiian Islands is generally characterized by warm temperatures, dry conditions, and persistent trade winds, which originate from the northeast during the summer season (May through September). Hawai'i's winter season (October through April) is typically characterized by cooler temperatures, elevated precipitation, and variable winds, including Kona (southerly) winds and storms (Juvik and Juvik 1998).

The climatic conditions of the Kahuku region are characteristic of lowland and coastal areas of O'ahu's windward side, having relatively consistent temperatures as well as persistent northeast trade winds. The Kahuku area has daily maximum temperatures in the range from the high 70s (˚F) during the winter to the low-to-mid 80s (˚F) during the summer. Average temperature lows range from the mid-to-high 60s (˚F) during the winter to the low-to-mid 70s (˚F) during the summer, with an annual minimum temperature of 70 ºF (WRCC 2011).

In general, rainfall is heaviest in October and April for most of the State of Hawai'i (the South Kona area of the Big Island is an exception because it experiences its heaviest rainfall in the summer). However, rainfall averages are greatly affected by terrain. Further, great variation in rainfall can occur over small distances with extreme topographical changes. In the subject area, rainfall is relatively moderate, with a median annual rainfall of approximately 36 inches. Approximately two-thirds of the rainfall in the subject area occurs between October and April. Annual rainfall also varies significantly from year-to-year in the area (WRCC 2011).

E.4. b. Climate Change

As the only state in the union that is located in the tropics and surrounded by ocean, Hawai`i is likely to experience the impacts of global climate change in unique ways. Although these changes cannot easily be isolated to specific geographic areas such as the Resort property, some regional trends have been identified and are discussed below.

E.4.b. [1] SEA LEVEL RISE

The most reliable means of identifying sea level rise in a given area is a comparison of the height of mean sea level over a period of time. Dr. Charles Fletcher of the University of Hawai'i's School of Ocean and Earth Sciences and Technology stated in a briefing to the Hawai'i State Senate in 2010, "Sea level has risen in Hawai'i at approximately 0.6 inches per decade over the past century and probably longer…Sea level rise accelerates and expands erosion, potentially impacting beaches that were previously stable…Although the rate of global mean sea level rise has approximately doubled since 1990, sea level not only did not rise everywhere, but actually declined in some large areas. The pattern of sea level change is complex due to the fact that winds and ocean currents affect sea level, and those are changing also." [Fletcher; 2010]

Shoreline changes (erosion and/or accretion) may help to indicate historical trends of changing sea levels. In May 2012, the U. S. Geological Survey published a document discussing beach erosion trends in Hawai'i: *National Assessment of Shoreline Change: Historic Shoreline Change in the Hawaiian Islands*. The report evaluates historic beach erosion trends on three of the major Hawaiian Islands; Kaua'i, O'ahu and Maui. Long-term trends were based on data from 1910 to 2007. Short-term trends were based on data from 1949 to 2007.

The report divided O'ahu's North Shore region into two areas; Sunset and Mokulē'ia. The Sunset area extends east from Hale'iwa to Kahuku Point and the Mokulē'ia area extends west from Hale'iwa to Kaena Point. The Resort is situated at the extreme eastern end of the Sunset Area.

The report identifies short-term and long-term beach erosion rates at 1,287 separate transects along the North Shore, based on data from 5-11 shorelines over the long-term and 5-8 shorelines over the short-term, and concludes that 24% of the short-term rates and 31% of the long-term rates are significant, the lowest rates of significance on O'ahu. The report attributes this low significance rate to the high seasonal variability in shoreline positions, due primarily to the large winter swells that can alter beach widths up to two-thirds [USGS 2012; p. 33]. The report also notes that the identified rates of erosion in some locations are unreliable due to the poor seasonal distribution of available aerial photographs.

The report concludes that the overall trend of North O'ahu beaches is erosion: seventy-three percent of the total extent of North O'ahu beaches is eroding in the long term and 68 percent is eroding in the short term. The two sub-regions of Sunset and Mokulē'ia have an overall trend of long- and short-term erosion, as indicated by average rates. The report identifies an erosion rate at Kuilima Bay of up to -0.4 ± 0.2 m/yr , at a 95% confidence level, but a general trend toward beach accretion (increase in beach area) at nearby Kahuku Point. [USGS: ibid, p. 33]

However, the report is careful to point out that "[R]ates of shoreline change presented in this report represent shoreline movement under past conditions and are not intended for use in predicting future shoreline positions or future rates of shoreline change." [USGS: ibid, p.1]

Sea level rise can lead to the potential for increased coastal inundation due to wave overtopping. In other words, at higher sea levels storm waves can impact areas further inland because the wave heights are further elevated by the increased sea level. Sea level rise can also increase the potential for flooding because it can raise the water table closer to the surface, causing drainage problems during high tides and periods of heavy rainfall

E.4.b. [2] Reduced Precipitation

Historical precipitation trends may help us to understand changes in climactic conditions. There are two rain gauges in the Kahuku region that are monitored by the National Weather Service (NWS); Kahuku gauge KAHH1 and Kahuku Training Area gauge KTAH1.

Discussions with NWS staff indicate that in general terms the Hawaiian Islands have been experiencing a drying trend in the past few years. Whether this trend is directly related to global climate change is unknown. But it does indicate that rainfall patterns may now differ from those that occurred in the 1980s. Along windward slopes, while the number of rain-days has been near normal, the amount of rain per day is only about half as much on average. This is believed to result from a lowered inversion layer (that point in the upper atmosphere that caps the height of cloud buildup), resulting in less windward showers being blown into leeward areas. (personal communication; Kevin Kodama (Lead Forecaster, National Weather Service, 11/8/11)

According to the recently published Rainfall Atlas of Hawai'i; "…the rainfall evidence and other data point to a downward trend in mean rainfall that may persist at least through the end of this century." [Hawaii Rainfall Atlas 2011, *http://rainfall.geography.hawaii.edu/rainfall.html*]

Decreasing precipitation rates have also been attributed to the increased vog in the atmosphere since the mid-1980s when Pu'u O'o began erupting on the Island of Hawai'i. It is now understood that the presence of increased amounts of particulate matter in the atmosphere attracts water molecules to bond with the particles. The result is that when the particles bond with water molecules, they tend to create more clouds, but the clouds produce less rain because the water molecules are dispersed and do not bond with each other to form rain droplets large enough to fall to earth: they stay suspended in the atmosphere. [Kodama; ibid]

E.4.b. [3] Increased Storm Intensity

At the same time there is some evidence of lower amounts of precipitation with periods of episodic rainfall, where several inches of rain can fall in a matter of a few hours. This appears to be global phenomenon that has also manifested in the Hawaiian Islands. Examples of these episodic precipitation events (derived from NWS on-line data) include:

- September 5, 1996: 12 inches of rain at Ewa Beach, O'ahu in 3 hours;
- November 29 to December 8, 2003: 33 inches of rain at Windward O'ahu;
- August 3, 2004: 10 inches of rain at Windward O'ahu; and
- October 30, 2004: 10 inches of rain at Manoa, O'ahu in 12 hours.

In addition to rainfall, an increase in thunderstorm activity is occuring. Most recently, on May 3, 2011, Windward O'ahu experienced an intense electrical storm that resulted in nearly 26,000 recorded lightning strikes in a 24-hour period according to the NWS.

Periods of intense rainfall can also obscure longer-term precipitation trends. If a given area has an average annual rainfall of 40 inches, but in a given year a quarter of that is attributable to a single event, the total rainfall for that year may seem normal but actually disguises a possible drying trend, and equally as problematic declining groundwater recharge, as much of the episodic rainfall is runoff resulting in very little percolation to the groundwater aquifer.

E.4.b. [4] Ocean Acidification

Ocean acidification results from increased volumes of carbon dioxide mixing with seawater. Measurements at a monitoring station (Station ALOHA) over two decades document that the surface ocean around Hawai'i has grown more acidic at exactly the rate expected from chemical equilibration with the atmosphere. Continued acidification may have a host of negative impacts on marine biota, and as the potential to alter the rates of ocean biogeochemical processes. [Fletcher; ibid, page 4] However as noted above, the marine resources study conducted for the SEIS identified no significant change to marine biota in the region (other than an increase in turtle and Hawaiian monk sea populations).

E. 5. Soils

Eleven soil types have been described and mapped in the SEIS Lands (Foote *et al.* 1972). These consist of beach sands, coral outcrops, Jaucus sand (0-15% slopes), Pearl Harbor clay, Waialua silty clay (0-3% and 3-8% slopes), Kaloko clay, Lahaina silty clay (7-15% slopes), Mokulē'ia loam and clay loam, and Kaena clay (2-6% slopes). The distribution of these soils is shown in Figure 2-26.

Jaucus Sand is the most widespread sediment, which encompasses 277 acres, or 33% of the SEIS Lands. It is exposed along the coastal margins and is characterized by well-drained single-grained sand to depths exceeding more than 60 inches. Permeability is rapid, runoff is very slow to ponding, and the erosion hazard is slight. It is considered suitable for pasture, sugarcane, truck-crops, and urban development.

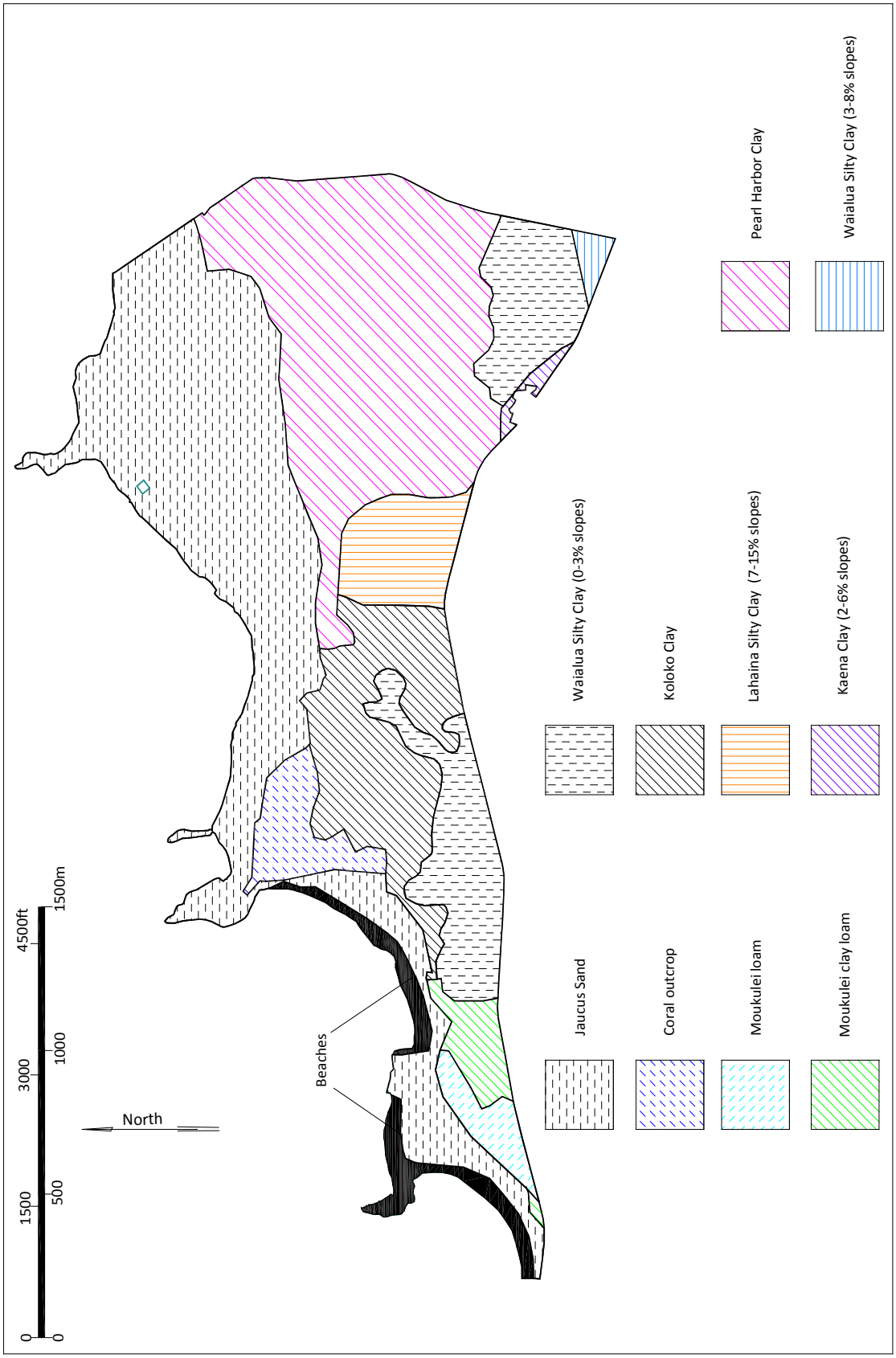
Pearl Harbor Clay is the next most extensive sediment, encompassing 227 acres, or 27% of the SEIS Lands. It largely coincides with the former extent of Punaho'olapa Marsh and consists of poorly drained, mottled clay overlying mottled clay subsoil, formed on layers of muck or peat. Permeability is very slow, runoff is very slow to ponding, and the erosion hazard is slight. Pearl Harbor clay is classified as suitable for pasture, sugarcane, taro and bananas.

Waialua Silty Clay covers 105 acres, or 12% of the total on gentle slopes in the southeastern corner of the SEIS Lands. It is moderately well drained and characterized by a silty clay surface layer overlying a subsoil of blocky silty clay formed on a mottled silty clay substratum. Permeability is moderate, runoff is slow, and the erosion hazard is slight. It is suitable for pasture, sugarcane and truck crops.

Kaloko Clay covers 96 acres, or 11% in the central portion of the SEIS Lands. It is developed in alluvium derived from igneous rock and is poorly drained. It consists of clay overlying multiple layers of clay and silt clay. Permeability is moderately slow to slow, runoff is slow to very slow, and the erosion hazard is slight. It is classified as suitable for pasture and sugarcane.

Lahaina Silty Clay covers 39 acres (5%) in the east-central portion of the SEIS Lands. It is derived from weathered igneous rock and is well drained, and is typically exposed on slopes above the coastal plain. The surface layer is severely eroded and overlies a blocky silty clay and silty clay loam subsoil, formed on weathered igneous parent material. Permeability is moderate,

Figure 2-26: Distribution of soils within the project area



runoff is medium, and the erosion hazard is moderate. It is classified as suitable for sugarcane and pineapple.

Coral (Limestone) Outcrops cover 27 acres, or 2% of the SEIS Lands, inland of Kuilima Point. The outcrops are composed of crushed and cemented coral or calcareous sand that formed in shallow ocean waters when the sea levels were higher. It is classified as suitable for military installations, quarries and urban development.

Mokulēʻia Clay Loam encompasses 20 acres or 2% of the SEIS Lands, and **Mokulēʻia Loam** comprises 18 acres, another 2% of the SEIS Lands. Both soil types are located in the southwest portion of the SEIS Lands. This soil is characterized as well-drained clay loam surface layers, over sand and loamy sand subsoils. Permeability is moderate, runoff is very slow, and the erosion hazard is slight. These soils are classified as suitable for pasture, sugarcane and truck crops.

Beaches cover 19 acres or 2% of the total SEIS Lands and are restricted to Turtle Bay and Kawela Bay. The coastal strands in these bays are characterized as sandy, gravelly or cobbly and are classified as suitable solely for recreation. Permeability is moderate, runoff is very slow, and the erosion hazard is slight.

Kaena Clay encompasses 6 acres, or 1% of the SEIS Lands, and is found only along the southeast edge of the Resort. The clay is very deep, poorly drained, and is exposed on alluvial fans and talus slopes. It is characterized by a clay surface layer overlying clay subsoil and formed on a highly weathered gravel substratum. Permeability is slow, runoff is slow, and the erosion hazard is slight. It is classified as suitable for pasture and sugarcane.

Waialua Silty Clay encompasses 5 acres, or 1% of the SEIS Lands, and is found in the southeastern corner of the Resort. It is moderately well drained and characterized by a silty clay surface layer overlying a subsoil of blocky silty clay formed on a mottled silty clay substratum. Permeability is moderate, runoff is slow, and the erosion hazard is slight. It is classified as suitable for sugarcane and truck crops.

E. 6. Agricultural Productivity

Agricultural productivity was discussed on page 38 of the 1985 Revised Final EIS. Pursuant to Section 11-200-28, that information is included here by reference. There have been no changes to the Agricultural Lands of Importance to the State of Hawaiʻi (ALISH) designations on the property.

E. 7. Terrestrial Vegetation

Given the amount of time that has passed since the 1985 EIS was prepared, a new botanical inventory survey was conducted by Rana Biological Consulting to determine if any significant changes to the vegetation have occurred. Two surveys were conducted; one in late March 2011 (wet season), and one in mid-September 2011 (dry season). A survey report is presented as Appendix F of the SEIS and is summarized below.

E.7. a. Historical Transformation

The SEIS Lands can be generally characterized as a disturbed area that has been subjected to periodic development and redevelopment since the late 1700s as detailed elsewhere in the SEIS.

E.7. b. Existing Conditions

The present-day vegetation of the SEIS Lands can be characterized as either developed landscape plantings (all hotel/Resort grounds, golf courses, and appurtenant facilities) or naturalized, non-native scrub and forest on previously disturbed lands. Areas of wetland vegetation associated with Punahoʻolapa Marsh are extensive. Coastal strand and dune vegetation zones occur along most coastal portions of the SEIS Lands. For the most part, the dune vegetation is also dominated by non-native, naturalized species and merges inland with either inland scrub/forest or Resort landscaping. In contrast, the most seaward part of the coastal strand, together with an area of active dunes in the east end of the SEIS Lands, support a relatively narrow strip of native vegetation.

A total of 226 species of vascular plants was identified in the survey area. For the purposes of description, the survey divides these plants into six vegetation types: Landscape, Forest, Shrub-scrub, Other Scrublands, Wetland, and Strand (a long narrow zone at the coast). The Forest vegetation type is the most complex on the property, consisting of trees forming a closed or nearly closed canopy. These cover a considerable portion of the SEIS Lands and vary in composition from place to place. For mapping purposes, the Forest vegetation is therefore subdivided into Ironwood Forest, Mixed Forest, and Cook Island Pine Forest.

The Ironwood Forest is the dominant Forest type in the SEIS Lands and found particularly close to the coast. Ironwood grows on dunes and immediately behind the beach (or rocky shore) in some places. Ironwoods are vey tolerant of the conditions that set the Strand apart from the inland plant communities. Because their needles accumulate on the ground, most other species are prevented from germinating and forming an understory in the Ironwood Forest. Although obviously a useful species for the dry Kahuku Point area, and widely incorporated into the landscape of the developed areas including the golf courses, ironwoods are considered to be invasive in the two most sensitive vegetation types: Strand and Wetland.

Areas of forest not dominated by ironwood (Mixed Forest) tend to comprise several common, mostly non-native tree species: Christmas berry (*Schinus terebinthefolius*); *Macaranga tanarius* (no common name); *milo* (*Thespesia populnea*); *koa haole* (*Leucaena leiucocephals*); Java plum (*Syzygium cumini*); and *hau* (*Hibiscus tiliaceus*) as monotypic stands in a few low-lying areas. Ironwood may also be present in these, but is not dominant. Many other species of trees, shrubs, and herbs occur in various parts of these forests, but tend not to dominate. The understory typically includes Chinese violet (*Asystasia gangetica*), Guinea grass (*Pacnicum maximum*), and sourbush (*Pluchea indica* and *P. carolinenesis*).

Koa haole grows as a shrub or small tree and can reach high densities. In areas where *Koa haole* is the dominant species, the tall woody plants approach a forest type, but are distinguished in the

survey as Shrub-scrub. The areas of purest Shrub-scrub are areas of former sugar cane lands that have not been developed. Typical understory plants in Shrub-scrub are Guinea grass, Chinese violet, and gycine vine (*Neonotonia wightii*). Other Scrublands occur inland from the Strand and are dominated by *Pluchea* spp.

Wetlands on the SEIS Lands are to two types: 1) former wetlands that were part of the Punahoʻolapa Marsh and 2) wetlands and aquatic features associated with the golf course hazards. The latter were either constructed during the grading of the golf courses, or incorporated (perhaps dredged) from prior exist wetlands or stream courses. Most of the features identified as "wetlands" on the property are, in fact, open golf course ponds or moat-like ponds. Some, but not all of these ponds, support wetland vegetation around their margins. The Wetland vegetation type (as opposed to ponds) is present at Punahoʻolapa Marsh, at an area east of the mean entrance adjacent to Kamehameha Highway, in the lower part of the main drainage swale, and as a shallow manmade wetland/pond west of the latter (just northeast of Kuilima Estates). These Wetland areas are not, or are only minimally, maintained. From a botanist's point of view, Punaho`olapa Marsh is the most interesting of the wetlands as it is part of a large complex of wetlands that existed in the distant past on the Kahuku Plain.

Nearly all of Punahoʻolapa Marsh is overgrown with herbaceous vegetation. Many areas supporting tree growth are evident as well, including areas of *hau* forest. There are, however, extensive interior areas supporting *koa haole* Shrub-scrub and Ironwood Forest. These areas were not visited during the surveys, and therefore unknown is how much of the area enclosed by moats in the Wetland remains as wetland (only one open pond area is seen in satellite images).[4]

Along the shore, the substratum of the SEIS Lands varies between consolidated beach rock and sandy beaches. Very few higher plant species can tolerate direct immersion in seawater or the shifting nature of sand deposits subjected to wave action. A number of environmental factors – brackish or saline groundwater, salt spray, absence of humus in the soil substratum, exposure to wind – are sufficiently harsh so as to limit the species that can survive in the Strand vegetation areas. Strand vegetation occupies a zone of variable width immediately inland of the ocean shore. Some of the vegetation grows on the upper part of active beaches (notably the vine, *pohuehue* or *Ipomoea pes-caprae*) and *ʻakiʻaki* grass or *Sporoblus virginicus*, seeding and/or invading down the beach by rhizomal growth. Mostly, this vegetation is found on sand moving slowly inland under the influence of the wind (which is predominantly onshore in this location) forming dunes, which – where active (that is where the sand is actively on the move) – might be mistaken for beach rather than wind (or in some cases, storm wave) deposited material. As far as plant growth is concerned, the difference is one of stability. Where the sand is actively moving about at a fairly good rate (waves constantly reworking the beach sand), plants cannot get established, or are buried (or the root exposed) and die.

[4] It was determined at the outset of the SEIS analysis that the value of leaving this interior wetland area undisturbed outweighed the value of inventorying its constituent plants.

The distance the Strand extends inland from the beach or beach rock areas depends on several factors: 1) how far inland the dunes extend, 2) how marked are salt air effects on extant vegetation, and 3) disturbances that damage the vegetation or the substratum. In most areas along the coast of the SEIS Lands, the width of this vegetation zone is too narrow to indicate on a map. The widest areas of Strand vegetation occur at the rocky points (Kahuku and Kuilima) and behind the shoreline extending east from Kahuku Point. The typical Strand plant community is one dominated by several native species – *naupaka kahakai* (*Scaevola taccada*), *ʻakoko* (*Euphorbia degeneri*), *ʻakiʻaki*, *hinahina* (*Heliotropium anomalum* var. *argeneum*), *maʻu* (*Fimbristylis cymosa*) – and at least one non-native tree (beach heliotrope or *Tournefortia argentea*). Along much of the shore, the area formerly occupied by dunes has been developed or ironwood trees grown nearly down to the shore; while these trees are part of the Strand vegetation, they are also part of the Ironwood Forest and Mixed Forest that extend yet further inland. Thus, there is no simple way to differentiate the Strand on the basis of vegetation alone where ironwoods predominate. As noted above, ironwoods can be invasive in the Strand vegetation type.

Approximately twenty percent of the 226 species of vascular plants are ornamentals, meaning landscape plants that have not become naturalized in Hawaiʻi. A much higher percentage (thirty six percent) of the vascular plants are actually serving landscape purposes at Resort, since many naturalized species are also used for landscaping.

Approximately eleven percent of the vascular plants in the SEIS Lands is Hawaiian natives and includes indigenous or endemic plants. A majority of these occur in the wetland and coastal strand vegetation, making these two areas the most sensitive botanical areas in the SEIS Lands. Another three and a half percent are early Polynesian introductions (technically not native but so-called "canoe" plants that have been in the islands for several thousand years). Only four native species were recorded in the developed and/or landscaped areas of the Resort.

However, eleven percent of the total number of plant species should not be misinterpreted as constituting eleven percent of the vegetation at the Resort. Indigenous plants such as *hala* (*Pananus tectorius*), *naupaka* (*Scaevola taccada*), and *niu* (coconut or *Cocus nucifera*) are prominent species in the landscaping of the Resort. The same is true for the wetland and the most seaward part of the strand vegetation, where native plants tend to dominate.

E.7. c. Comparison of 1984 and 2011 Surveys

The flora survey conducted for the Resort and presented in the 1985 EIS categorized the vegetation types slightly differently that the 2011 surveys as summarized below. However, they are not dissimilar in their approach.

The 1985 EIS distinguished among disturbed areas by characterizing them as grassy clearings (e.g. roadway shoulders), agricultural fields, existing Resort and residential areas while the 2011 survey combined all disturbed areas into a single category called "Landscape". The description of shrub/scrub areas was fairly consistent between the two reports. The various types of

Table 2-7: Comparison of Flora Surveys at Turtle Bay Resort (1984 & 2011)

1984	2011
Grassy clearings	Landscape
Agricultural fields	
Residential Communities	
Resort Facilities	
Scrub thickets and airstrip vegetation	Shrub-scrub
	Other Scrublands
Ironwood Groves	Forest:
	Ironwood Forest
	Mixed Forest
	Cook Island Pines
Marshlands:	Wetland:
Shrub thickets	Punaho`olapa Marsh
Marshlands	wetlands
Mudflats	
Open Water	
Dune vegetation	Coastal Strand

forest identified in 2011 were all grouped together under the Ironwood Groves in 1985. The Punahoʻolapa Marsh area was treated much differently in 2011 than in 1984. In 1984, the moat around the marsh had not yet been excavated and the marsh was, therefore, less defined that it is today. Thus, while the 2011 report presents considerable detail about the plants in the marsh, it does not attempt to categorize them as separate vegetation types. In addition, the 2011 report distinguishes between golf course wetlands and marsh. Finally, the 2011 report characterizes the dune system as a transition area among various vegetation types (forest and shrub), but calls out the Coastal Strand as a distinctive and sensitive area, while the 1984 report included the strand in the dune system almost as an afterthought.

Neither the 1985 EIS nor the 2011 surveys identified any endangered, threatened, or candidate species on the property. Further, there is no federally delineated Critical Habitat present on or adjacent to the SEIS Lands.

E. 8. Fauna

Avian and mammal surveys of the property were conducted by Rana Biological Consulting at the same time as the botanical survey discussed above. The complete report is presented in Appendix F and is summarized below.

E.8. a. Avian Population

A total of 1,735 individual birds of 27 species, representing 19 different families, were recorded the course of the wet and dry season surveys. Three of the species recorded, Common Gallinule (*Gallinula galeata sandvicensis*), formerly known as the Common Moorhen (*Gallinula choloropus*), Hawaiian Coot (*Fulica alai*), and Hawaiian Stilt (*Himantopus mexicanus knudseni*) are endemic endangered waterbird species. One species recorded, Black-crowned Night-Heron (*Nycticorax nycticorax hoactli*) is an indigenous water obligate species, and four, Pacific-Golden Plover (*Pluvialis fulva*), Wandering Tattler (*Tringa incana*), Bristle-thighed Curlew (*Numenius tahitiensis*), and Ruddy Turnstone (*Arenaria interpres*) are indigenous migratory shorebirds. The remaining 19 species detected are considered to be alien to the Hawaiian Islands.

There was very little difference between the results of the wet and dry season surveys. Two additional migratory shorebird species recorded during the fall were not recorded during the earlier spring survey. All of the species recorded in the spring survey were also recorded in the fall.

Avian diversity and densities are in keeping with the vegetation and current usage of the SEIS Lands, most of which are golf course, condominium units, apartments, hotel, or open maintained parkland. Four species, Common Waxbill (*Estrilda astrild*), Red-vented Bulbul (*Pycnonoyus cafer*), Zebra Dove (*Geopelia striata*), and Japanese White-Eye (*Zosterops japonicas*) accounted for 51 percent of all birds recorded, with the Common Waxbill being the most common.

A total of 26 adult and two sub-adult Hawaiian Gallinule, three Hawaiian Coot, five Hawaiian Stilt, and one domestic Muscovy (*Cairina moschata*) were recorded within water and wetland features on the property. The presence of the two sub-adult Hawaiian Gallinule may indicate on-site nesting activity. The two sub-adult birds were each seen with two separate sets of adults. No nests were observed in any of the water features, though unobserved nests could have been present with Punahoʻolapa Marsh, which in its current state is not readily searchable for nesting waterbirds.

E.8. b. Existing Mammals

Eight terrestrial and one marine mammalian species were detected on site during the course of the survey. With the exception of the endangered Hawaiian monk seals (*Monachus schauinslandi*) seen hauled out on the beach during both the spring and fall surveys, all of the mammals recorded on site are alien to the Hawaiian Islands. These alien mammalian species included European house mouse (*Mus musculus domesticus*), Domestic dog (*Canus f. familiaris*), Small Indian mongoose (*Herpestes a. auropunctatus*), House cat (*Felis catus*), Domestic horse (*Equus c. caballus*), Donkey (*Equus a. asinus*), Mule (*Equus asinus x Equus caballus*), and Pig (*Sus s. scrofa*).

The findings of the mammalian survey were consistent with the current habitat present on site and the land usage of the areas surveyed. Although three species of rodents found on Oʻahu

(roof rat – *Rattus r. rattus*; Norway rat – *Rattus norvegicus*; Polynesian rat – *Rattus exulans hawaiiensis*; and European house mouse – *Mus musculus domesticus*) were not detected during the course of the surveys, it is likely they use various resources found within the general project area on a seasonal basis. These three human commensal species are drawn to areas of human habitation and activity. All of these introduced rodents are deleterious to native ecosystems and the native faunal species dependent on them.

No Hawaiian hoary bats were detected during the course of these surveys. Given the paucity of documented records of this species on Oʻahu, this finding was not unexpected. (USFWS, 1998; David 2011).

There is no federally delineated Critical Habitat present or adjacent to the SEIS Lands.

E.8. c. Stream Biota

The density of native aquatic species is generally low in Oʻahu's streams. Regular stream flow is critical for streams to maintain a population of native stream organisms. Most native stream species spend part of their life in the stream and part of their life in the ocean. Both Kawela Stream and ʻŌʻio Stream are generally perennial, meaning that stream flow occurs year round. However, stream flow in the SEIS Lands, that constitute the lowest reach of the streams, generally occurs only during the wet season or after heavy rainfall events in the mountains. For this reason, the streams may serve as intermittent avenues of migration between the sea and upstream perennial reaches, but not as permanent habitat for native fishes, crustaceans, and mollusks.

As the lower reach of ʻŌʻio Stream exists as a grassed swale across the Palmer Golf Course that is dry for much of the year, no survey of its biota has been conducted. However, in 2006 a biological survey of Kawela Stream was conducted by AECOS, Inc. The survey identified fourteen different aquatic species of mollusks, crustaceans, insects, amphibians, and fishes in the stream. Four species are endemic, including *Eleotris sandvicensis*, one is indigenous, and nine species are naturalized.

None of these aquatic species is listed as threatened or endangered, or otherwise would be considered rare or special by the State or Federal governments (DLNR, 1998; Federal Register, 2005; USFWS, 2005, 2006).

F. Contextual Human Environment

Following is a description of those aspects of the environment that are directly influenced by human activities, past and present. A discussion of the Proposed Action's impacts on the human environment is presented in Chapter Five of the SEIS.

F. 1. Archaeological Resources

The following discussion of archaeological resources represents a summary of the Supplemental Archaeological Inventory Survey (SAIS) conducted for the project by Haun & Associates, and presented in its entirety in Appendix C. The document has been submitted to the State Historic Preservation Division of DLNR for review and approval. Once approved, it will be relabeled as a Final SAIS.

Table 2-8: Kawela Stream Biota

INVERTEBRATES:
Mollusks MOLLUSCA, GASTROPODA THIARIDAE (*Melanoides tuberculata*): red rimmed melania – Naturalized/Exotic
Crustaceans ARTHROPODA, CRUSTACEA PALIEMONIDAE (*Macrobrachium grandimanus*): *`opae `oeha`a* – Endemic
ARTHROPODA, CRUSTACEA PALIEMONIDAE (*Macrobrachium lar*): Pacific prawn – Naturalized/Exotic
Insects ARTHROPODA, INSECTA ODONATA, COENAGRIONIDAE (*Ischnura ramburii*): Rambur's forktail – Naturalized/Exotic
VERTEBRATES:
Amphibians VERTEBRATA, AMPHIBIA RANIDAE (*Rana catesbeiana*): bullfrog – Naturalized/Exotic
VERTEBRATA, AMPHIBIA RANIDAE (*Rana catesbeiana*): tadpole – Naturalized/Exotic
Fishes VERTEBRATA, PISCES ELEOTRIDAE (*Eleotris sandvicensis*): *`o`opu akupa* – Endemic
GOBIIDAE (*Stenogobius hawaiiensis*): `o`opu naniha - Endemic
CICHLIDAE (*Sarotherodon melanotheron*): black chin tilapia – Naturalized/Exotic
KUHLIIDAE (*Kuhlia xenura*): *aholehole* – Endemic
MUGILIDAE (*Mugil cephalus*): `ama`ama – Endemic
POECILIIDAE (*Gambusia affinis*): mosquito fish – Naturalized/Exotic
POECILIIDAE *(Poecilia Mexicana*): Mexican molly – Naturalized/Exotic
POECILIIDAE *(Poecilia reticulate*): guppy, rainbow fish – Naturalized/Exotic

F.1. a. Previous Studies

Between 1977 and 2006, twenty-one separate reports have been prepared documenting archaeological investigations at the Resort.

The Bernice Pauahi Bishop Museum (BPBM) conducted the first systematic archaeological survey of all undeveloped Resort property (649 acres) in 1977 for Prudential Insurance Company (Dye 1977). This pedestrian survey was followed by a series of subsurface testing projects conducted by Paul H. Rosendahl, Ph.D. Inc. (PHRI) in the mid-1980s. Beginning in 1984, PHRI (Bath *et al*. 1984) conducted a subsurface reconnaissance survey of thirteen areas throughout the Resort property including further investigation of subsurface deposits initially identified by Dye. The initial reconnaissance-testing project was followed by three intensive

subsurface testing surveys conducted in 1986 that focused on cultural deposits identified by Bath *et al*. at Kawela Bay (Walker *et al*. 1988a), Kahuku Point (Walker *et al*. 1988b), and Punahoʻolapa Marsh (Davis *et al.* 1986).

In 1987, PHRI prepared an archaeological Data Recovery Plan (DRP; Walker *et al*. 1987) to mitigate the effect of Resort expansion on archaeological sites at Kawela Bay, Kahuku Point, and Punahoʻolapa Marsh. The Plan was incorporated into a Memorandum of Agreement (MOA) executed in 1988 by the U.S. Army Corp of Engineers – Honolulu District (COE), the Hawaiʻi State Historic Preservation Department (SHPD) Officer, the Office of Hawaiian Affairs (OHA), the Advisory Council on Historic Preservation (ACHP), and the City and County of Honolulu (CCH). In addition to implementation of the DRP, the MOA required development and implementation of plans for archaeological monitoring and for burial disinterment and reburial. PHRI prepared the plans for monitoring and burial treatment (Jensen 1989b) that were approved by the Department of Land and Natural Resources (DLNR) State Historic Preservation Program Director in 1990 (January 9, 1990 letter from Don Hibbard to Paul Rosendahl).

The archaeological data recovery work and monitoring were conducted by PHRI from late 1990 to 1991. After initial data recovery excavations at the Kahuku Point Site were initiated, the landowner decided to halt further work and preserve the site. Monitoring fieldwork results were reported in a series of monthly status reports prepared by PHRI (Sullivan 1990, 1991; Dunn 1991; Donohue 1991). Corbin (2003) reported the full descriptive findings of the PHRI data recovery and monitoring fieldwork and subsequent analyses. DLNR-SPHD approved the Corbin (2003) report in 2005 (letter from Melanie Chinen to Paul Rosendahl March 11, 2005 LOG NO: 2005.0110; DOC NO: 0501SC05).

In 1992, PHRI prepared a Burial Treatment Plan (Maly and Rosendahl 1992) for the reburial and preservation of remains recovered during previous data recovery and monitoring. The plan was prepared to comply with legislation enacted in 1990 pertaining to the treatment of traditional Hawaiian burials under Hawaiʻi Revised Statutes (HRS) Chapter 6E:43, Act 306. The plan also included reburial of remains inadvertently discovered in 1992 near the Resort hotel (Kennedy 1992) and in the mid-1980s at Kahuku Point (Neller 1984, 1989). The MOA-mandated osteological analysis of human remains by PHRI is reported by Kalima (1993).

In 1996 and 1999, a report on inadvertent discovery of additional burials was prepared by Archaeological Consultants of the Pacific (ACP) for human remains inadvertently discovered in 1996 (Carson *et al*. 1996, 1999). Cultural Surveys Hawaiʻi (CSH) conducted archaeological monitoring for golf course refurbishment in 2001 but encountered no cultural deposits (Borthwick *et al*. 2001).

In March 2003, PHRI submitted a report to State Historic Preservation Division (SHPD) documenting the mitigation work conducted up until then at the Resort. On March 11, 2005, SHPD responded with a letter that the PHRI adequately fulfilled the mitigation plans previously provided to SHPD. On August 15, 2006, Cultural Surveys Hawaii submitted a Mitigation Plan addressing the proposed Resort expansion to the SHPD for approval. (An approved mitigation

plan is essentially the last step in the archaeological process that begins with an approved archaeological inventory plan, then moves through an approved inventory survey to an approved preservation plan and burial treatment plan, before concluding with an approved mitigation plan.)

On October 25, 2006, SHPD responded, in part, that based on the Mitigation Plan, "…there is a high probability that one or more of the proposed hotel sites is located in an area within which numerous (as yet undiscovered) subsurface burials are located…We recommend that the Master Plan be revisited and revised, including the consideration and proposal of alternative design schemes in order to avoid all or most of the burial areas, in particular."

On November 16, 2006, CSH responded to the SHPD letter by withdrawing the Mitigation Plan from further consideration. However, as the result of further discussions between the Resort property owner at the time (Kuilima Resort Company) and SHPD, on May 31, 2007, SHPD wrote to TBR's attorney to "…clear up any confusion that ensued as a result of [the] October 25, 2006 letter…" noting that the recommendations contained within the letter were not legal recommendations.

F.1. b. Current Efforts

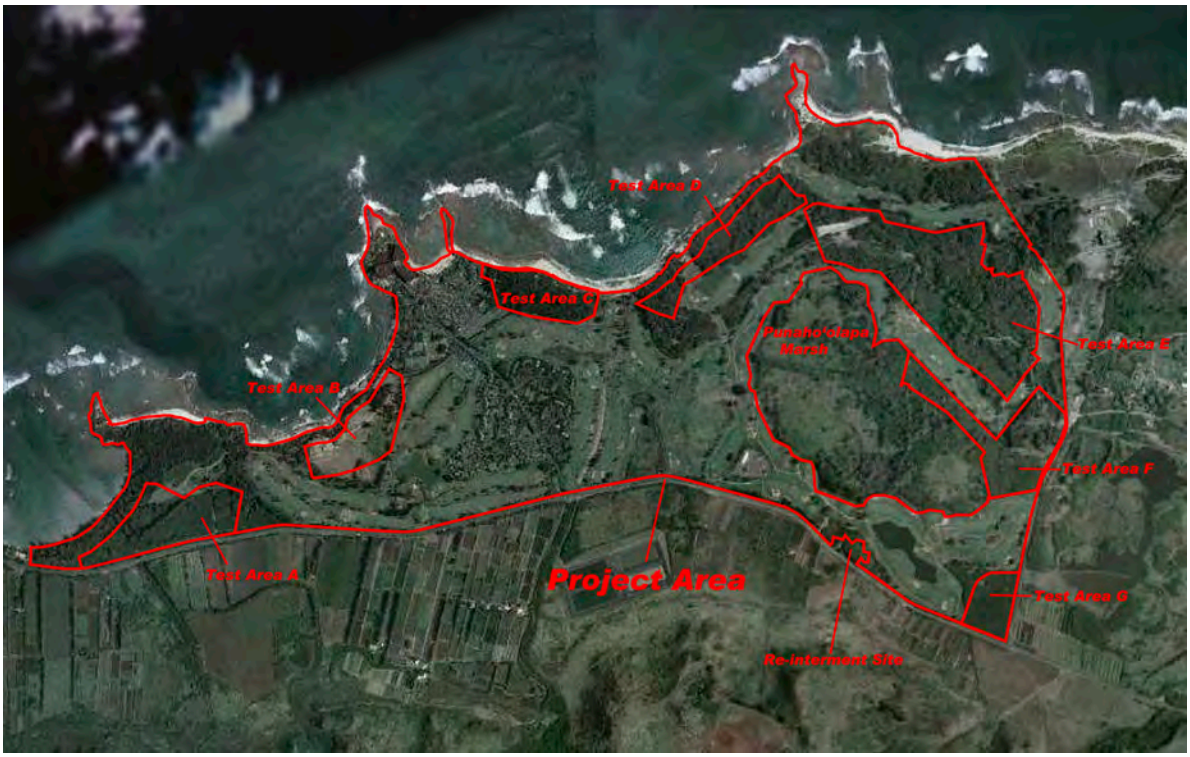
The current property owners subsequently reviewed the entire record and after consultation with community and cultural leaders in the Kahuku region, concluded that the previous archaeological work was not sufficient to address the Proposed Action. Haun and Associates was retained to prepare a plan for the SAIS, submit it to SHPD for approval, and once approved, execute the plan. On December 12, 2011, SHPD approved the SAIS Plan.

The SHPD-approved Supplemental Archaeological Inventory Survey Plan (SAIS Plan)(Haun *et al.* 2011) is presented in Appendix G. It includes a thorough summary of previous land use for the Resort property, beginning with traditional Hawaiian land use through World War II and subsequent developments. The SAIS Plan was prepared in advance of the SAIS fieldwork, in accordance with the requirements for an Archaeological Inventory Survey Plan detailed in Hawai'i Administrative Rules (HAR) §13-13-284-5(c) and §13-13-276-5 (a) and (b). The Plan presents the results of historical documentary and archaeological background research for the general Kahuku area and specifically for the project area. The Plan also provides a synthesis of the background information and provides a research design with a methodology to guide the proposed SAIS fieldwork. The reader is referred to Appendix G for this background information.

F.1. c. Subsurface Testing

In early January 2012, Haun and Associates began implementing the SAIS Plan, which called for the systematic excavation of 314 trenches for the purpose of sub-surface testing of proposed development sites within the Proposed Action along with surface surveys (systematic pedestrian survey of a given area).

Figure 2-27: Aerial view of project area showing Test Areas



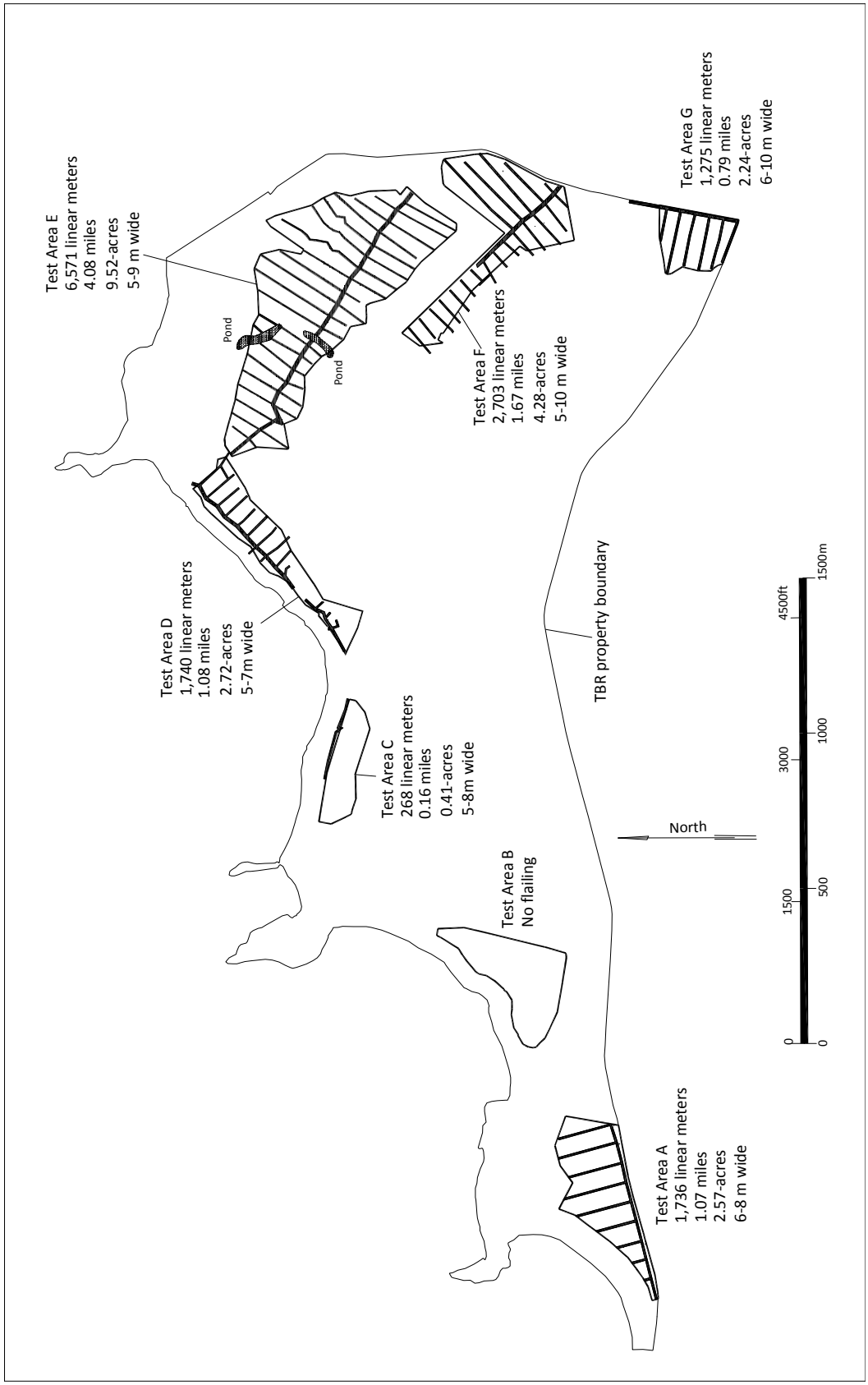
On February 2, 2012, the surface surveys and sub-surface testing were completed in seven separate development areas; test areas A-G (see Figure 2-27). Additional surface survey work was conducted within the Kahuku Point Preserve and along the forested areas surrounding Kawela Bay.

No testing was proposed for parks and other open spaces where development impacts are anticipated to be minimal, primarily consisting of landscaping that would have very shallow, less than 1 ft (30 cm) deep impact. (All ground disturbing activity in the open space areas was subject to archaeological monitoring done in accordance with a monitoring plan prepared for SHPD review and approval.)

Moderate to dense vegetation covered all of the test areas, except Areas B and C. To facilitate access by excavating equipment, most transects were mechanically cleared prior to trenching. The initial clearing effort for all test areas, except Area B, involved clearing a baseline that paralleled the long axis of each test area. Next, transects were laid out perpendicular to the baseline. Transects were sequentially numbered as were the trenches within each transect. (For example, BT-A-1-1, indicates backhoe trench (BT), Area A, Transect 1, Trench 1.)

Baselines and transects were cleared using a mechanical flail attached to a Komatsu PC130 excavator. A total of 14,293 linear meters or nearly 9 miles of transect were cleared. Transects

Figure 2-28: Extent of mechanical flailing



varied in width from 5.0 to 10.0 m. The extent of vegetation clearing is presented in Figure 2-28. No clearing was necessary for Test Area B because it is open lawn and occupied by an equestrian facility. Test Area C is relatively open beneath a canopy of ironwood trees and mechanical clearing was limited to the baseline.

Previous archaeological studies for the Resort property established a higher potential for encountering subsurface cultural remains including burials in mapped Jaucus Sand and Pearl Harbor Clay deposits. These two soil types were subjected to higher intensity testing. Lower intensity testing sampled the various clay and loam soil types elsewhere on the Resort property.

Low density testing of 1 trench per acre sampled the Waialua/Mokulēʻia Clay soils at Kawela Bay (Test Area A) and the planned residential housing development (Test Area G). The remaining test areas are characterized by Jaucus Sand and Pearl Harbor Clay sediments, where high-intensity testing density of 2 trenches per acre were sampled. Figure 2-29 presents an overlay of the test areas on the project area's soil types.

The SAIS Plan proposed additional discretionary trenches as needed for:

- specific areas that might be missed by the systematic transect trenching such as Land Commission Awards (LCAs);
- the location of a former plantation worker housing (Camp 3) in Area B;
- areas where subsurface cultural remains[5] were documented by previous archaeological studies (Areas D and E);
- segments of the proposed Kaihalulu Drive outside the potential test excavation areas that are undeveloped; and
- defining the extent of subsurface cultural deposits identified in systematically placed trenches.

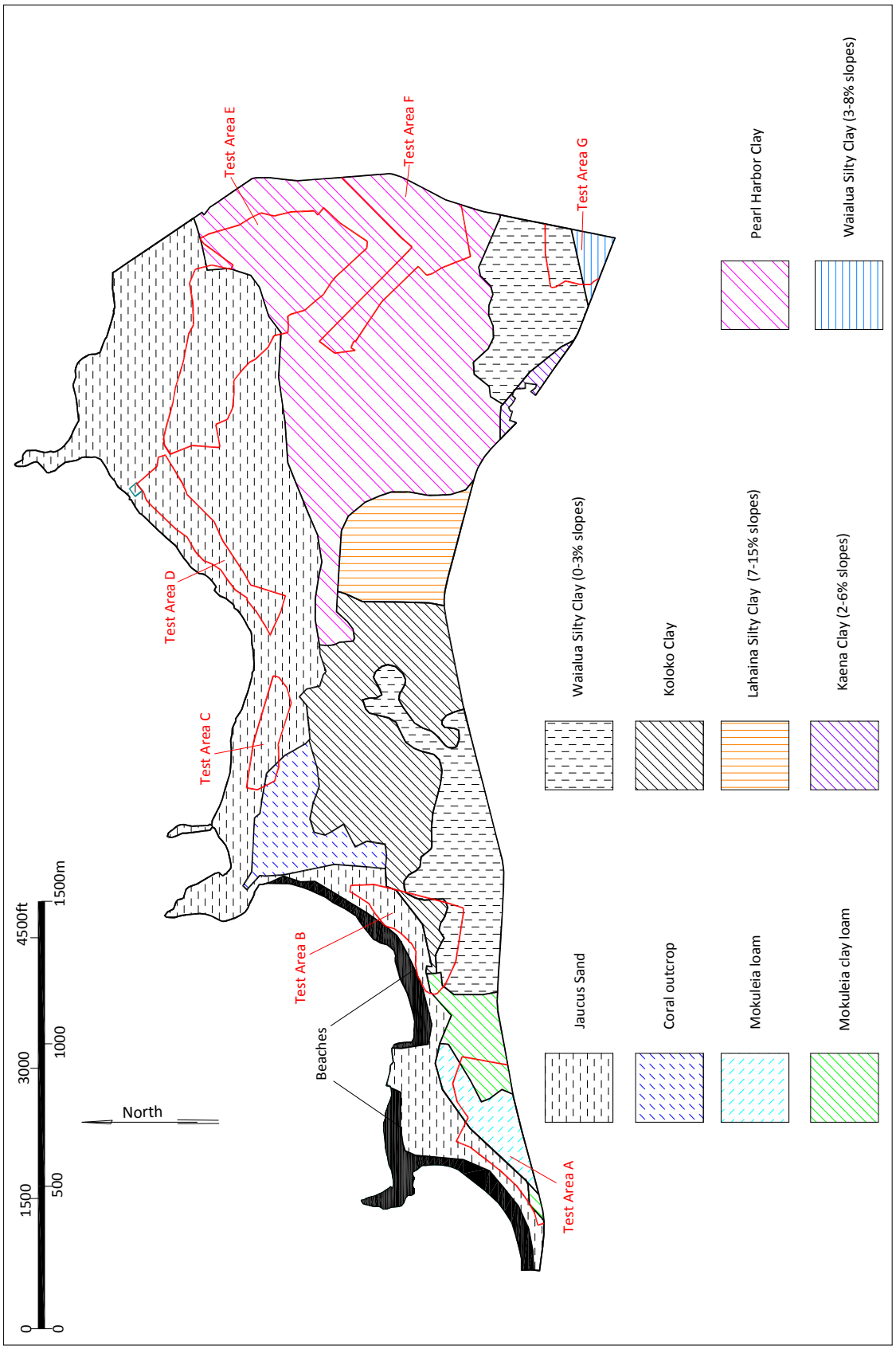
Field conditions required some adjustments to test area extent and trench placement. No segments of the proposed Kaihalulu Drive were tested because undeveloped sections were either in tested areas or developed portions of the Resort. These modifications are discussed below.

Following is a summary of the seven Test Areas:

> **Test Area A** was reduced in size from the 24.4-acre area proposed in the SAIS Plan to 20.8-acres to accommodate a wider (300 ft) coastal setback included in the Proposed Action. Prior archaeological excavations in and adjacent to Test Area A reached a maximum depth of 1.15 m below surface without identifying

[5] In archaeological terms, a "cultural deposit", "cultural remains", or a "cultural layer" refers to an identifiable layer within the subsurface soil strata that indicates disturbance as the result of human habitation and containing traces or remains of human activities. The thickness of the cultural layer varies depending mainly upon the length and intensiveness of human activity at a given site.

Figure 2-29: Distribution of soils within the project area



any cultural layers (Walker *et al.* 1988b, Bath *et al.* 1984). Prior testing identified two to three non-cultural sand layers in the seaward portion of Area A and three non-cultural sandy clay and clay loam layers in the inland portion. Evidence of plowing was observed in the eastern portion of the area where the test excavations reached the water table. The plow zone is a 0.35 m thick clay loam underlain by two layers of sand. The SAIS Plan proposed excavation of 25 systematically placed trenches and five discretionary trenches for Area A. Two discretionary trenches were proposed to test areas within adjacent LCA parcels, and three were proposed to test sand areas along the seaward side of Area A. These discretionary trenches were excluded during the fieldwork because the shoreline setback was expanded to 300 ft. Twenty-four trenches were excavated during the SAIS fieldwork in Test Area A and no intact cultural deposits were identified.

Test Area B was increased from 16.5 to 17.5-acres by the inclusion of additional areas along the south and west sides. No cultural layers were observed in prior excavations conducted adjacent to the west side of Test Area B (Bath *et al.* 1984). Previous excavations extended to a maximum depth of 2.1 m below the surface, exposing 3-4 layers of sand. The SAIS plan proposed excavation of 33 systematically placed trenches in Test Area B and two discretionary trenches: one in the eastern portion of the area where an LCA parcel (LCA 235M) is located and one where Kahuku Plantation Camp 3 was formerly located. Thirty-seven systematically placed trenches were excavated in Test Area B. Slight deviations in trench orientation and placement were necessitated by the equestrian stables, corrals and associated facilities. No discretionary trenches were necessary because the systematically placed trenches adequately sampled the LCA parcel and the plantation camp.

Test Area C was reduced from 14.4 to 8.3-acres as a result of an increase in the shoreline set back from 150 ft to 200 ft and other adjustments along the southern boundary, where a golf course fairway and other facilities are located. Previous excavations by Bath *et al.* (1984) in Test Area C documented three sand layers extending to a depth of 2.1 m below the surface in Test Area C. These sand deposits were highly disturbed; containing mixed prehistoric and modern debris. Site 4488 is located in the western portion of this test area, where past sand mining led to the inadvertent discovery of several burials that were documented by Kennedy (1992) and Carson *et al.* (1996). The SAIS Plan proposed excavation of eight or more manual test units in the vicinity of Site 4488. These test units were to be excavated manually until the stratigraphy in this area was well documented and the potential for encountering additional burials was evaluated. Twenty-nine systematically placed trenches were also proposed for Test Area C, with one discretionary trench to be excavated at the west end of Area C.

Several large deep depressions were identified in Test Area C, where sand mining occurred in the past. It was apparent from these deep depressions, and from a TBR-provided topographic map, that the sand deposit in some areas exceeded 6 m in depth. The depth and unconsolidated nature of the sand deposit rendered unfeasible the SAIS Plan proposal to manually excavate test pits. The alternative test excavation strategy employed was manual excavation of sand pit sides to expose vertical faces for profile documentation. Accompanying mechanical excavations

adjacent to the manual profiles were used to expose the deepest portions of the deposit and the underlying bedrock. As a result of the reduced area and modified testing strategy, a total of ten manual profiles and 18 systematically placed and mechanically excavated trenches documented the subsurface deposits in Test Area C.

Test Area D retained its original size (15.9 acres) and its configuration was not changed during fieldwork. Previous excavations within and adjacent to this area documented multiple (2-6) sand layers extending to a maximum depth of 1.6 m below the surface (Walker *et al.* 1988b, Bath *et al.* 1984, Corbin 2003). An intact cultural deposit was identified at the northeast end of Area D (Site 6411, Feature C), consisting of black loamy sand that varied in depth from 1.16 to 1.41 m. The central portion of Area D contains highly disturbed sand deposits with at least some cultural material, although Corbin (2003) does not indicate which layer(s) contained cultural material. Two non-cultural sand layers are present in the southwest portion of Test Area D (Corbin 2003).

The SAIS Plan proposed 33 systematically placed trenches for Test Area D and additional discretionary trenches in the eastern and central portions to further examine previously identified cultural deposits. During the SAIS fieldwork, 36 systematically placed trenches and 3 discretionary trenches were excavated. The systematic trenches identified the inland extent of the previously identified cultural deposits along the shoreline. The discretionary trenches were excavated in the western portion of the area to define the extent of a subsurface cultural deposit.

Test Area E was increased from 66.8 to 68.9-acres by the inclusion of additional areas along the east and west sides during the SAIS fieldwork. Previous excavation in and adjacent to the area reached a maximum depth of 3.6 m below surface (ibid.). Most of the test excavations reached bedrock. An intact cultural layer was identified in the southeast portion of the area (Site 6414). This deposit was described by Corbin (2003) as dark brown silty clay loam that varied in depth from 0.59 to 0.89 meters. Remnant wetland deposits were present at the northwest and west ends of the area. Sediments were impacted by the historical airfield construction at the north end. Relatively shallow Pearl Harbor Clay deposits border Area D to the east, west and south.

The SAIS Plan proposed excavation of 133 systematically placed trenches for Test Area E and least three discretionary trenches in former LCA parcels (LCA 2698:3, 2880:2, and 3958:2). During fieldwork, 137 systematic and 20 discretionary trenches were excavated. The systematically placed trenches identified the remnants of five cultural deposits, but none of these can be correlated with previously identified Site 6414 cultural deposit. The discretionary trenches were excavated at three of the five cultural deposits to define cultural deposit extent.

Test Area F was increased from 25.6 to 26.6 acres as a result of the additional areas along the northwestern side. Prior excavations adjacent to Area F extended to a maximum depth of 4.93 m below the surface. Most of these excavations extended to bedrock or the water table (Bath *et al.* 1984, Davis *et al.* 1986, Corbin 2003). Stratified cultural deposits were identified in excavations adjacent to the northeast end of the area (Site 6422). The upper cultural deposit consisted of a very dark grayish brown silty clay loam that is 0.12 to 0.31 m in depth over a

brown silty clay loam cultural layer that is 0.31 to 0.42 m in depth. The SAIS Plan proposed excavation of at least two discretionary trenches next to the reported location of the stratified deposits. Remnant wetland deposits associated with Punahoʻolapa Marsh are located west of Area F and non-cultural Pearl Harbor Clay is present to the north and northwest.

The SAIS Plan proposed excavation of 52 systematically placed trenches and the two previously mentioned discretionary trenches. Fifty-eight systematically placed trenches were excavated during fieldwork. No intact prehistoric cultural deposits were identified in Test Area F.

Test Area G was increased slightly from 9.6 to 9.9-acres by the inclusion of additional areas along the west side during the SAIS fieldwork. No previous excavations were conducted in or near Test Area G. The closest prior test excavations consist of two cores located more than 100 meters to the northwest by Bath *et al.* (1984). These cores extended to a depth of 3.6 m and identified multiple layers of loam, clay and silt with an intervening peat layer. No cultural deposits were present. The SAIS plan proposed 10 systematically placed trenches in Area G. Twelve trenches were excavated. No intact cultural deposits were identified in Test Area G.

A total of 345 trenches were excavated among the seven development areas, consisting of 322 systematically placed trenches (excavated by backhoe) and twenty-three discretionary trenches. These trenches varied in length from three to twenty-three meters with an average length of six meters (approximately eighteen feet). Approximately 1.2 miles of trenches were excavated for the purpose of determining if any cultural deposits, including burials, were present. In addition to the backhoe trenches, ten manual profiles were documented within previously excavated sand borrow pits in Test Area C.

An archaeologist monitored all mechanical trench excavations. The trenches were excavated using Komatsu PC 130 and Hitachi ZX200 excavators. Most trenches were excavated either to a basal limestone deposit or the water table. Two were terminated when human remains were identified (BT B-6-2 and BT D-2-1b) and two trenches were terminated when conditions made further excavation unfeasible (BT E-15-6 and F-3-4). Trenches that measured greater than 1.0 m in depth were widened and stepped for safety. Trench location was determined with a Magellan Mobile Mapper using Global Positioning System (GPS) data.

Following excavation, the trench walls were manually scraped to examine and document the stratigraphy. A profile drawing was prepared using the Munsell soil color notation system and U.S. Soil Conservation Service descriptive terminology. The depth, time and date when the water table was encountered was recorded, if present. If no intact cultural deposits were present, an average 1 meter-wide profile drawing was prepared depicting the representative stratigraphy. Larger sections of trench wall, and in some cases, the entire trench wall was documented when cultural deposits or unique atypical features or complex stratigraphy were encountered.

When cultural deposits were observed, these layers were carefully examined for portable remains. Collected remains were placed in paper bags labeled with the appropriate provenience information. When charcoal was encountered it was deposited in an aluminum foil pouch

and placed in a layer bag. Following their documentation, the trenches were backfilled as expeditiously as possible.Following completion of fieldwork, analysis of all recovered remains and data followed standard archaeological methods. All recovered artifacts were analyzed to determine morphological type, condition/degree of completion and material. Metric measurements included weight, length, width, and thickness. Standard typological classifications were used for all artifacts. Food remains were identified to the Family level, or to the Genus/species level, when possible. Quantitative analysis included a determination of total weight and total number of fragments (TNF) per taxon. All cultural material and samples collected during fieldwork are presented in the project Accession Record in Appendix D of the SAIS (see Appendix C).

Human remains were identified in three locations during the SAIS. These consist of *in situ* burials noted in trenches in Areas B and D, and a secondarily deposited human metatarsal identified on the surface of a sand pit in Area C. Trench excavations were immediately terminated when human remains were identified and the find was immediately reported to the SHPD. Profiles of the trenches were prepared and the remains carefully and respectfully documented. No photographs were taken of any burial or isolated human bone. The *in situ* burials were carefully backfilled following consultation with SHPD. After consultation with SHPD, the isolated and displaced human metatarsal was collected for temporary storage at the adjacent TBR office trailer to protect it because it was lying on the ground surface in an area frequented by hotel guests and the general public. The Kahuku Burial Committee was also consulted concerning identification of all human remains. Committee members provided appropriate cultural protocols.

Another SAIS fieldwork task was relocation and documentation of previously identified archaeological sites. This task sought to evaluate the current status of seven sites. These consist of sites that were previously assigned State Inventory of Historic Places (SIHP) site designations and ones that retain the original field temporary designations. The four SIHP sites are the Site 5791 OR&L railroad grade, a walled pool (Site 6421), and two stone walls (Sites 6424 and 6426). Sites with no prior SIHP site designation consist of Kahuku Army Airfield remnants, including a concrete structure (Site T-4), the Site T-2 wall and the Site T-3 cattle enclosure. The relocation effort confirmed the presence of the OR&L railroad grade (Site 5791), the Site T-4 military structure and portions of the Kahuku Army Airfield. Site T-4 and the airfield remnants were assigned SIHP site designations during this project. The remaining previously identified sites were determined to have been destroyed, presumably by golf course related construction activity.

During the mechanical clearing of transects for subsurface testing, it became apparent that there were a number of concrete structures and structural remains that were not documented during earlier surveys. The lack of documentation was likely because these remains are mostly World War II era military-related features that had not attained sufficient age (50 years) to be considered historic resources when the earlier surveys were conducted in late 1970s to mid-1980s. To rectify this situation, the seven test areas and adjacent undeveloped lands, Kahuku Point Archaeological Preserve and the Kawela Bay shoreline were subjected to 100% pedestrian archaeological survey prior to commencing subsurface testing.

F.1. d. Surface Survey

The pedestrian surface survey methodology involved walking survey transects spaced approximately 10 meters apart. Identified site locations were plotted with the aid of a hand-held Magellan Mobile Mapper GPS device using the NAD 83 datum. The accuracy of this GPS device for a single point is less than one meter. Intact or predominately intact structures were subjected to detailed recording consisting of mapping, preparing standardized site and feature forms and photographic documentation. Displaced structural remnants were described and photographed, but no plan maps were made. Sites were flagged with pink and blue flagging tape and a metal site tag was placed at each site datum and the tag location was plotted on the site plan map.

F.1. e. Findings

The SAIS fieldwork documented extensive disturbance that has occurred throughout the Resort property. The land altering impacts to the project area (see Figure 2-30) begins with historic cultivation of sugarcane that occurred throughout the inland portions of the project area. Coastal areas where sand was unsuitable for cultivation and areas that were too wet in the vicinity of Punahoʻolapa Marsh were the focus of World War II-era development including the construction and use of the expansive Kahuku Army Airfield complex (see Figure 2-31) and the subsequent development of the Resort and golf course facilities.

F.1.e. [1] SURFACE SURVEY FINDINGS

The survey identified 29 surface sites with 35 features. These sites are summarized in Table 2-9. The features consist of 9 concrete structures, 8 concrete blocks, 5 concrete slabs, 3 asphalt pavements, 2 artifact scatters and one each of the following: transit bus, concrete cylinder, a pair of metal gateposts, metal tank, railroad grade, revetment, stone mound and wall. Feature function includes antenna support (8), foundation (4), gun position (4), transportation (3), trash disposal (2), storage (2), gate (1), livestock control (1), possible agriculture (1), possible light fixture base (1), pavement (1), runway remnant (1), water storage (1) and indeterminate (5). The majority of the sites are associated with the World War II era use of the area as an Army Airfield.

The surface sites were distributed among Test Areas A, E and F, the Kahuku Point Archaeological Preserve and the northern portion of Kawela Bay. No surface sites were present in Test Areas B, C, D or G. The absence of sites in these areas is due primarily to extensive ground altering activities associated with historic agriculture, ranching and golf course-related construction.

The SAIS Plan called for re-identification and evaluation of seven previously identified surface sites. These consist of the OR&L railroad grade, remnants of the Kahuku Army Airfield, the Site 6421 walled pool, the Site 6424 and 6426 rock walls, the Site T-2 wall, the Site T-3 cattle enclosure and the Site T-4 military structure (See Figure 2-31). The OR&L railroad grade and the Kahuku Army Airfield runway were depicted on maps of the area by various researchers, but were never formally documented. Sites 6421, 6424 and 6426 were previously reported by Corbin (2003). Sites T-2, T-3 and T-4 were identified by Bath *et al.* (1984).

Figure 2-30: Aerial view of TBR property showing former extent of sugarcane fields

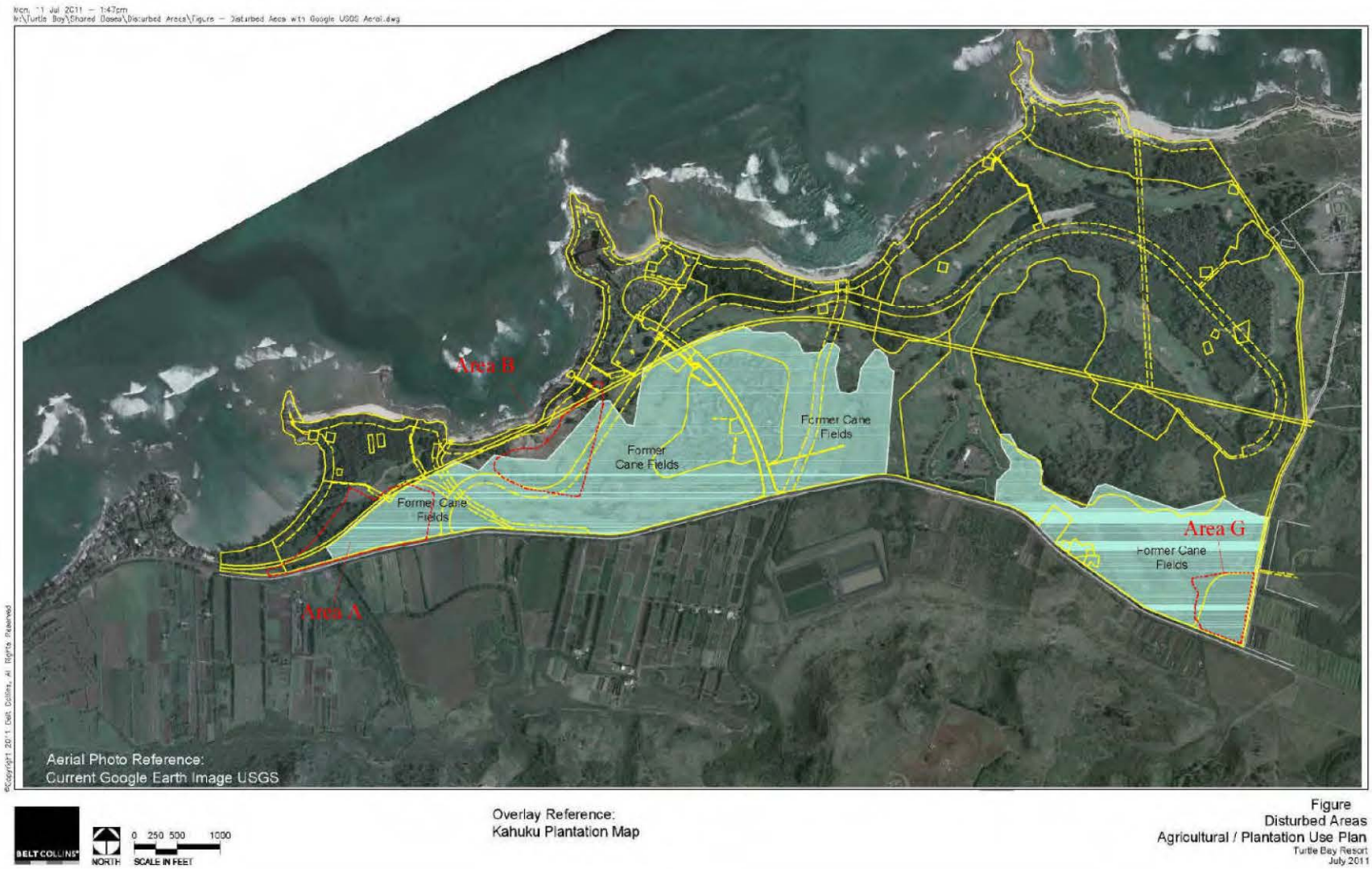


Figure 2-31: Surface sites and Test Areas showing extent of Kahuku Army Airfield complex

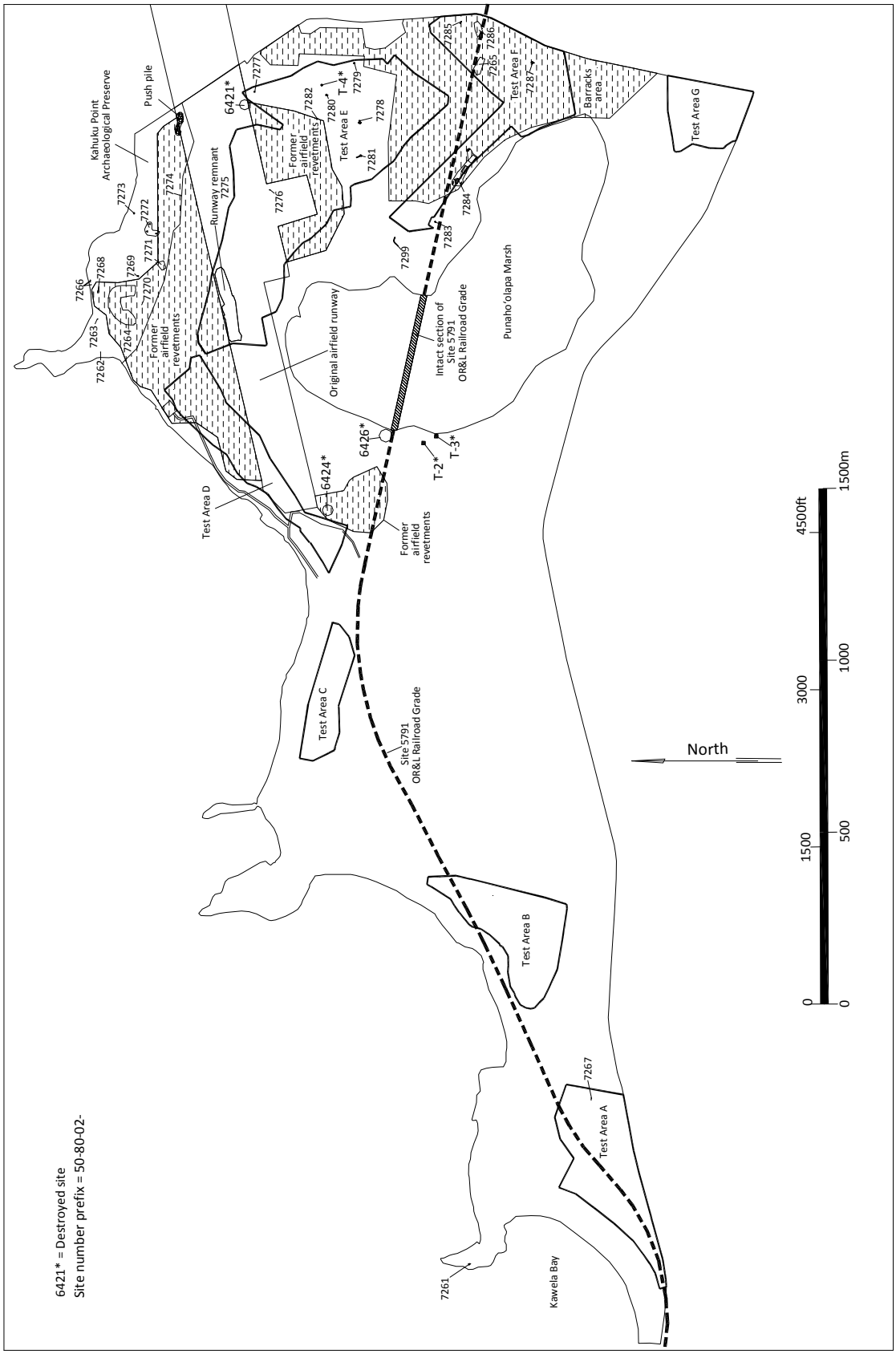


Table 2-9: Summary of identified sites

SIHP Site No.	Formal type	Function	Area	TMK	Age	No. of Features	Formal Type																Function																H&A Temp Field No.
							Concrete structure	Cultural deposit	Concrete block	Concrete slab	Human remains	Asphalt area	Artifact scatter	Transit bus	Concrete cylinder	Metal posts	Metal tank	Railroad grade	Revetment	Stone mound	Wall	Habitation	Antenna support	Foundation	Gun position	Burial	Transportation	Trash disposal	Storage	Gate	Livestock control	Possible agriculture	Possible light fixture base	Pavement	Runway remnant	Water storage	Indeterminate	
4488	Human remains	Burial	C	5-7-01:013	Prehistoric/ early historic	1					1															1												
5791	OR&L Railroad grade	Transportation	A, B, F, Punaho'olapa Marsh	5-7-01:033	1899-1946	1												1									1											-
7261	Concrete structure	Gun position	Kawela Bay	5-7-06:23	1942-1946	1	1																		1													69
7262	Concrete slab	Indeterminate	Kahuku Point	5-7-01:033	1942-1946	1				1																											1	58
7263	Concrete pier block	Antenna support?	Kahuku Point	5-7-01:033	1942-1946	1			1													1																60
7264	Revetment	Storage	Kahuku Point	5-7-01:033	1942-1946	1													1									1										70
7265	Concrete slab	Foundation	F	5-7-01:033	1942-1946	1				1													1															71
7266	Concrete pier blocks	Antenna support?	Kahuku Point	5-7-01:033	1942-1946	3			3													3																63
7267	Transit bus	Transportation	A	5-7-01:033	1950s-1973	1								1													1											68
7268	Concrete structure	Indeterminate	Kahuku Point	5-7-01:033	1942-1946	1	1																														1	61
7269	Concrete structure remnant	Indeterminate	Kahuku Point	5-7-01:033	1942-1946	1	1																														1	56
7270	Metal tank	Storage	Kahuku Point	5-7-01:033	1942-1946	1											1											1										57
7271	Asphalt area	Transportation	Kahuku Point	5-7-01:033	1942-1946	1						1														1												51
7272	Concrete structure	Gun position?	Kahuku Point	5-7-01:033	1942-1946	1	1																	1														52, 55
7273	Concrete block	Indeterminate	Kahuku Point	5-7-01:033	1942-1946	1			1																												1	64
7274	Concrete cylinder	Possible light fixture	Kahuku Point	5-6-03:41	1942-1946	1									1																	1						53
7275	Asphalt area	Runway remnant	E	5-7-01:033	1942-1946	1						1																					1					6
7276	Concrete block	Anchor base	E	5-6-03:41	1942-1946	1			1													1																10
7277	Concrete slab	Foundation	E	5-6-03:41	1942-1946	1				1													1															67
7278	Concrete structure	Gun position?	E	5-6-03:41	1942-1946	1	1																														1	18
7279	Concrete block	Antenna support?	E	5-6-03:41	1933	1			1													1																19
7280	Concrete structure	Antenna support?	E	5-6-03:41	1930s	1	1															1																65
7281	Concrete structure	Gun position?	E	5-6-03:41	1942-1946	1	1																	1														49
7282	Concrete block	Antenna support?	E	5-6-03:41	1930s	1			1													1																46
7283	Stone mound	Possible agricultural	F	5-6-03:44	Prehistoric	1														1											1							37
7284	Complex	Barracks complex	F	5-6-03:44	1942-1946	5	1			2			2										2				2									1		32, 34, 35,
7285	Metal posts	Gate	F	5-6-03:44	1942-1946	1										1													1									21
7286	Asphalt area	Pavement	F	5-6-03:44	1942-1946	1						1																					1					20
7287	Concrete structures	Gun position?	F	5-6-03:44	1942-1946	1	1																	1														25
7288	Human remains	Burial	B	5-7-01:020	Prehistoric	1					1														1													BT-B-6-2
7289	Cultural deposit with human remains	Habitation/Burial	D	5-7-01:01	Prehistoric	2		1			1										1				1													BTs D-2-1, 2-1b, 2-1d
7290	Cultural deposit	Habitation	D	5-7-01:01	Prehistoric	1		1													1																	BTs D-5-, 6-1, 7-1
7291	Cultural deposit	Habitation	D	5-7-01:033	Prehistoric	1		1													1																	BTs D-12-2, 13-3, 14-2, 14-3, 15-3
7292	Cultural deposit	Habitation	E	5-7-1:033	Prehistoric	1		1													1																	BT-E-2-3, 3-2, 3-3, 4-1, 4-2, 4-2b, 4-3
7293	Cultural deposit	Habitation	E	5-7-1:033	Prehistoric	1		1													1																	BT-E-10-2
7294	Cultural deposit	Habitation	E	5-7-1:033	Prehistoric	1		1													1																	BT-E-13-6, 13-6b, 13-6c, 13-6d, 136e
7295	Cultural deposit	Habitation	E	5-6-03:041	Prehistoric	1		1													1																	BT-E-15-3, 15-3a, 15-3b, 15-3d
7296	Cultural deposit	Habitation	E	5-6-03:044	Prehistoric	1		1													1																	BT-E-22-4
7299	Wall	Livestock control	Punaho'olapa Marsh	5-6-03:044	pre-1900	1														1										1								5
						46	**9**	**8**	**8**	**5**	**3**	**3**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**8**	**8**	**4**	**4**	**3**	**3**	**2**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**5**	

The surface survey relocated portions of the OR&L railroad grade (Site 5791) and portions of the Kahuku Army Airfield (Sites 7275-7278, 7280-7281). An additional previously identified site (Site T-5), consisting of a stone wall (Bath *et al.* 1984) was also relocated. This wall was recorded and assigned a SIHP Site designation (Site 7299). The remaining previously identified sites have been destroyed, presumably by golf course-related construction. Detailed descriptions of the surface sites identified during the SAIS are presented in the SAIS document in Appendix C, beginning on page 21.

F.1.e. [2] SUBSURFACE SURVEY FINDINGS

Of the 345 trenches excavated, ten subsurface sites were identified during the subsurface testing phase of the project. These consist of seven prehistoric cultural deposits (Sites 7290 and 7291 in Area D; Sites 7292-7296 in Area E), two prehistoric cultural deposits with human burials (Site 7288 in Area B; Site 7289 in Area D) and one isolated human skeletal element (Site 4488; Area C). In addition, widespread evidence of tsunami-related deposits, fill episodes (the depositing of fill material) associated with military and Resort related land modifications, and evidence of plantation era features were identified. Fill is present in most test areas as a result of prior land modification during World War II in the vicinity of the Kahuku Army Air Field and barracks, and subsequently during the development of Resort facilities.

Detailed descriptions of each trench excavation are presented in the SAIS report, beginning on page 76. The research design provided for a sampling strategy of two trenches per acre based on the previously mapped locations of Jaucus Sand and Pearl Harbor Clay deposits and one trench per acre in areas where these deposits do not occur (Areas A and G). Based on the results of the sampling strategy, the areal extent of soil deposits with increased potential to contain significant intact subsurface cultural deposits can be identified. Data collected during subsurface testing will be a valuable tool for future planning and development. Individual trench profiles are summarily illustrated in Appendix B of the SAIS, while specific details of individual trench stratigraphy and sedimentology are tabulated in Appendix C of the SAIS. Cultural materials recovered and analyzed during documentation of subsurface cultural deposits are tabulated in the project Accession Record in Appendix D of the SAIS. The raw data presented in the SAIS appendices form the scientific basis for the inferences, observation and recommendations made in the SAIS.

F.1.e. [3] CONCLUSIONS

The SAIS Plan made predictions regarding expected site types based on previous archaeological research and historical documentary evidence. As expected, prehistoric to early historic remains documented in the SEIS Lands include subsurface cultural deposits and subsurface features including a house floor, fire pit, post molds, and burials. Also as expected, historic remains dating to the 1800s to 1900s were documented, including the OR&L railroad and at least one probable Kahuku Ranch-related wall. Other expected sites are the extensive WW II military-related remains of Kahuku Army Airfield including the main runway, revetments, defensive fortifications and a variety of support facilities.

As previously noted, the SAIS fieldwork documented the extensive disturbance that has occurred throughout the Resort property. Despite this extensive disturbance, extant surface sites were

Figure 2-32: Summary of identified sites

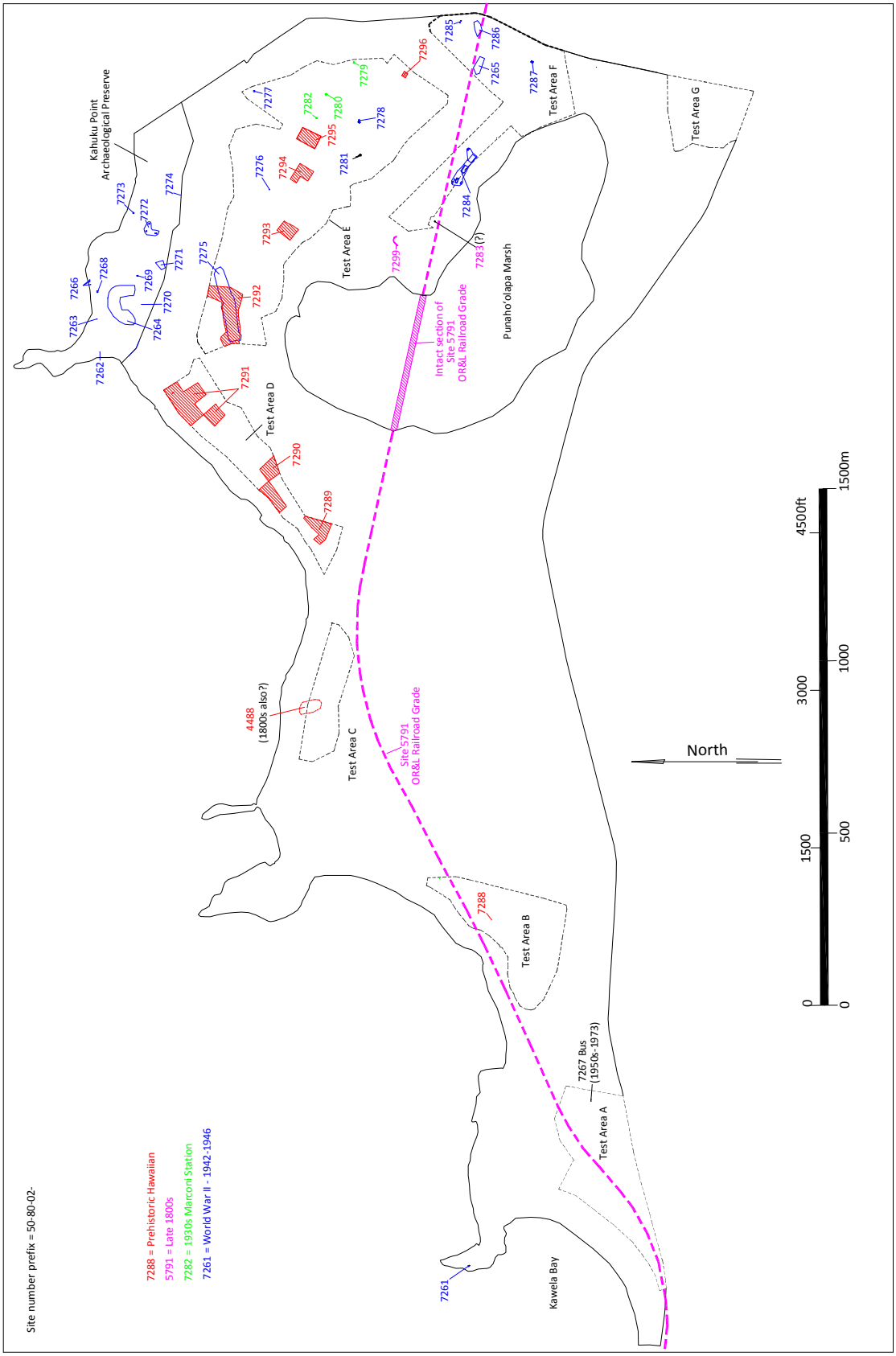


Table 2-10: SAIS identified and relocated sites

SIHP Site No.	Formal type	Function	Area	Age	No. of Features
4488*	Human remains	Burial	C	Prehistoric and early historic	1
5791*	OR&L Railroad grade	Transportation	Punaho'olapa Marsh	1899-1946	1
7261	Concrete structure	Gun position	Kawela Bay	1942-1946	1
7262	Concrete slab	Indeterminate	Kahuku Point	1942-1946	1
7263	Concrete pier block	Antenna support?	Kahuku Point	1942-1946	1
7264	Revetment	Storage	Kahuku Point	1942-1946	1
7265	Concrete slab	Foundation	F	1942-1946	1
7266	Concrete pier blocks	Antenna support?	Kahuku Point	1942-1946	3
7267	Transit Bus	Transportation	A	1950s-1973	1
7268	Concrete structure	Indeterminate	Kahuku Point	1942-1946	1
7269	Concrete structure remnant	Indeterminate	Kahuku Point	1942-1946	1
7270	Metal tank	Storage	Kahuku Point	1942-1946	1
7271	Asphalt area	Transportation	Kahuku Point	1942-1946	1
7272	Concrete structure	Gun position?	Kahuku Point	1942-1946	1
7273	Concrete block	Indeterminate	Kahuku Point	1942-1946	1
7274	Concrete cylinder	Possible light fixture base	Kahuku Point	1942-1946	1
7275	Asphalt area	Runway remnant	E	1942-1946	1
7276	Concrete block	Anchor base	E	1942-1946	1
7277	Concrete slab	Foundation	E	1942-1946	1
7278	Concrete structure	Gun position?	E	1942-1946	1
7279	Concrete block	Antenna support?	E	1933	1
7280	Concrete structure	Antenna support?	E	1930s	1
7281	Concrete structure	Gun position?	E	1942-1946	1
7282	Concrete block	Antenna support?	E	1930s ?	1
7283	Stone mound	Possible agricultural	F	Prehistoric	1
7284	Complex	Barracks complex	F	1942-1946	5
7285	Metal posts	Gate	F	1942-1946	1
7286	Asphalt area	Pavement	F	1942-1946	1
7287	Concrete structures	Gun position?	F	1942-1946	1
7288	Human remains	Burial	B	Prehistoric	1
7289	Cultural deposit w/ burial	Habitation/Burial	D	Prehistoric	2
7290	Cultural deposit	Habitation	D	Prehistoric	1
7291	Cultural deposit	Habitation	D	Prehistoric	1
7292	Cultural deposit	Habitation	E	Prehistoric	1
7293	Cultural deposit	Habitation	E	Prehistoric	1
7294	Cultural deposit	Habitation	E	Prehistoric	1
7295	Cultural deposit	Habitation	E	Prehistoric	1
7296	Cultural deposit	Habitation	E	Prehistoric	1
7299*	Wall	Livestock control	Punaho'olapa Marsh	pre-1900	1

*Relocated Sites

Table 2-11: Previously identified sites

SIHP Site No.	Other Site No. /Name	Site Type	McAllister (1933)	Dye (1977)	Bath et al. (1984)	Neller (1984)	Walker et al. (1988a)	Walker et al. (1988b)	Davis et al. (1986)	Kennedy (1992)	Kennedy (1996)	Sullivan (1990, 1991), Dunn (1991), Donohue (1991)	Haun and Henry (2001)	Corbin (2003)	Current Status
4488	-	Cultural deposit with burials								X	X				Burials removed and reinterred
5791/ 9714	-	Railroad Grade											X		Intact segment present across Punaho'olapa Marsh
6410	-	Cultural deposit with burials			X		X							X	Mitigated through Data Recovery; Burials removed and reinterred
6411	T-1	Cultural deposit with burials		X	X	X		X						X	Preserved
6412	-	Cultural deposit in Marsh with 3 sinkholes		X	X				X						Preserved
6413	TM-1	Cultural deposit										X		X	Mitigated through Data Recovery
6414	TM-2	Cultural deposit										X		X	Mitigated through Data Recovery
6415	TM-3	Enclosure										X		X	Mitigated through Data Recovery
6416	TM-4	Cultural deposit										X		X	Mitigated through Data Recovery
6417	TM-5	Cultural deposit										X		X	Mitigated through Data Recovery
6418	TM-6	Cultural deposit										X		X	Mitigated through Data Recovery
6419	TM-7	Cultural deposit										X		X	Mitigated through Data Recovery
6420	TM-8	Alignment										X		X	Mitigated through Data Recovery
6421	TM-9	3 pools with walls										X		X	Destroyed prior to SAIS
6422	TM-10	Cultural deposit										X		X	Mitigated through Data Recovery
6423	TM-11	Cultural deposit with burials										X		X	Mitigated through Data Recovery; Burials removed and reinterred
6424	TM-12	Stone wall										X		X	Destroyed prior to SAIS
6425	TM-13	Cultural deposit										X		X	Mitigated through Data Recovery
6426	TM-14	Stone wall										X		X	Destroyed prior to SAIS
7275*	Kahuku Army Air Field														Intact runway identified in Test Areas D and E
7299*	T-5	Stone wall			X										Preserved as part of Site 6412
	262	Kukio Pond	X					X							Destroyed prior to 1977
	T-2	Stone wall			X										Destroyed prior to SAIS
	T-3	Cattle enclosure			X										Destroyed prior to SAIS
	T-4	Antenna Support?			X										Destroyed prior to SAIS
	T-7	Gray sand layer in dune (determined to be historic)		X	X										Status undetermined, located within coastal setback

documented in Test Areas E and F, the Kahuku Point Preserve, and shore of Kawela Bay; and subsurface archaeological remains were identified in Test Areas B, D and E.

The SAIS Plan guided-surface and -subsurface surveys documented thirty-nine sites consisting of 10 traditional Hawaiian habitation sites, 2-3 sites dating to the late 1800s, 3 sites associated with 1930s operation of Marconi Wireless Station, 22 sites that were part of the United States Army Airfield at Kahuku, and an abandoned 1950s Honolulu City and County transit bus (see Figure 2-32 and Table 2-10. These sites include four sites identified by prior studies, including three that were not formally assigned site numbers by previous Resort studies (sites 5791, 7275, 7299; in Table 2-11).

Prehistoric Sites

The ten traditional Hawaiian sites documented are all likely prehistoric in age. Human remains were identified at three of these sites. Two sites (7288 and 7289) have intact, primary burials. The third site is Site 4488 where an isolated skeletal element was identified on the ground surface. Human remains representing at least 8 individual burials were previously discovered and recovered from Site 4488. At least one of these burials is likely historic (based on probable coffin remains consisting of wood fragments and square nails) and it is probable that most of the other burials are prehistoric. One site with a burial (7289) and seven other sites (7290-7296) have intact subsurface cultural deposits indicative of habitation-related occupations.

Archaeological and historical background research presented in the SAIS Plan (Haun *et al.* 2011:79-81) indicates that in late prehistory the Kahuku Point vicinity was well populated and extensively cultivated. There were permanent residences scattered along the coast. Larger settlements were present in areas such as Kahuku and Kawela Bay where sheltered ocean access was available. Temporary habitation, probably associated with agricultural activity and natural resource exploitation, occurred in inland overhangs, caves and walled shelters. Fishponds were present in sheltered areas and salt was collected from depressions along the shore. Fishing shrines and rock formations of legendary, and probably ritual significance were scattered along the coast. *Heiau* were sited on prominent topographic features overlooking the coast. Sand dunes and cliff face caves were used for burial.

Agricultural use included cultivation of taro in pond fields wherever topographically suitable locations could be provided with sufficient freshwater. The abundance of freshwater around Punahoʻolapa Marsh provided ideal conditions for wet taro cultivation with minimal labor investment compared to pond field development of stream drainages. Dryland gardens were present around the coastal residences and on the lower volcanic slopes where bananas, sweet potatoes, *wauke,* sugar cane, gourds, breadfruit, and other crops were cultivated. Upland areas were also farmed. Food remains from archaeological excavations include dog, pig, birds, and a wide variety of fish and marine invertebrates, representing activities such as animal husbandry, hunting, fishing and gathering.

Previous archaeological studies of Resort property produced 77 radiocarbon age range determinations on charcoal from cultural deposits that fall within the timeframes associated with Polynesian cultural occupation and later (Haun *et al.* 2011:71-77). Of these 77 results, 23 (30%) are from the Kawela Bay Archaeological Area (Site 6410), 25 (32%) are from the Kahuku Point Archaeological Preserve (Site 6411), and 29 (38%) are from Punahoʻolapa Marsh (Site 6412) and its environs (Sites 6414, 6416, 6417, 6422, and 6423). The earliest cultural deposits (i.e. prior to c. A.D. 1000) are to be found on the periphery of the Marsh. These early age ranges support the inference that the wetland was a highly desirable locale for initial settlement. The earliest cultural age range determinations were recovered from Site 6412 where a sample obtained from the east trench spans A.D. 645 to 979 and a sample from the north trench spans A.D. 785 to 1160 (Figure 2-33). A second early cluster was obtained within and east of the Marsh from Site 6423. Age ranges from Site 6423 span A.D. 793 to 1105.

Figure 2-33: Pre-1800 chronology of occupation within project area

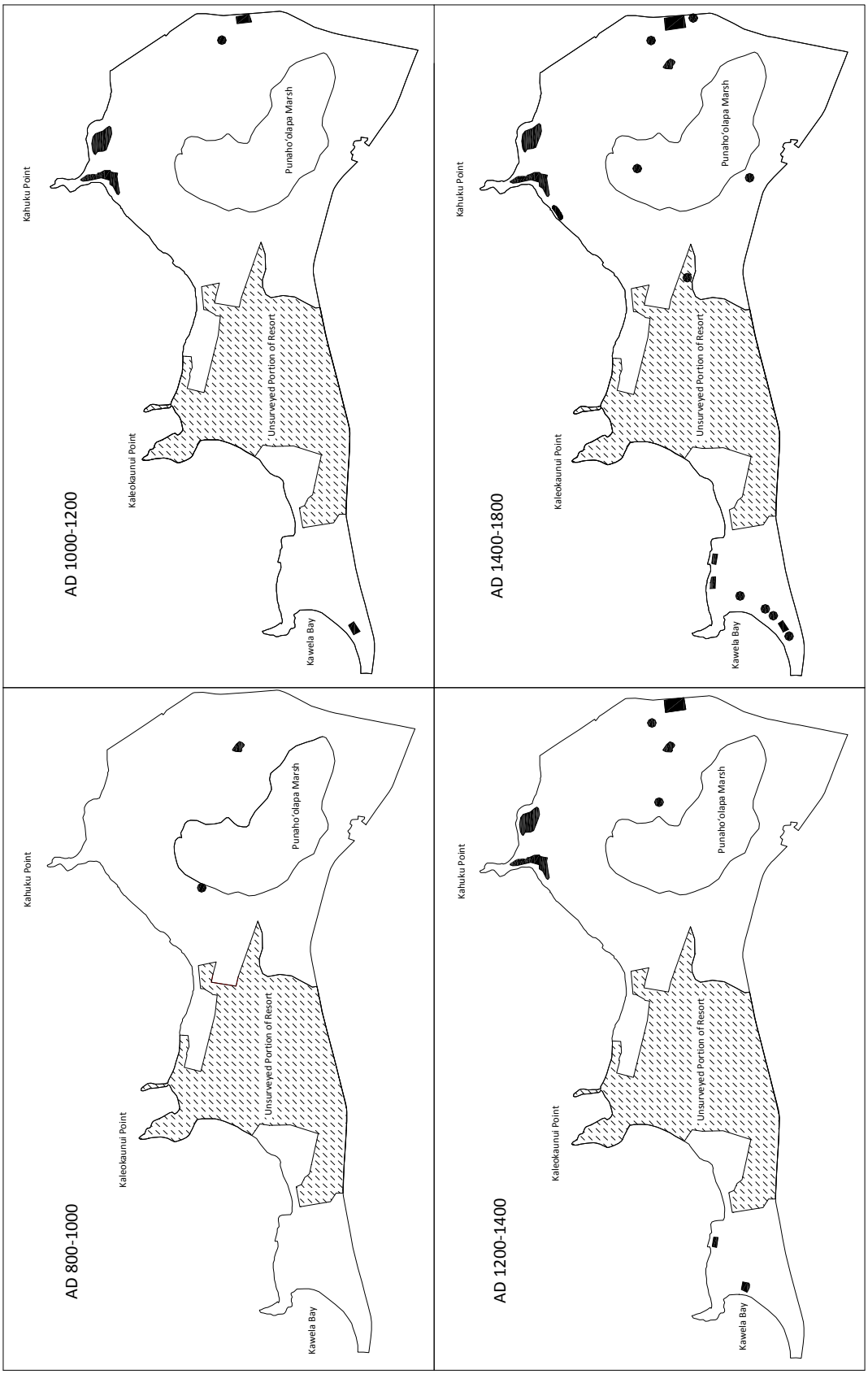


Figure 160. Pre-1800 chronology of occupation within project area

The A.D. 1000 to 1200-age ranges show continued use of the area east of Punahoʻolapa Marsh, along with settlements in the sand dunes east and west of Kahuku Point and around Kawela Bay. Settlement in these areas intensified in the period between A.D. 1200 and 1400. The earliest cultural deposits sampled along Turtle Bay post- date A.D. 1200. Sites dating to the period between A.D. 1400 to 1600 have been documented on the west and southwest of Punahoʻolapa Marsh, as well as southwest of Kahuku Point. Use of the area east of Punahoʻolapa Marsh, Kawela Bay and Kahuku Point continued as a population focal point into the A.D. 1600 to 1800s.

More than 100 Land Commission Awards (LCA) claims were awarded in the mid-1800s in the area spanning the region from Kawela to Kahuku (ibid.: 2011:17-27). Thirty-five LCA claims with at least 24 house lots were awarded in the project area. The LCA claim testimonies refer to numerous *loʻi* (taro pond fields) and cultivated plots of bananas, sweet potatoes, *wauke* (paper mulberry), sugar cane, bitter melon, *noni* (Morinda *citrifolia)* and an orange tree. Other named plants are *hala* (Pandanus) groves and *koa* trees for canoes. A brackish spring and a fishery also are mentioned in the testimonies.

Figure 2-34 depicts the distribution of traditional Hawaiian sites and Figure 2-35 illustrates the distribution of mid- 1800s LCAs. The two distributions show a high degree of correlation and demonstrate that the historic LCA pattern reflects the earlier prehistoric settlement pattern. The only exception to this correlation is the lack of prehistoric sites on the coast immediately south of Kaleokaunui (Kuilima) Point where five LCAs are present. It is likely that prehistoric sites were also present there, but were destroyed by 1800s-1900s sugarcane cultivation and early 1970s resort development that occurred before any systematic archaeological surveys were conducted. The late prehistoric to early historic (mid-1800s) settlement pattern likely extends back to at least the 13th Century based on radio-carbon dating results (see Figure 2-37) and potentially to the 11th Century.

The traditional Hawaiian sites primarily consist of subsurface cultural deposits. Previously identified Hawaiian sites at Kawela Bay, Kahuku Point and the areas surrounding Punahoʻolapa Marsh were, with the exception of Kahuku Point, previously mitigated through data recovery. After initial data recovery work the landowner elected to preserve the Kahuku Point site. The data recovery work documented stratified, cultural deposits at Kawela Bay and Kahuku Point that contained numerous soil features including post molds, burials and hearths; and abundant and diverse assemblages of artifacts and food remains. Data recovery at the inland sites generally encountered either isolated subsurface features or remnant subsurface deposits with limited quantities of food remains and artifacts.

The eight sites with cultural deposits documented by the SAIS study comprise more than 32,000 square meters and are situated in the remnant dunes along the coast southwest of Kahuku Point (Test Area D) and the lowlands northeast of Punahoʻolapa Marsh (Test Area E). The deposits in the dunes are usually stratified with two cultural layers and the inland ones typically have a single cultural deposit that was vertically truncated by World War II or subsequent land modification. The very limited sampling of these subsurface deposits recovered artifacts (basalt and volcanic glass stone debitage and tools), charcoal, *kukui* nutshells, and food remains

Figure 2-34: Prehistoric Sites

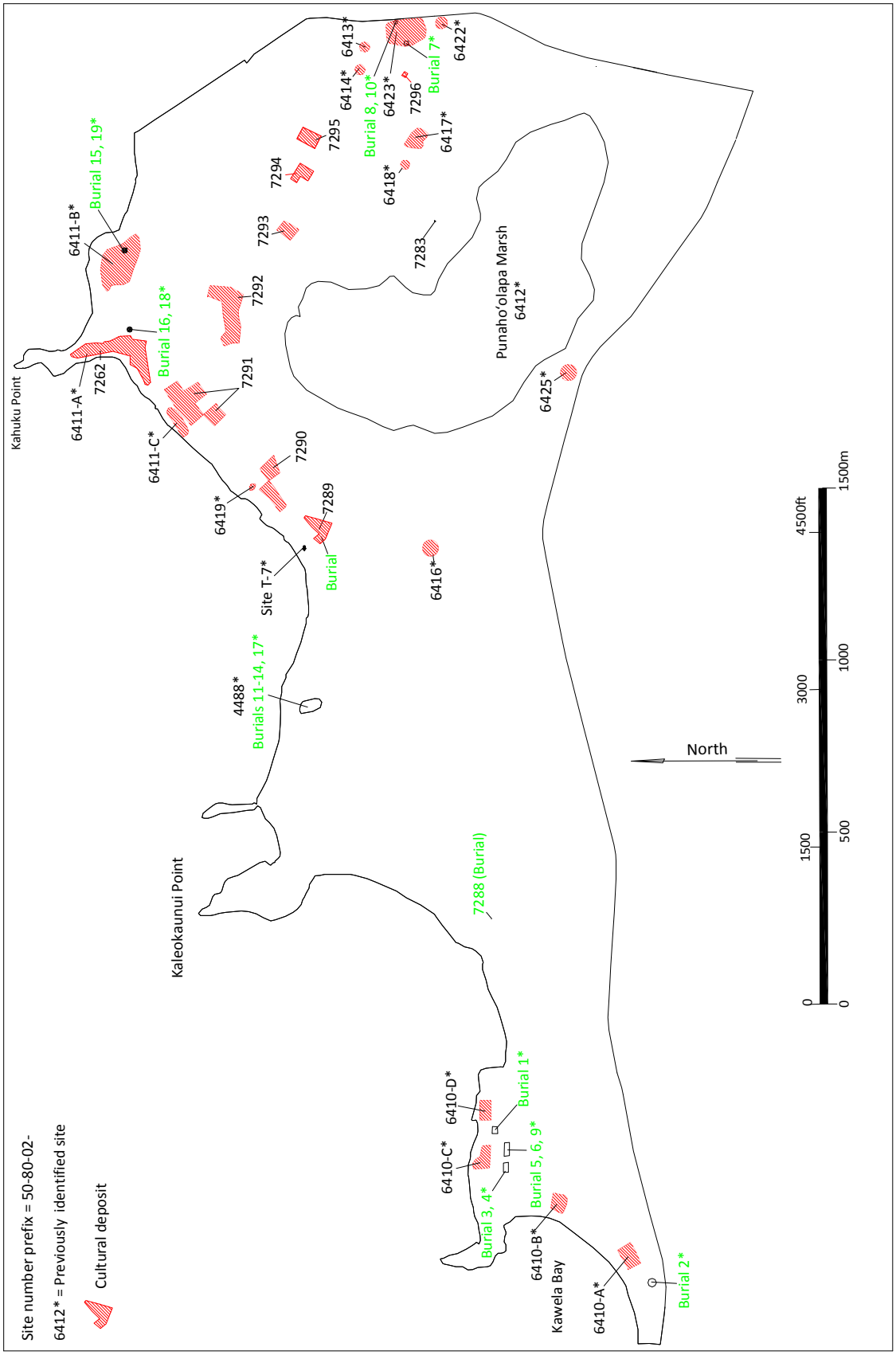
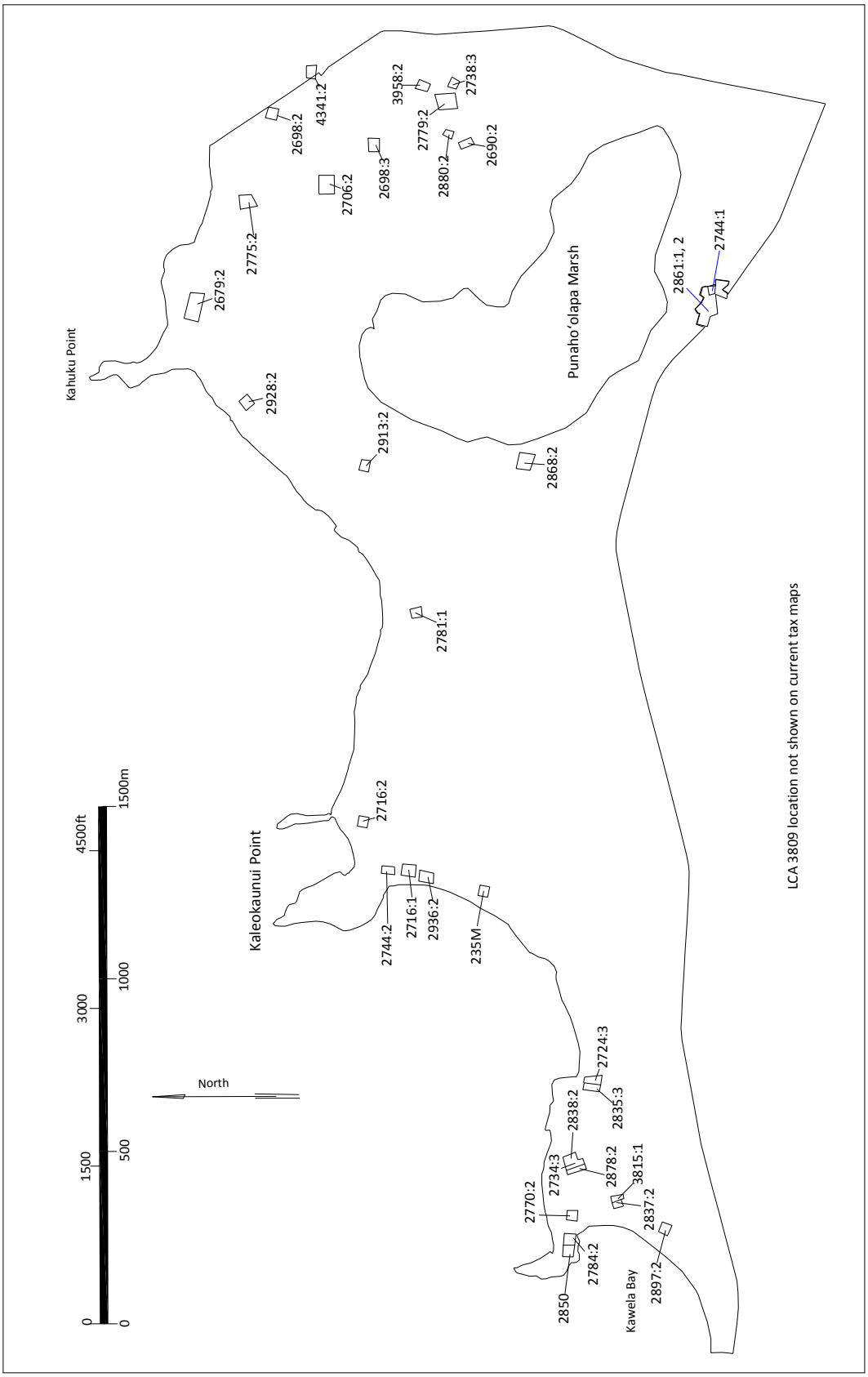


Figure 2-35: Land commission awards within project area



including marine invertebrates (gastropods, bivalves, sea urchins, crustacean), fish bone and terrestrial vertebrate bone (dog, pig, bird). These cultural deposits reflect traditional Hawaiian habitation. Mortuary use was also documented. In Test Area B, an intact primary burial of probable Hawaiian ancestry was identified during subsurface testing (Site 7288). An isolated human metatarsal was identified in Test Area C that is likely from one of the eight individual burials that were previously discovered at Site 4488. Another intact primary burial was identified in Test Area D at Site 7289. This brings the total number of burials identified at the Resort to 27 (Table 2-12). The majority of the burials were found in coastal Jaucus Sand deposits near Kawela Bay and Kahuku Point (see Figure 2-38. Three burials (Nos. 7-10) were discovered during archaeological monitoring in Pearl Harbor Clay east of Punahoʻolapa Marsh in Site 6423.

The SAIS subsurface testing consisted of both high density (2 trenches per acre) and low density (1 trench per acre) testing with high intensity testing for all Jaucus Sand and Pearl Harbor Clay sediments. All of the human remains identified during testing were encountered in Jaucus Sand. While traditional Hawaiian burials are potentially present in numerous soil types and topographic settings of sufficient age and integrity, there is an increased potential for such remains to be encountered in areas of intact Jaucus Sand deposits. In addition to burials there is an increased potential to encounter cultural deposits and other subsurface features such as post molds and hearths in intact Jaucus Sand deposits as well as intact Pearl Harbor Clay deposits.

Based on the density of test trenches for these soil types, the areal extent of any potential additional cultural deposits would be less than one half acre, and likely much smaller, consisting of isolated remnant deposits and truncated subsurface features. Following is an assessment of the future likelihood of additional archaeological finds.

Test Area A has a low potential for encountering intact subsurface cultural deposits or human remains during future excavations based on the results of subsurface testing. Any potential cultural deposits in Area A would be confined to the alluvial sediments overlying the marine-deposited sand. The alluvial deposits are no more than 0.66 m thick and most are substantially less, but the average thickness is 0.37 m. The alluvial deposits are surficial in some places and in others are buried by fill. Testing documented that the entire area has been disturbed by historic agricultural activity that would have destroyed the physical integrity of surficial prehistoric cultural deposits. Prehistoric agricultural use of the alluvial land along Kawela Bay is probable, but evidence for agricultural use is negligible.

Test Area B was formerly used as the staging area for equipment and material during construction of the Turtle Bay hotel and is currently used for generalized recreation-related activities, including horse stables and pasture. Most of the surface is relatively flat and grass-covered, punctuated by clumps of trees around the Test Area boundary, with a perceptible but gentle rise toward the shore. The relatively flat surface lacks visual evidence of the presence of deeply buried sediments. In fact, the limestone substrate at the south end is as shallow as 16 cm below the surface and overlain by minimal alluvial deposition. Trenches across the *mauka* half of Test Area B encountered abundant evidence of fill deposits, extending 1.80 meters deep in

Table 2-12: Summary of burials identified in TBR property

Site Number	Burial Number	Location	Number of Burials	Researchers	Description	Final Disposition of Remains
4488*	11-14, 17	West side of Kaihalala Bay - Test Area C	8	Kennedy (1992), Maly and Rosendahl (1992), Carson *et al.* (1996, 1999), Haun et al. (2012)	Burials 11-14 consist of 4 disturbed burials (3 sub-adults, 1 adult female) removed from dune south of Kulima Point (Kennedy 1992). Disturbed remains of 3+ adults and 1 bone from sub-adult noted by Carson *et al.* (1996, 1999) in same area and designated as Burial 17. Wood and nails suggesting a coffin were found in associated with one set of the Burial 17 remains. Burials 11-14 reinterred following Maly and Rosendahl (1992) BTP. Burial 17 curated with SHPD in 1996 and subsequently reinterred. Isolated metatarsal identified during SAIS	Burials 11-14, 17 Reinterred, Treatment of metatarsal to be determined by O'ahu Island Burial Council (OIBC)
6410	1	TU-20, Makai Test Area A	1	Bath et al. (1984), Walker et al. (1988a), Jensen (1989), Maly and Rosendahl (1992), Kalima (1993)	Adult female burial in wooden coffin within stone-lined cyst noted 1st by Bath et al. (1984), then Walker et al. (1988a). Burial disinterred following guidelines in (1989b) mitigation program. Osteological analysis by conducted by Kalima (1993). Burial reinterred at Reinterment Site as specified in Maly and Rosendahl (1992) Burial Treatment Plan (BTP).	Reinterred
6410	2	TU-9	1	Walker et al. (1988a), Jensen (1989), Maly and Rosendahl (1992), Kalima (1993)	Adult male burial in flexed position noted in pit feature (HF-45) by Walker *et al.* (1988a). Burial disinterred as part of Jensen (1989b) mitigation program. Osteological analysis by Kalima (1993). Burial reinterred following Maly and Rosendahl (1992) BTP.	Reinterred
6410	3, 4, 5, 6, 9	Makai Test Area A	5	Sullivan (1991), Jensen (1989), Maly and Rosendahl (1992), Kalima (1993)	Human remains noted during monitoring of grading for Hotel H-2. Two clusters of two burials found 15 m apart. Burial 3 is a juvenile, Burial 4 is a infant, Burials 5 and 6 are adults. Burials disinterred following guidelines in Jensen (1989b) mitigation plan. During osteological analysis of Burials 5 and 6 by Kalima (1993), single humerous of third individual was noted, designated as Burial 9. Burial reinterred following Maly and Rosendahl (1992) BTP.	Reinterred
6423	7	BT-1, TUs 11 and 13, East side TBR Property	1	Sullivan (1991), Jensen (1989b), Maly and Rosendahl (1992), Kalima (1993)	Human remains noted during monitoring at Site 6423 area, found within a natural sinkhole feature used as a burial pit (HF-12). Cranium and infracranial skeletal remains interpreted as those of female adult from 25 to 30 years of age. Burials disinterred following guidelines in Jensen (1989b) mitigation plan and analysis conducted by Kalima (1993). Burial reinterred following Maly and Rosendahl (1992) BTP.	Reinterred
6423	8, 10	TU-14, East side TBR Property	2	Sullivan (1991), Jensen (1989b), Maly and Rosendahl (1992), Kalima (1993)	Human remains noted during monitoring at Site 6423 area, beneath resort access road and west fork of Marconi Road. Remains were partially articulated and are those of adult female. Burials disinterred following guidelines in Jensen (1989b) mitigation plan and osteological analysis conducted by Kalima (1993). During analysis, fragmentary remains of an additonal sub-adult were found and designated as Burial 10. Both sets of remains reinterred following Maly and Rosendahl (1992) BTP.	Reinterred
6411	15, 19	East Kahuku Point Burial Area	5	Neller (1984), Walker *et al.* (1988b), Maly and Rosendahl (1992)	Burial 15 noted in dunes east of Kahuku Point was exhumed and examined by SHPD (Neller (1984) and determined to be two complete skeletons and one partial skeleton. Walker *et al.* (1988b) identified two burials (Burial 19) in pits in TU-2 in Area B. Burial 19 was re-buried in original location.	Reinterred (Burial 15), Left *in situ* (Burial 19)
6411	16, 18	West Kahuku Point Burial Area	2	Neller (1989), Walker *et al.* (1988b), Maly and Rosendahl (1992)	Burial 16 noted in dunes to west of Kahuku Point and exhumed by Honolulu Police. Remains were subsequently examined by SHPD (Neller (1989). Burial 18 identified by Walker *et al.* (1988b) in TU-24 in Area A. Burial 18 was re-buried in its original location.	Reinterred (Burial 16), Left *in situ* (Burial 18)
7288	-	Test Area B	1	Haun et al. 2012	Burial identified during trenching in Test Area B in BT-B-6-2 . Primary sub-adult burial, estimated age of 6 to 8 years, undetermined gender. Displaced remains reburied in original location	To be determined by OIBC
7289	-	Test Area D	1	Haun et al. 2012	Burial identified during trenching in Test Area D in BT-D-2-1b . Complete adult male primary burial. Displaced remains reburied in original location	To be determined by OIBC
		Total	**27**			

4488* - isolated metatarsal likely element of a previous identified burial

some places. It is on the *makai* side of Test Area A that aeolian sand deposits exceed 2.5 m and are capped by marine-deposited sand. This area constitutes the back slope of the coastal dune. Prior to development, alluvial sediments behind the bay front were covered by aeolian sand. Episodically deposited marine sand covered the dune and some alluvial deposits on the *mauka* side of the dune.

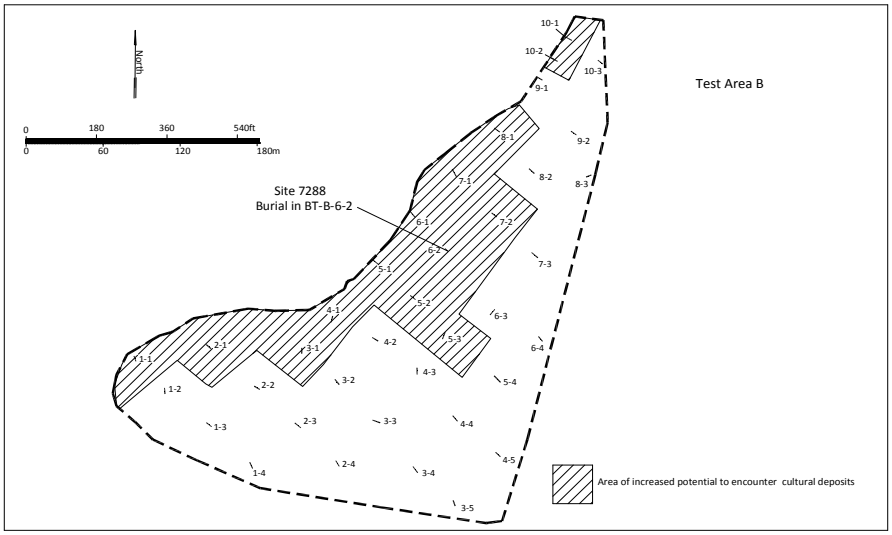
An intact subsurface human burial (Site 7288) was encountered in an aeolian sand deposit in Test Area B. The topographical setting of the intact burial at Site 7288 and location of sand deposits is the key to identifying areas of increased potential for encountering additional burials in Test Area B. The burial was preserved in an aeolian dune deposit 44 cm below the surface. The aeolian deposit was capped by about 25 centimeters of marine deposited sand. There was no evidence of an associated cultural deposit, *per se*. That is, no dark staining, no charcoal flecks, no cultural material other than the burial exposed in the trench wall. Yet, cultural materials characteristic of habitation deposits were recovered from the screened excavation deposits containing mixed Layer I and II sand while recovering bone fragments. The cultural materials are either associated with the burial or with the marine deposited sand, possibly in secondary context, since the burial is presumably in a pit underlying a cultural surface. In either case, intact sand deposits in Test Area B exhibit increased potential for encountering additional subsurface cultural deposits and subsurface features including burials. Figure 2-36 illustrates the locations exhibiting increased potential for encountering subsurface cultural remains in Test Area B. These deposits encompass an area of approximately 23,600 square meters (5.8-acres) of Test Area B.

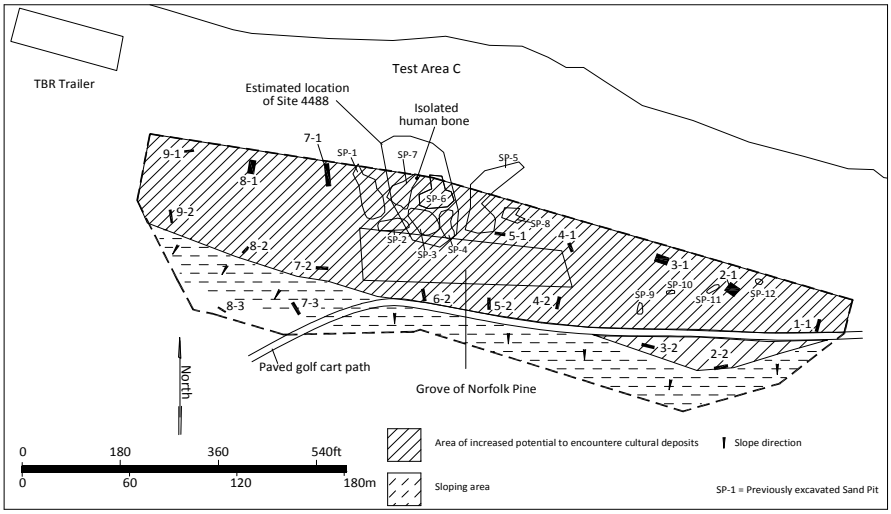
Test Area C is a forested coastal sand dune on the west side of Kaihalulu Bay, about 90-135 meters from the shoreline. The central *makai* side of the dune contains 4.75 to 6.7 meters of aeolian sand overlying the limestone substrate. The southwest side of the dune contains 1.0 to 2.60 meters of aeolian sand and fill overlying limestone. The southeast side of the dune was possibly mined for sand during WW II, and the pits subsequently filled with trash of the same era. In the late 1980s and early 1990s the north side of the dune was mined for sand in connection with Resort development; the pits remain as open holes to this day.

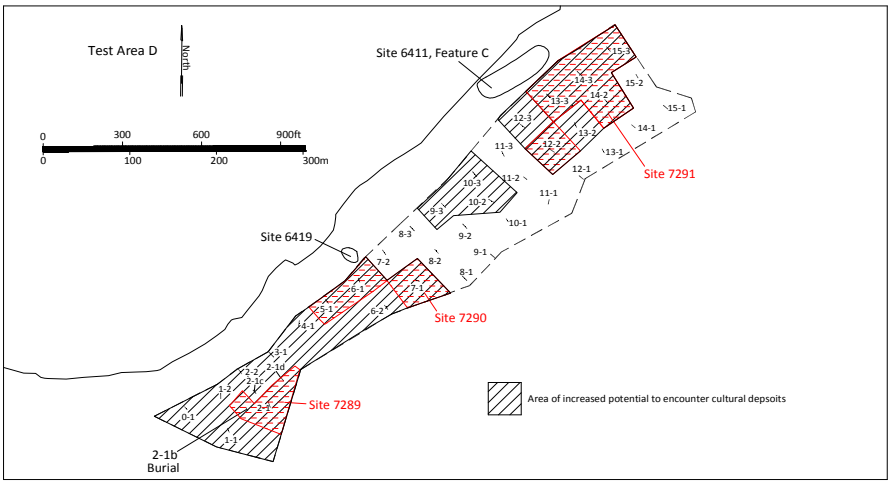
As many as 8 individual burials from the central portion of the dune (Site 4488) have been documented (Kennedy 1992, Carson *et al.* 1996) and an isolated skeletal element was recovered on the ground surface near SP-7 during fieldwork for the SAIS, presumed to be a bone displaced from one of the eight burials. The SAIS study identified relatively shallow disturbance (roads, trash pits, areas of fill) across the dune, but deep, intact aeolian and marine deposited sand deposits remain. The upper 1.5 meters of these intact sand deposits exhibit an increased potential for encountering cultural deposits in future excavations and encompass approximately 22,300 square meters (5.5-acres; 68.7%) of Test Area C. The area of increased potential for cultural deposits is depicted in Figure 2-37.

Test Area D is located inland of the forested sand dunes parallel to the shoreline on the west side of Kaihalulu Bay and is undeveloped. The terrain is fairly level and varies in elevation from

Figure 2-36: Areas of increased potential for encountering cultural deposits in Test Areas B-D







about 4 ft to 16 feet. The south one-third of Test Area D contains aeolian sand deposits to a depths exceeding 2.8 meters above the water table, overlying clay deposits. The northeastern two-thirds of Test Area D contain about 0.1 to 3.8 meters of tsunami deposits overlying alluvial deposition formed on tropical peat or the limestone substrate. The absence of surface sites in Test Area D can be attributed to widespread land modification associated with the Kahuku Army Airfield and the destructive effects of the 1946 tsunami. Subsurface cultural deposits were identified between 1988-1992 on the north side of Area D at Site 6411-Feature C and Site 6419.

Stratified subsurface prehistoric habitation deposits, including an adult burial, were documented in association with the aeolian deposition at the south end of Test Area D. These deposits are exposed from 0.30 to 0.80 meters at Site 7289. Intact stratified subsurface prehistoric habitation deposits were also documented in alluvial deposits in the center of Test Area D at Site 7290 from 0.17 to 0.85 meters below ground surface (bgs); Kahuku Army Airfield deposits (Site 7275) seal the underlying prehistoric deposits. Similarly, widespread subsurface prehistoric habitation deposits were documented at the north end of Test Area D, where Site 7291 was documented from 0.38 to 3.53 meters bgs in association with alluvial deposition and sealed by Airfield deposits or tsunami deposits. Buried alluvial A horizons that could contain subsurface cultural deposits were identified in an area between Sites 7290 and 7291. Because of the demonstrated association between prehistoric habitation deposits and burials, intact deposits around the prehistoric sites in Test Area D exhibit an increased potential to contain cultural deposits. These deposits and the areas of the three sites comprise approximately 36,500 square meters (9 acres; 56%) of Test Area D. The extent of these areas is presented in Figure 2-38.

Test Area E is a relatively level, low lying and currently undeveloped ironwood and *haole koa* forest east of Punahoʻolapa Marsh. The ground surface of Test Area E was extensively modified during construction of the main NW-SE runway of the Kahuku Army Airfield (Site 7275) and peripheral support facilities. A sod farm and nursery formerly used by the Resort occupied the south end of Test Area E in the recent past. Testing in Area E documented widespread fill deposits associated with the Airfield overlying alluvial deposits and gley developed on the limestone substrate. WW II-era fill deposits vary in depth from 0.25 to 1.38 meters bgs. Where preserved, alluvial deposition was encountered 0.16 to 0.82 meters bgs, overlying gley or the limestone substrate. Many fill deposits directly overlie bedrock in Test Area E, but where no fill deposits were encountered, testing documented that alluvial deposits overlying gley or limestone were at least 0.45 to 0.82 meters deep. Five subsurface prehistoric habitation sites were identified as a result of testing in Area E (Sites 7292-7296). All are associated with buried alluvial deposition and overlying fill seals many of the cultural deposits. Prehistoric subsurface cultural deposits cover approximately 14,325 square meters (3.5-acres) or 5% of Test Area E.

Test Area F is characterized by widespread surface disturbance associated with 20th Century infrastructure for the OR&L railroad, the Kahuku Army Airfield barracks, the Palmer golf course and ancillary access roads. Although intact alluvial deposits are preserved across much of Test Area F, no evidence of prehistoric subsurface cultural deposits was encountered. It is possible that prehistoric cultural deposits were destroyed as a result of 20th Century land modification, but the potential to encounter intact prehistoric cultural deposits or burials in Test Area F is negligible.

Figure 2-37: Mid-1800s to early 1900s sites

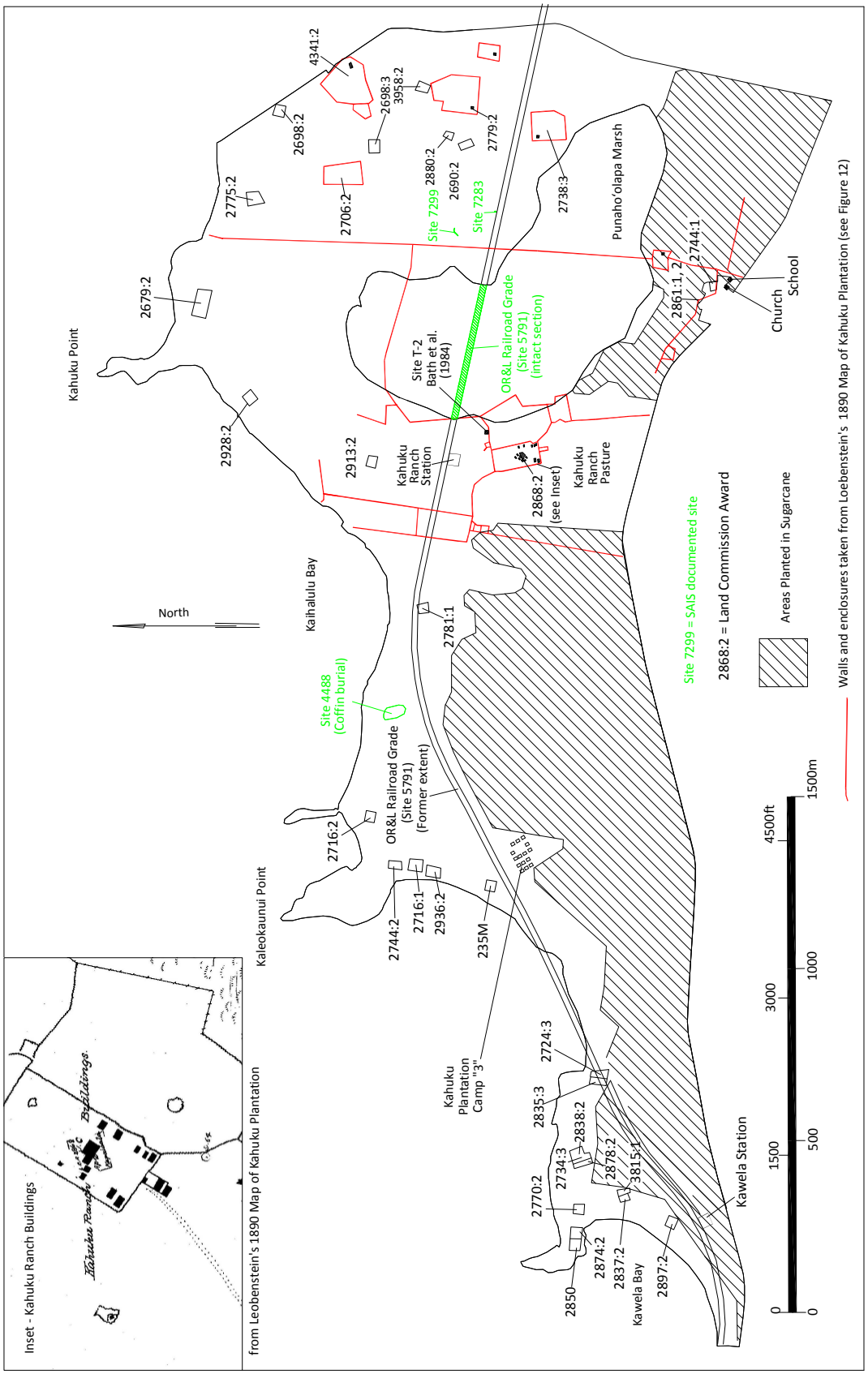
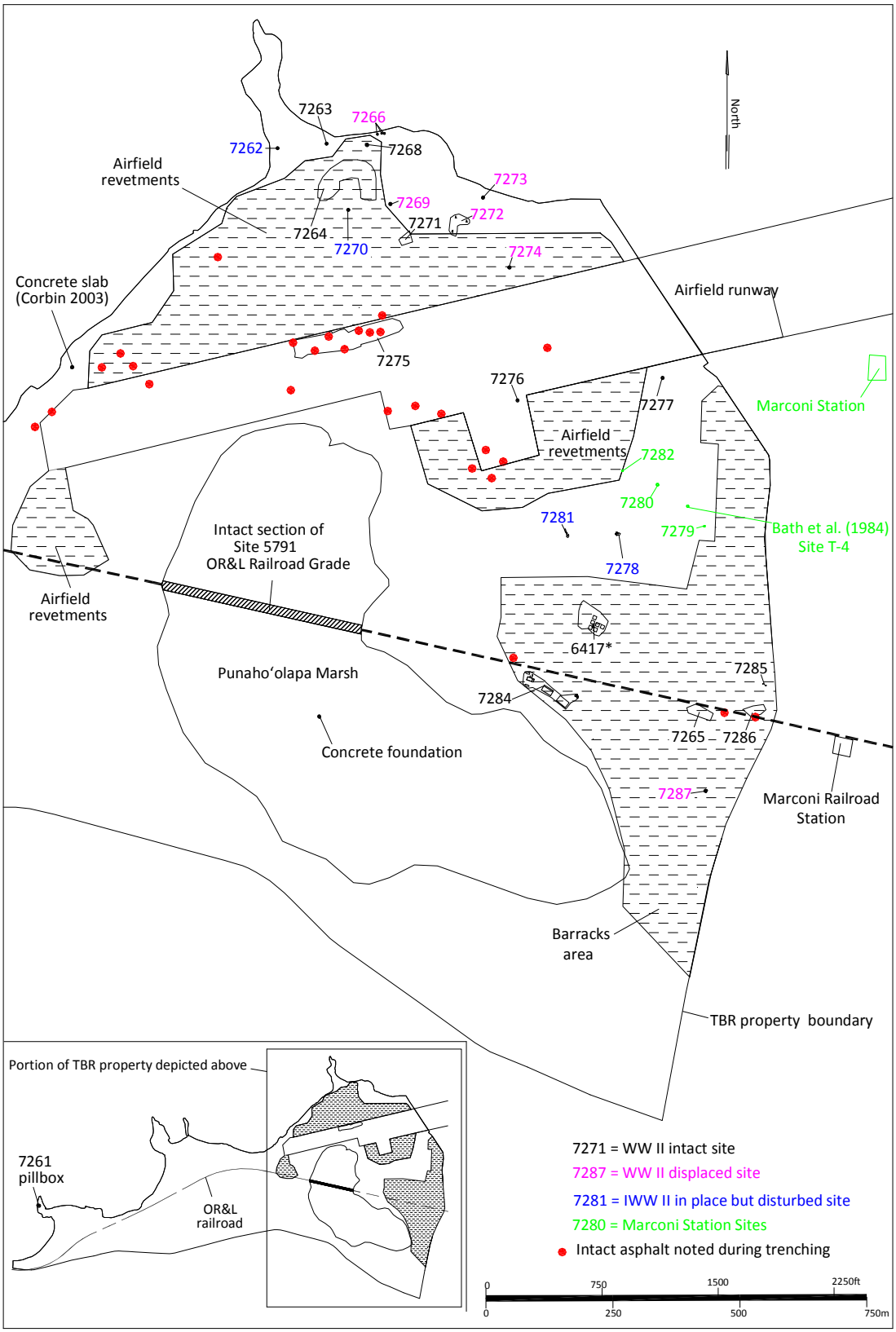


Figure 2-38: WorldWar II and Marconi Station sites



Test Area G consists entirely of alluvial Waialua Silty Clay and was sampled by excavating one-trench per acre. The soil is more suitable for agricultural use rather than habitation and not surprisingly, no evidence of historic or prehistoric habitation was encountered. Test Area G exhibits very low potential for encountering subsurface cultural deposits or burials.

Historic Sites

Historic sites are those associated with human activity during the period between European Contact and the early 1960s (fifty years ago).

The first site that is potentially prehistoric to early historic in age is Site 7283, a possible agricultural mound.

One of the burials previously documented at Site 4488 was associated with coffin remnants including square nails that likely indicate interment in the 1800s.

A section of dry-stacked limestone wall (Site 7299), which probably functioned as a livestock wall associated with Kahuku Ranch was documented and likely dates to the mid- to late 1800s. Charles Hopkins purchased 8,000 acres at Kahuku in 1850-1851 from Kamehameha III and established the Kahuku Ranch (Haun et al. 2011:26-27). Forests were cleared for pasture for free-ranging herds of sheep and cattle, which soon plagued the small Hawaiian farms that were scattered throughout the area, eventually displacing many of the farmers. Hopkins land subsequently passed through a series of owners and was sold to James Campbell for $63,500.00 in 1876. In 1889, Benjamin Franklin Dillingham chartered the Oʻahu Railroad and Land Company (OR&L) and leased the Kahuku lands from James Campbell for 50 years (ibid.). Dillingham then subleased the lands to James Castle. Castle's Kahuku Plantation Company received its charter in 1890. The company began commercial production of sugarcane using pumped spring water, streams and rain for irrigation. The first sugarcane crop from 2,800 cultivated acres was harvested in 1892. Figure 2-41 is based on an 1890 map of Kahuku Plantation and shows areas in sugarcane cultivation. A series of walled enclosures correspond to LCAs surrounding Punahoʻolapa Marsh. An old school and a church are located seaward of the Old Government Road and the Kahuku Ranch buildings are located in the central portion of the Resort property, immediately west of the marsh. The Site 7299 wall (see Figure 2-39 initially identified by Bath et al. in 1984, that may be a remnant of a ranch wall shown on Figure 2-37, extends from the inland side of the marsh to the coast east of Kahuku Point.

Bath et al. (1984:33) identified another wall site (T-2) on the east side of the marsh that probably was part of the Kahuku Ranch facility (see Figure 2-37). Although not mapped, the site was described as "an L-shaped stacked coral wall. The SE leg is 30 meters long; the NE leg was not followed beyond 40 meters from the wall corner. It appears to go out into the present marsh" (ibid.). These walls described by Bath et al. are probably part of the complex of walls depicted on Figure 2-37 on the east side of the Kahuku Ranch buildings based on Loebenstein's 1890 map of Kahuku Plantation (see inset Figure 2-37).

By 1900, the OR&L Railroad line (Site 5791) extended from Honolulu to Kahuku. Site 5791 is an intact portion of the OR&L railroad grade that consists of a 475 meter-long causeway extending across Punahoʻolapa Marsh (see Figure 2-40). By the early 1900s there were railroad stations at Kawela, Kahuku Ranch, and Marconi. A plantation camp was established along the railroad between Kawela and Kahuku Ranch Stations to house plantation workers by at least 1932 (see Figure 2-37, "Camp 3"). Marconi Station was located just east of the Resort property at Punamanō Marsh.

Two sites, and potentially a third, date to the early 1930s operation of Marconi Station that was situated adjacent to the Resort property near Kahuku Point (Figure 2-42). The wireless communication facility was established by the Marconi Company in 1914, and its operation was taken over by Radio Corporation of America (RCA) by the 1930s (Bennett 2011:52). The SAIS survey documented two concrete structures (Sites 7279, 7282; see Figures 2-41 through 2-45) that functioned to support the station's extensive antenna array (see Figures 2-46 and 2-47). Site 7280 is an unusual octagonal concrete structure that also potentially served to support an antenna and may also date to the station's operation in the 1930s (see Figure 2-48). A nearly identical octagonal structure was reported by Bath et al. (1984) in the same vicinity as 7280 (Site T-4), but differences in its reported dimensions and location indicates it is not the same feature identified at Site 7280, but rather a second one.

The majority of the sites (22 of 39) documented by the SAIS work are associated with the Kahuku Army Airfield (see Figure 2-38). The SIHP Site Number 7275 is applied to the main runway in Area E, but is also used here generically to refer to the entire airfield facility (which covered the eastern portion of the Resort property and extended east, beyond the Resort property boundary). The airfield was a large military complex covering 12,000 acres that were initially transferred by the James Campbell Estate to the US Navy for use as a bombing range and subsequently to the US Army for use as an airfield. Construction on the runway began in December 1941 and the airfield was in use until March 1946, and was not returned to the landowner until sometime between June 1947 and March 1948 (Bennett 2011: 52, 59).

Figure 2-39: Site 7299 wall

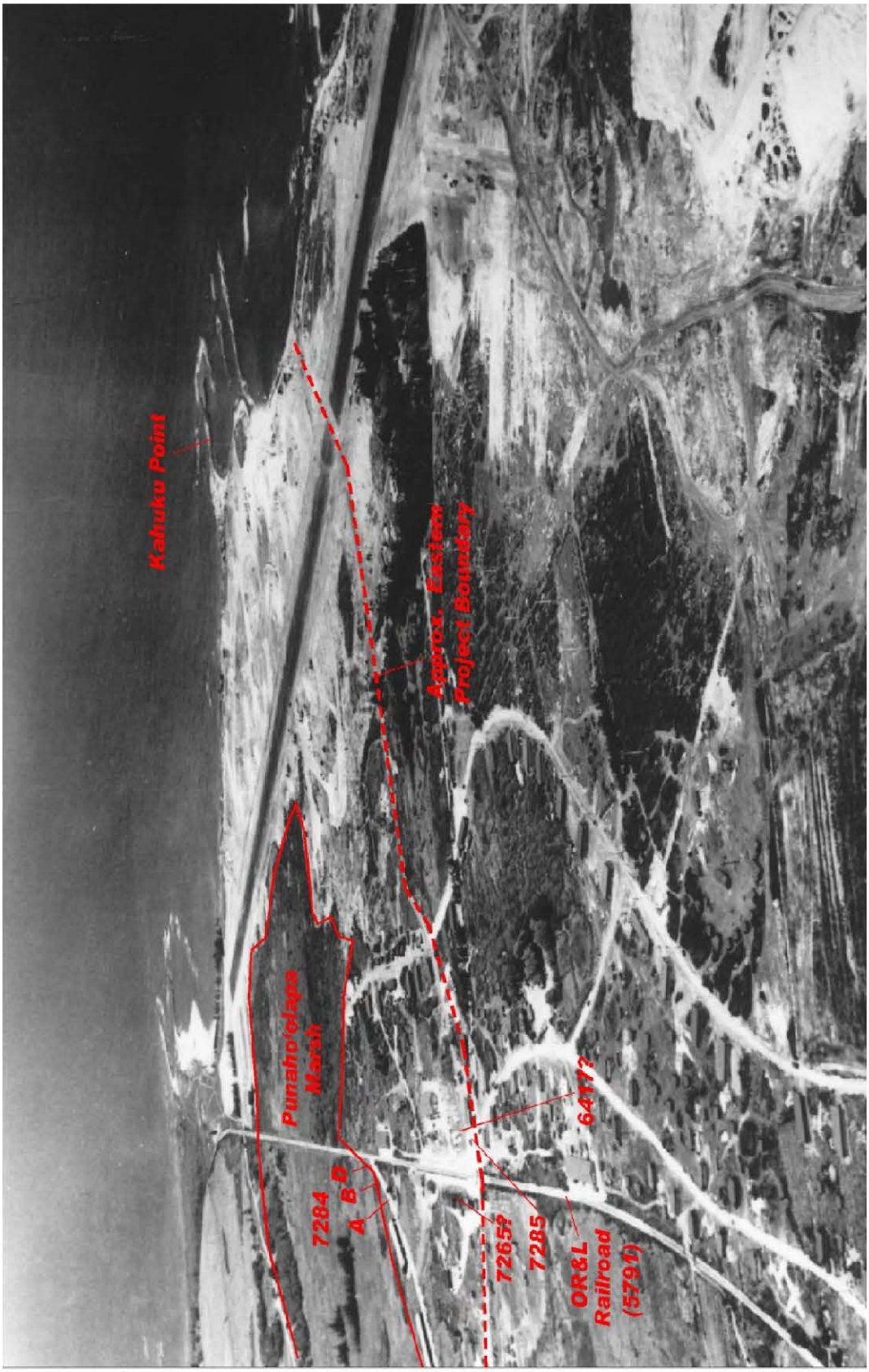


Figure 2-40: August 20, 1942 photograph of Kahuku Army Airfield

David Trojan of the Hawaiian Aviation Preservation Society (Trojan, n.d.) presents a brief history of the construction and use of the airfield:

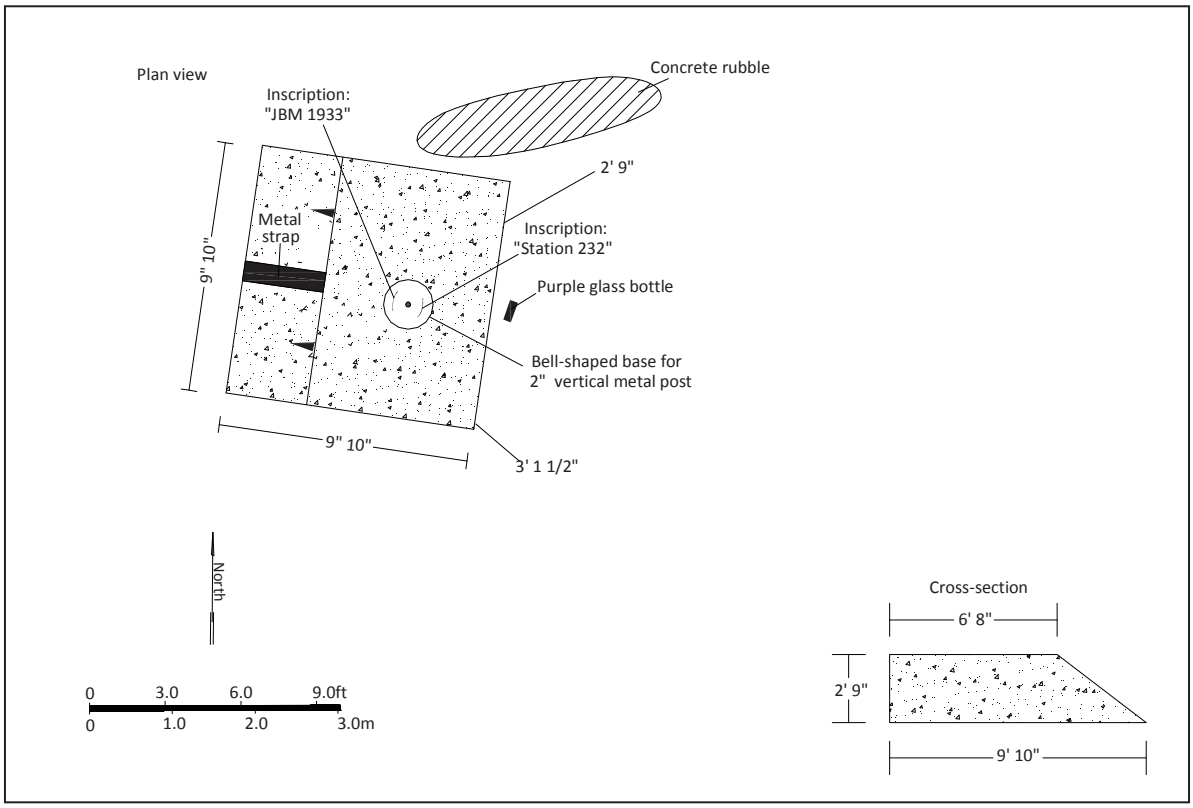
> ***There are references to Kahuku as an emergency field dating to the 1930's, but it was not until the United States entered World War II that the airfield was developed. Kahuku Army Airfield was classified as an auxiliary field and had a very short life span, from 1942 until it was closed in the late 1940's. Ground troops were stationed in the area to protect the airfield and man the shoreline fortifications. The northern tip of Oahu had a total of three airfields in close proximity during World War II. The Kahuku Point Airfield was located near the tip of Kahuku Point, and was evidently the most elaborate. The Kahuku Army Airfields were used for training of pilots from Wheeler AAF for instrument flying on different types of aircraft. The airfield was ideal for training because it had a good approach, runway length, and take off clearance. This field was not over populated like Hickam or Wheeler. It is documented that the 18th Air base Group, 47th Pursuit Squadron was stationed there along with B-24s and B-17s that were based at Kahuku for short periods of time during World War II.***

The Airfield encompassed runways, taxiways, revetments, bunkers and artillery emplacements. A composite of three blueprint sheets of the airbase shows its various components (see Figure 2-49); note the U-shape revetments used for airplane storage located adjacent to the runways. A recent aerial photograph of the Resort property (Figure 2-50) shows the extent of the Kahuku Army Airfield facility superimposed on it as well as a large area for barracks and other facilities inland of the Airfield (see Figure 2-38). The Airfield, revetments and barracks occupied approximately 195 acres (23%) of the Resort property.

The surviving remnants of the airfield recorded during the SAIS fieldwork consist of a concrete pillbox located at Kawela Bay (Site 7261), 11 sites located in the Kahuku Point Archaeological Preserve (Sites 7262-7264, 7266 and 7268-7274), six sites located in Test Area E (Sites 7275-7278 and 7280-7281) and five sites located in Test Area F (Sites 7265 and 7284-7287). Although many of the structures are displaced and badly damaged, likely by tsunami in 1946 and 1957 and during the construction of the golf course, intact remnants of the complex are present. Figure 2-38 depicts the distribution of all World War II era sites documented by the SAIS and prior studies.

The central feature of the Airfield facility is Site 7275, a 717' long section of the original 6,500' long airfield runway. The NE-SW main runway served as the primary feature of the airfield and was used for pilot training. Following the war, the runway was used as a racecourse and as a civilian airfield. An intact earthen revetment (Site 7264) that is present to the north of the runway was used for the storage and protection of the military aircraft. It is the only documented revetment of 32 or more that were situated on the north and south sides of the main runway. As is illustrated in Figure 2-38, the extant exposed portion of the runway represents a tiny portion of the overall surface. The SAIS subsurface testing encountered intact asphalt pavement in 27 locations that are depicted as red dots on Figure 2-38. The dots shown within the area of the Site 7275 portion of the runway are surface exposures of the pavement and the

Figure 2-41: Site 7279 plan map



2-42: Site 7279 concrete block

2-43: Site 7279 showing metal strap

2-44: Site 7279 concrete mound with inscription

2-45: Site 7279 concrete mound with inscription

These photos show the remains of a Marconi wireless radio station discovered near Kahuku Point.

Figure 2-46: 1932 U.S. Coast and Geodetic survey map

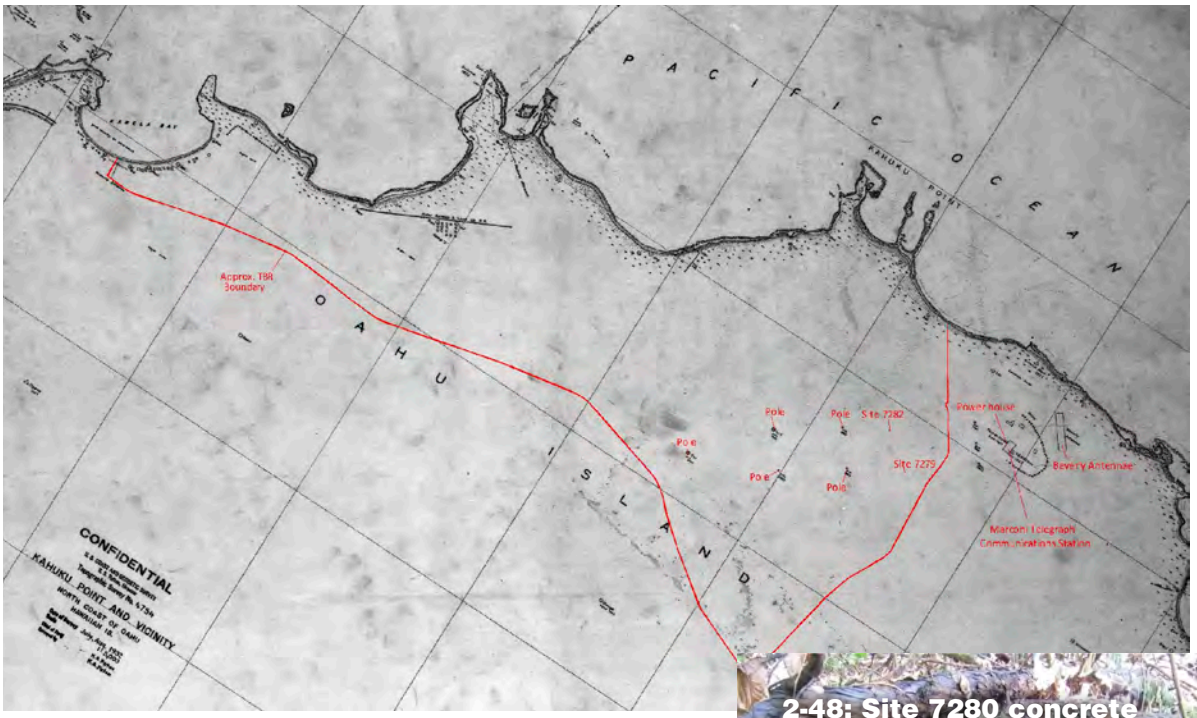


Figure 2-47: Transmitting aerials at Marconi Telegraph Communication Station

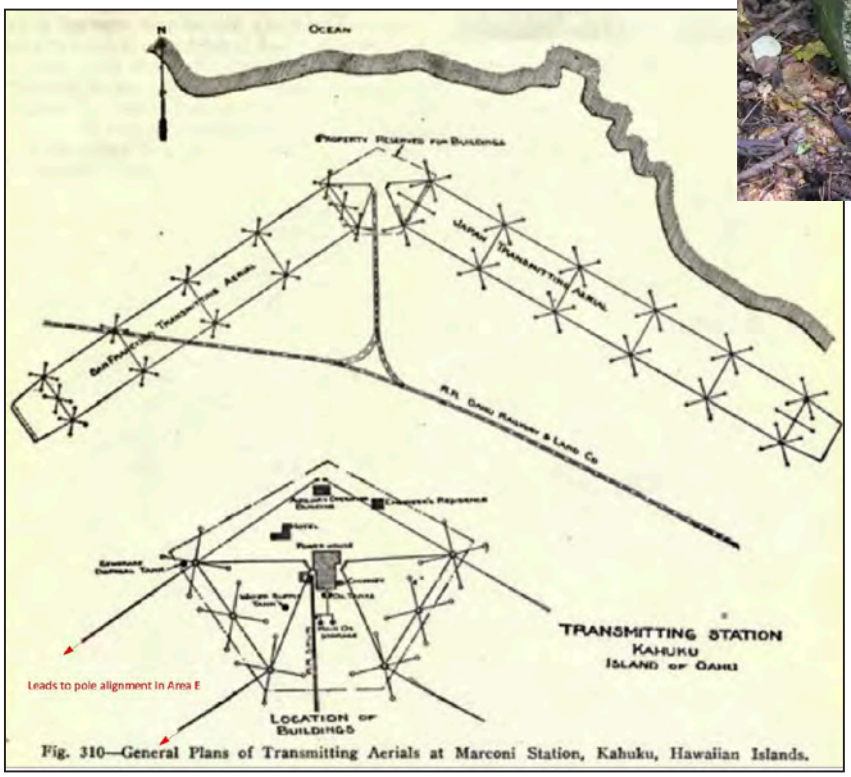
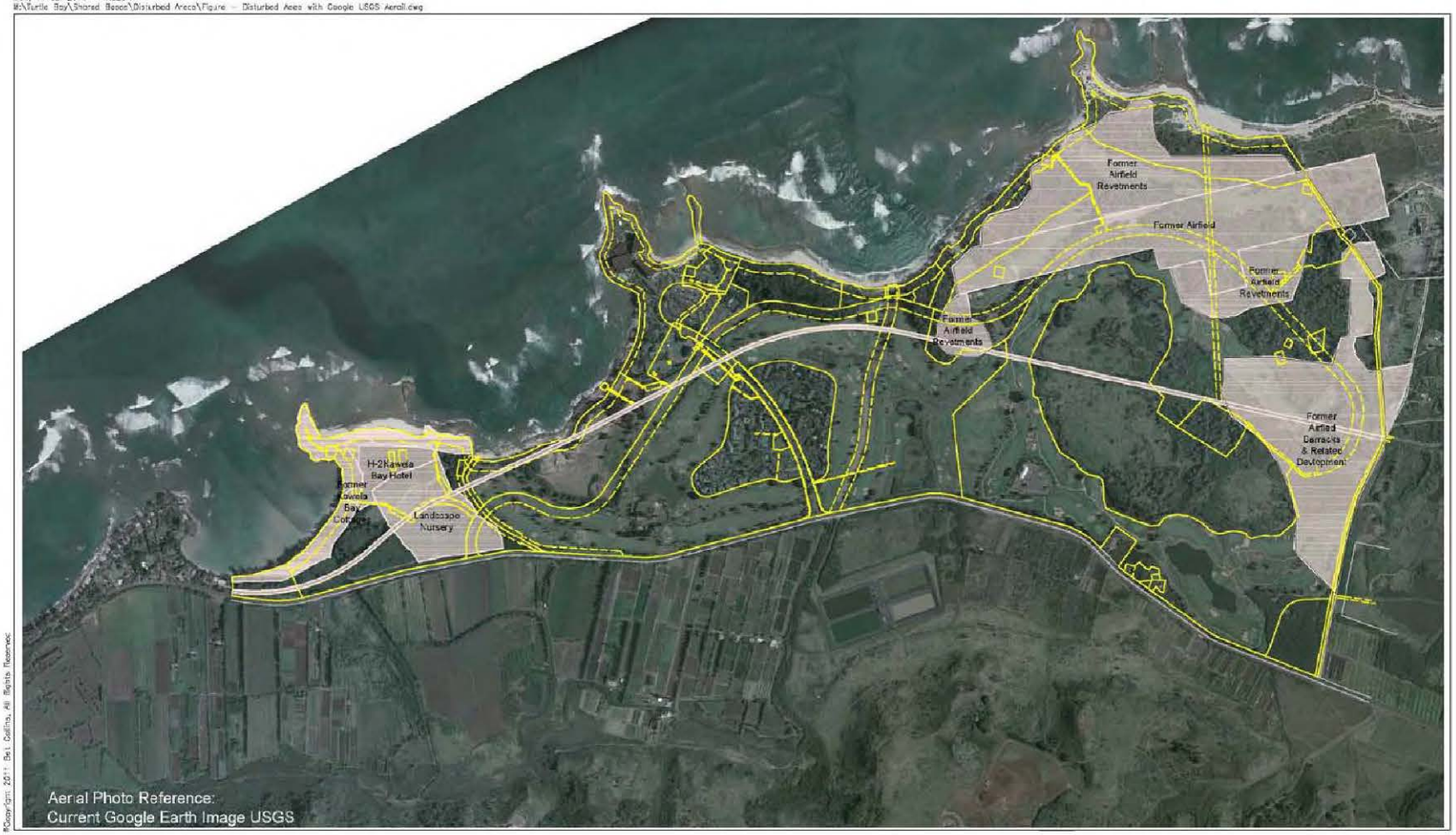


Fig. 310—General Plans of Transmitting Aerials at Marconi Station, Kahuku, Hawaiian Islands.

The concrete structure above may have been a base for one the station's many antennas, which were laid out in vast arrays.

Figure 2-49: Composite map of Kahuku Army Airfield

Figure 2-50: Disturbed Areas, Previous Use/Development Activities Plan



BELT COLLINS

NORTH 0 250 500 1000 SCALE IN FEET

Overlay Reference:
1943 War Department Topo Kahuku/1949 Aerial Photo, Topographic Survey from R.M Towill Corporation dated 10/11/2005, and Construction Plans for H-2 Kawela Bay Hotel dated 10/15/89

Figure
Disturbed Areas
Previous Use / Development Activities Plan
Turtle Bay Resort
July 2011

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other red dots denote intact runway pavement in subsurface contexts in test trench walls. The dots within the runway foot-print shown on Figure 2-38 were part of the main runway and the ones situated elsewhere represent remnants of taxiways, service aprons, roads, and other paved areas; however, no attempt was made to correlate these with specific features.

Figure 2-38 color codes the Airfield SIHP site numbers with degraded physical integrity, in which pink indicates displaced remains, and blue indicating in place, but damaged features. All except for one of the displaced sites are situated adjacent to the shoreline and probably represent structural remnants that were displaced by the 1946 and/or 1957 tsunamis. The one displaced structure situated inland is Site 7287, located in the airfield barracks area (see Figure 2-51). The structure is situated upside down on a mechanically-piled berm of boulders and other debris. Site 7287 appears to be identical to a relatively intact concrete structure, Site 7278 (based on dimensions and other construction attributes), situated in the central portion of the airfield facility in between the main runway and the inland barracks area (see Figures 2-52, 2-53 and 2-54). Two other sites consist of concrete structural remnants that probably are from the same type of structure (Sites 7272 and 7281). The structures all are interpreted as possible gun positions, potentially open revetments for anti-aircraft guns, based on their morphology and locations around the periphery of the main runway facility.

Figures 2-40 and 2-55 show the locations of several sites associated with the Airfield. Figure 2-40 is a 1942 aerial photograph showing the Airfield facility as originally constructed. It shows the OR&L Railroad line (Site 5791) extending through the facility and the probable locations of several sites along the rail line. The railroad was used to transport troops to base (Bennett 2011). A group of faintly visible structures potentially includes a cluster of six concrete pads recorded as Site 6417 by Corbin (2003; see Haun et al. 2011:63, figure 32). Figure 2-55 is a 1943 map of the main cantonment, or barracks area from Bennett (2011:54). It shows the same area depicted in the Figure 2-40 aerial photo.

The map (see Figure 2-55) also shows the location of the most intact group of Airfield structures on the Resort property. These are the foundations of three buildings at Site 7284 (Features A, B and D) that were apparently constructed in 1943 based on their absence in the aerial photograph from the previous year. Also shown are the locations of the Site 7265 concrete slab and Site 7286 pavement. The concrete slab apparently was the foundation for a large building, probably a warehouse situated on the inland side of the OR&L railroad. The Site 7286 asphalt pavement is correlated with an expanse of pavement at a road intersection on the seaward side of the railroad grade. (SAIS Trench F-3-9 was excavated on the inland side of the pavement and encountered an asphalt pavement overlying probable railroad grade fill indicating the Site 7286 pavement also served as a railroad crossing.) The gate posts recorded as Site 7285 probably were positioned on either side of a main road leading from this paved intersection seaward toward the main runway. The estimated locations of the slab, pavement, and gate posts are also shown on the Figure 2-44 aerial photograph.

The remaining site identified during the SAIS fieldwork is an abandoned 1950s era bus in Test Area A (see Figures 2-56 through 2-59). The Site 7267 bus was operated by the Honolulu Rapid

Figure 2-51: Site 7287 displaced concrete structure remnant

Figure 2-53: Site 7278 concrete structure

Figure 2-52: Site 7278 plan map

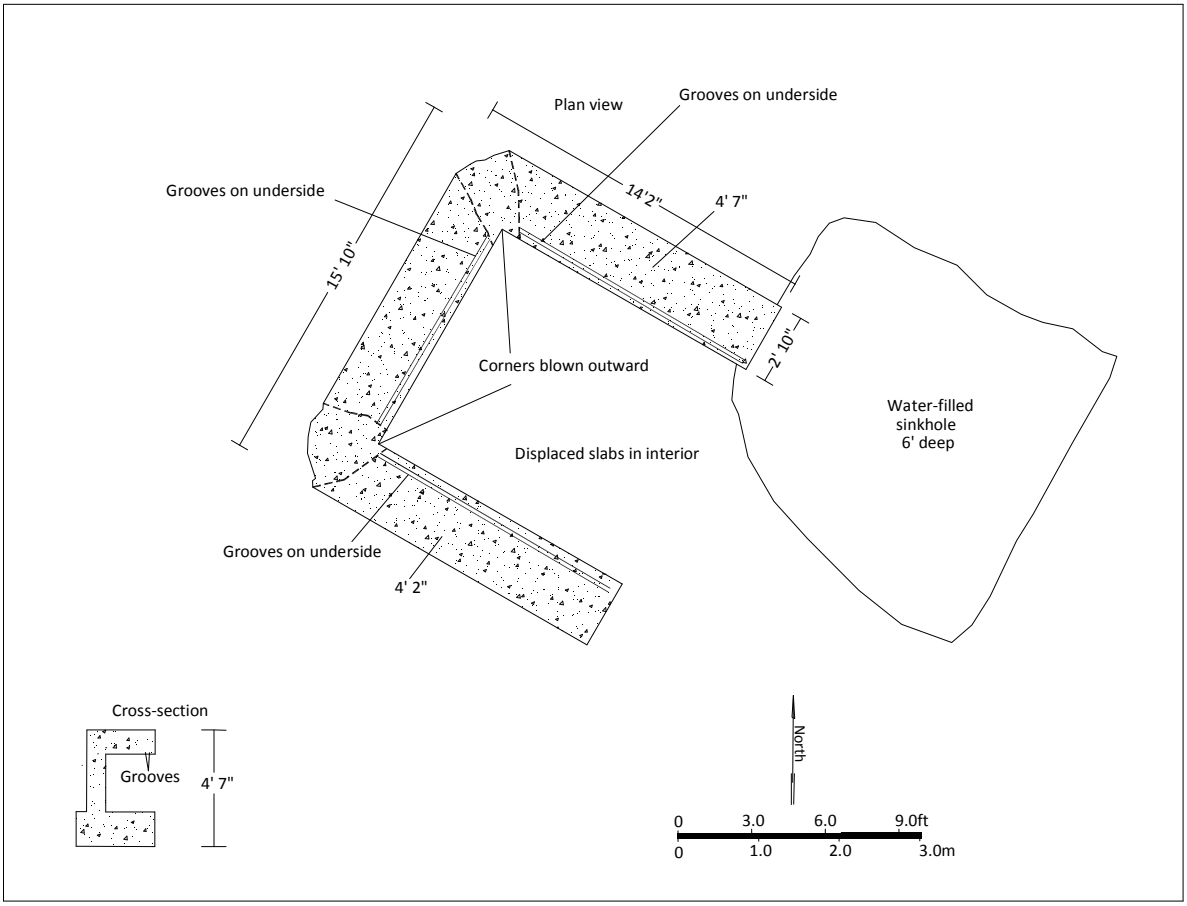


Figure 2-54: Site 7278 blown out corner of concrete structure

Transit Company for the City and County of Honolulu until at least 1973. Sugarcane cultivation continued until 1971 when the Resort and golf course were constructed. Some inland portions of the property continued to be used for vegetable farming until the 1980s.

F. 2. Cultural Resources

A Cultural Impact Assessment (CIA) of the Proposed Action was prepared by Pacific Legacy Inc. and is included in the SEIS as Appendix D. The CIA is divided into three parts; 1) a discussion of the cultural and archaeological history of the project and the surrounding region based on archival research; 2) the identification of current cultural practices on the property based upon oral history interviews conducted as part of the CIA, and 3) an analysis of the project's anticipated impacts upon identified cultural practices.

F.2. a. Archival Information

Because the archaeological information presented in the CIA is too voluminous to present here in detail, the reader is directed to Sections 3 and 4 of the report (Appendix D) for this background information. The CIA also replicates much of the archaeological information presented in the Supplemental Archaeological Inventory Survey conducted in 2012 for the project and presented in Appendix C. Following is a summary of the information presented in the CIA.

Archival research has revealed that, in general, the SEIS Lands and surrounding areas have a long and interesting history. From the archaeological record, traditional stories and myths, and historic documents attributed to this vast area, it is evident that these lands have been the stage of many significant acts in the long drama of Oʻahu's pre- and post-Contact history. Oral traditions and historical references to the specific area are ubiquitous as found in the CIA and previous historic investigations (Silva 1984; Wong-Smith 1989).

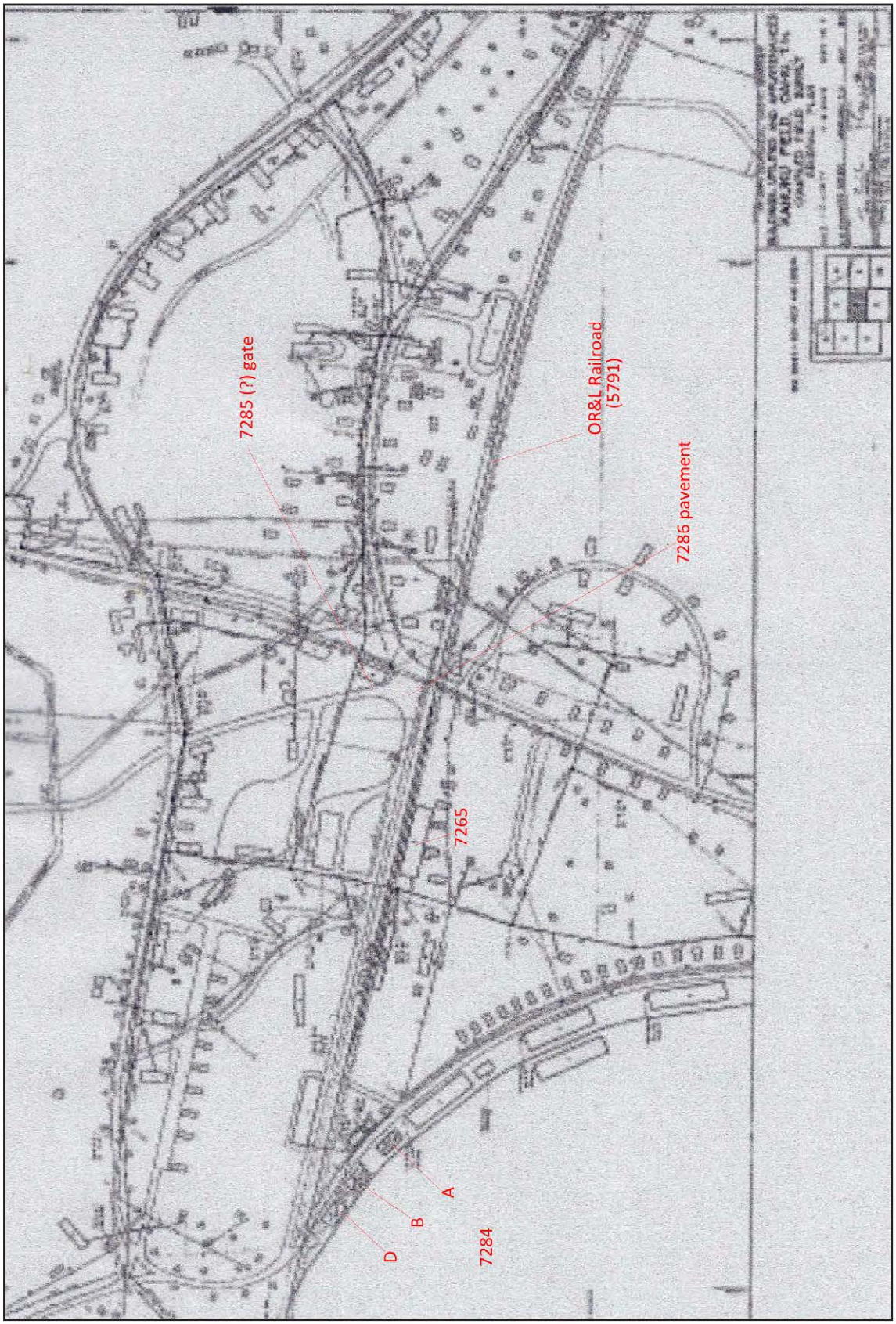


Figure 2-55: Main cantonment of Kahuku Army Airfield

Figure 2-56: Surface of Test Area A

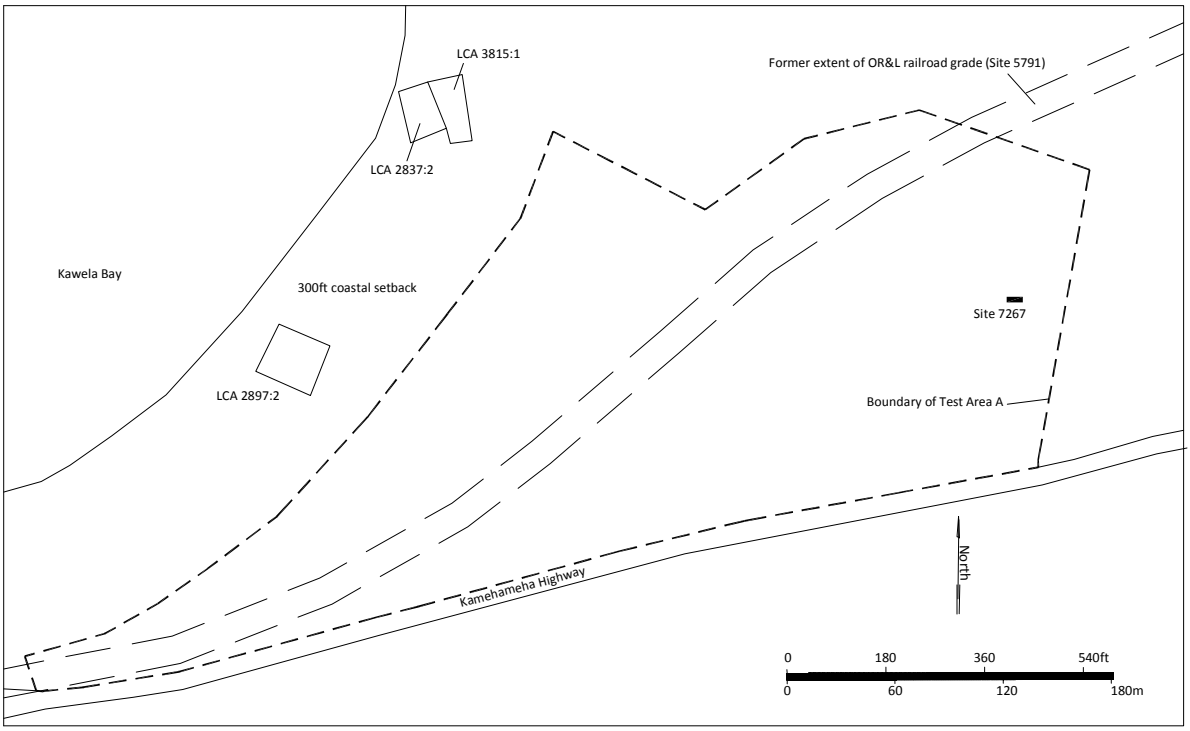


Figure 2-57: Site 7267 bus

Figure 2-58: Honolulu Rapid Transit Company brochure

Figure 2-59: Site 7267 license plate

Two previously written reports (Silva 1984; Wong-Smith 1989) provide excellent summaries of the legendary and historical background of the project area. As a component of the 1985 Kuilima Resort Expansion Revised Environmental Impact Statement, Silva (1984) compiled mythological and historical records for the *ahupuaʻa* of ʻŌpana, Kawela, Hanakaʻoe, ʻŌʻio, Ulupehupehu, Punalau, and Kahuku (Group 70:1985). That information is included in the SEIS by reference. Another noteworthy historic research document was composed by Wong-Smith (1989) on the lands of Kahuku. This document was intended as a component of the Archaeological Inventory Survey, Punamanō and Malaekahana Golf Courses (Jensen 1989). Both Silva (1984) and Wong-Smith (1989) manuscripts are provided in Appendix B of the CIA.

The Resort has been the subject of numerous archaeological investigations between 1977 and 2006, resulting in 21 individual reports. These archaeological investigations have documented 19 archaeological sites providing data from 291 auger tests excavations, 121 controlled excavations, 78 radiocarbon dates, 50 pollen samples, and substantial midden and artifact collections. The concordant Supplemental Archaeological Inventory Survey (SAIS) adds a significant amount of data to the existing archaeological record for the project area.

F.2. b. Oral History Interviews

The purpose for oral interviews is to acquire information from *kūpuna* and local knowledgeable individuals about the background and contemporary cultural use, if any, of the subject property that could be adversely affected by the Proposed Action.

Concerted attempts were made by Pacific Legacy to identify and locate persons knowledgeable about traditional practices that took place in the past or that are currently taking place in the Turtle Bay area and potentially impacted by the expansion project. In addition to prior CIA reports written about the Kahuku area (Collins and Nees 2006; Hammatt 2008), the State Office of Environmental Quality Control (OEQC) and Office of Hawaiian Affairs (OHA) were consulted for a listing of Cultural Assessment Providers. Various Neighborhood Boards, civic clubs, and other North Shore community associations were also contacted to obtain cultural informants. Appendix C of the CIA provides a listing of potential cultural informants and their detailed contact history. Of the 68 individuals recommended by others informants or identified through research as potential cultural informants, contact information was found for 52 individuals, all of which were solicited for participation. While no response was received from 15 of those asked to participate, 37 individuals responded and 16 interviews were secured. Many of those who responded to interview requests did not wish to be interviewed, but recommended other, more knowledgeable individuals or community groups to interview. One cultural informant, Cathleen Piʻilani Mattoon, wrote a letter on behalf of the Koʻolau Loa Hawaiian Civic Club outlining the organization's concerns with the development rather than opting to participate in an interview (Appendix F of the CIA).

A total of 16 interviews were conducted between 4 May and 11 April 2012. All interviewees had a personal association with the Resort area, most of which were repeatedly recommended by various sources in the community. Most informants are active in the local community and well respected for their leadership and knowledge of the project area and its history. Table 2-13

provides a list of the consulted parties, their association with the Resort project area, and form of interview.

During the typical interview, a basic questionnaire (Appendix D of the CIA) was used as a guide to solicit interviewees' knowledge of the area and biographical information. Maps of the Turtle Bay project area were used to further assist the interview process and gain specific information about locations of resources and/or cultural practices. After the interview, an interview summary was created. The interview summary was then shared with the interviewee for review, which allowed them the opportunity to correct, add, and/or delete information in their testimony. These interviews were occasionally supplemented with subsequent personal and telephone conversations with informants for clarification and additional information. When the interview summary met their approval, the interviewee was asked to sign an Oral History Release Form. Copies of release forms are provided in Appendix E of the CIA. Summaries of the resulting interviews are presented in Section 6.1 of the CIA.

Ethnographical evidence obtained through community consultations upholds the archival research findings that the Resort property was abundant in cultural resources and lore, though much has changed throughout time. These community consultations also verified the existence of cultural practices, such as the gathering of various traditional marine and terrestrial resources. Out of the sixteen interviews performed, information from 15 interviews is represented in the CIA report, omitting testimonial information from one individual who requested that the interview not be included. From the thirteen interviews a variety of cultural resources in the Resort property were identified, including a total of 40 species of flora and fauna as well as *paʻakai* (sea salt) (Figure 22; Tables 7 and 8 in the CIA).

F.2. c. Identified Traditional Cultural Resources

From the Resort coastline and coastal waters, 32 marine species, including 17 species of fish, six crustacean, one mollusk, two gastropod, two sea urchin, and four sea weed species were identified as cultural resources, as summarized in the table below. A total of six plant species and two tree species were identified as collected from inland areas of Resort. These resources are currently being gathered by an array of Hawaiian cultural practitioners for a variety of traditional activities, including *lāʻau lapaʻau* (herbal healing), *kālai kiʻi* (wood carving), *lei* making, cordage making, and consumption. While none of the informants claimed that any of these cultural resources were the last of their kind or this was the only place to collect them, the majority of those interviewed shared that these resources have drastically declined in their lifetimes and are now found in diminutive numbers. Further, the locations of many resources are guarded secrets according to many informants who fear over-harvesting to the point of extinction.

With regard to cultural practices being performed in and around the Resort property, other than the gathering of marine and terrestrial resources, no traditional activities were reported as occurring at the present. While surfing and paddling occur in waters around the project area, according to Kahu Helemano, Ms. Napeahi, and Mr. Pawn, none of the thirteen interviewees held this area as being a traditional or culturally significant surf spot. The lack of reference to

Table 2-13: Persons Consulted for the Cultural Impact Assessment

Name(s)/Title	Association	Form of Interview
Ralph Makaiau, Kupuna	Senior Project Manager of Turtle Bay Development; Native Hawaiian area descendent; Kahuku Burial Committee	Person-to-person, at Turtle Bay
Nova-Jean McKenzie, Kupuna	Kuleana land owner in Turtle Bay property; Native Hawaiian area descendent; Kumu of Hawaiian Studies, Retired	Person-to-person
John Colburn, Kupuna	Native Hawaiian area descendent; Kuleana land owner (east of Turtle Bay property)	Person-to-person, joint with Pua Colburn
Pua Colburn, Kupuna	Kahuku Burial Committee, member; Kuleana land owner (east of Turtle Bay property)	Person-to-person, joint with John Colburn
Junior Primacio, Kupuna	Fourth Generation Kahuku Village resident; Former plantation worker; Koʻolau Loa Neighborhood Board, Chair on Agriculture and Parks and Recreation Committees	Person-to-person, joint with Gladys Pualoa-Ahuna
Gladys Pualoa Ahuna, Kupuna	Seventh-generation resident of Lāʻie; Member of Koʻolau Loa Neighborhood Board	Person-to-person, joint with Junior Primacio
Carol Anamizu, Kahuna Lāʻau Lapaʻau	Former resident of Kuleana east of project area; collects traditional Hawaiian medicinal plants within the Turtle Bay property; Native Hawaiian cultural practitioner	Part I: Person-to-person, Part II: tour of traditionally used plants in the Resort; Part III person-to-person
Butch Helemano, Kahu	Native Hawaiian area descendent and cultural practitioner; Master Hawaiian wood carver; collects plants and wood within the Turtle Bay property; Former resident of Turtle Bay	Person-to-person
Raymond "Buddy" Ako, Kupuna	Community Liaison for Turtle Bay Resort Development; Longtime employee of Turtle Bay Resort; Former resident of Kahuku; educated in Kahuku	Over-the-phone
Dawn Wasson, Kupuna	Educator of Hawaiian traditional practices; collects medicinal plants within the Turtle Bay property; Former resident of Kahuku	Person-to-person
Robert Nakata, Reverend, Kupuna	Former Hawaiʻi State Senator; member of Koʻolau Loa Neighborhood Board and other civic associations	Person-to-person
Mark Kahuokapono Manley	Commercial Fisherman; Native Hawaiian Cultural practitioner; Long-term resident of Kawela Bay; combines modern and traditional fishing methods	Person-to-person
Wayne Gemeno	Fisherman; fishes on Turtle Bay coast regularly for 50+ years; Plantation descendent	Person-to-person, at Turtle Bay
Kylie Matsuda	Managing Director, Kahuku Farms; Inc. Fourth generation at Kahuku Farms; plantation descendent	Person-to-person, withdrawn
Josanda Napeahi	Recreation and Security Officer at Turtle Bay Resort, eleven years; Native Hawaiian cultural informant	Person-to-person, at Turtle Bay
Marshall Pawn	Recreation and Security Officer at Turtle Bay Resort, seven years; Lifelong resident of Hauʻula; cultural informant; plantation descendent	Person-to-person, at Turtle Bay

this activity in the archival research upholds this idea as well. As Aunty Pua noted, the waters in this area are much too rough most of the year and there are better surf spots to the west. This was echoed by Kumu McKenzie during her interview.

Table 2-14: Cultural Resources Identified at the Turtle Bay Resort Property

	Hawaiian Name	Common Name	Scientific Name
Marine Resources	*ʻAʻawa*	Hawaiian hogfish, Table boss	*Bodianus bilunulatus*
	Āholehole	Hawaiian flagtail	*Kuhlia sandvicensis*
	ʻAmaʻama	Striped mullet	*Mugil cephalus*
	ʻAnae	Mullet	Mugilidae spp
	ʻĀweoweo	Bigeye, glasseye	Pricanthidae spp.
	Kala	Unicorn fish	Acanthuridae spp.
	Manini	Convict Tang	*Acanthurus triogus sandvicensis*
	Moi	Six-fingered threadfin	*Polydactylus sexfillis*
	Nunue	Sea chub, rudderfish	Kyphosus spp.
	ʻŌʻio	Bonefish	Albula spp.
	Palani	Eyestripe surgeonfish	*Acanthurus dussumieri*
	Weke	Goat fish	Mullidae spp.;
	Puhi	Moray eel	Gymnothorax spp.
	Toʻau	Blacktail snapper	*Lutjanus fulvus*
	Uhu	Parrotfish	Scaridae spp.
	Ulua (juv. *Pāpio*)	Jack, Trevally	*Carangidae spp.*
	ʻŪʻū	Soldierfish, menpachi	Myripristis spp.
	ʻAʻama	Natal lightfoot crab	*Grapsus grapsus tenuicrustatus*
	Kuahonu	*Haole* crab	*Portunus sanguinolentus*
	Lolo	Sand crab, Ghost crab	Ocipodidae spp.
	Pāpaʻi kualoa	Kona crab	*Ranina ranina*
	ʻUlaʻula (also *ʻula*)	Spiny lobster	*Panulirus marginatus*
	ʻUla pāpapa	Slipper lobster	*Arctides regalis*
	Heʻe	Octopus and squid	Cephalapoda spp.
	Pipipi	Nerites	*Nerita picea*
	ʻOpihi	Limpets	Patellidae spp.
	Wana	Sea urchin	Echinoidea spp.
	Hāʻukeʻuke	Shingle urchin	*Colobocentrotus atratus*
	Limu kohu	None	*Asparagopsis taxiformis*
	Limu maunawea	*Ogo, ogonori (Japanese)*	Gracilaria spp.
	Limu waiwaiʻole	None	*Codium edule*
	Limu ʻopihi	None	*Grateloupia*, *Polyopes*, and *Gymnogrongus* spp
Terrestrial Resources	*Hala*	Pandanus, screw pine	*Pandanus tectorius, Pandanus odoratissimus*
	Hinahina	Native heliotrope, beach heliotrope	*Heliotropium anomalum*
	Koali	Morning-glory	Ipomoea spp.
	Lauwaʻe	Creeping fern, maile-scented fern	*Phymatosorus scolopendria*
	Naupaka	Scaevolas, fan-flowers, half-flowers	*Scaevola* spp.
	Pōhuehue	Beach morning glory	*Ipomoea pes-caprae subsp. brasiliensis*
	Kamani	Beach mahogany, oil nut tree	*Calophyllum inophyllum*
	Milo	Portia Tree	*Thespesia populnea*

F.2. d. Iwi Kūpuna

Adding to the cultural significance of the Resort property is the existence of several other cultural connections[6] of the Hawaiian community to these lands. As evidenced by previous archaeological investigations, inadvertent discoveries, as well as community consultations there are known human burials within the property, specifically in sand dune areas.

Iwi kūpuna are the ancestral skeletal remains of Native Hawaiians. These remains are highly revered by contemporary Hawaiians. It is believed that, upon death, the *na iwi* of a person become the repository of the *mana* (power, authority) they possessed in life. The method of Hawaiian burials varied with an individual's rank, changed through time, and differed from one area to another. Coastal properties, especially where there are areas of sand, were common grounds for Native Hawaiian burials. Traditionally, the *kuleana* (responsibility, privilege) of caring for *na iwi* was a sacred task. In general, today's Native Hawaiians strongly believe that *iwi kūpuna* should not be disturbed and rest in the original place of burial. However, there can be mitigating circumstances such as erosion that result in the re-interment of threatened remains to be considered. In these cases, the guidance of lineal descendants or, in their absence, *kupuna* with a spiritual connection to the land may be sought.

Sensitivities regarding the *iwi kūpuna* are high, given the past disturbances. Obviously, for those with ancestral ties to the land, the *iwi kūpuna* represent and reinforce spiritual ties to the land. Several interviewees objected to any disturbance of *iwi kūpuna*. Also mentioned in several interviews were manifestations of ancestor spirits and supernatural phenomenon within the property. In the testimony of Ralph Makaiau, as a child he experienced a supernatural force on this property that seemed to challenge his very being and ties to the land, yet his father contested this force, successfully warding off or placating the conflicting force. This act solidified Mr. Makaiau's spiritual connection to his ancestral lands. Another example is the existence of "Night Marchers," which are widely held by locals to traverse through the property. Mr. Makaiau suggested that the very name of the *ahupua'a* "'Ōi'ō" or "'Oi'o", which translates as "Procession of ghosts of a departed chief and his company," refers to this path (Pukui and Elbert 1986:280). Kahu Butch Helemano maintains that these warrior spirits are the ancestors of his and others who have roots in this area. This is upheld by Aunty Dawn Wasson's account of the hotel being built in the location of an ancient *heiau* that was demolished prior to its construction. Aunty Dawn holds that harmful consequences of disturbing this site have already occurred and could transpire in the future.

Since the initial construction of the hotel in the early 1970s, the inadvertent discovery and treatment of *iwi kūpuna* has been a point of contention at the Resort. Traditionally, the *kuleana* (responsibility) to *mālam*a (take care of) the *iwi kūpuna* was in the hands of the descendents and/or the *konohiki*. However, these lands have had many owners and withstood many developments, which has made it difficult for the proper treatment of *iwi kūpuna*. Further, as a

[6] For the purposes of the SEIS, the preservation and custodial care of iwi kupuna is considered to be a cultural connection to the past, rather than a specific "activity".

Burial Treatment Plan (BTP) was not required by law until the late 1980s, the treatment of *iwi kūpuna* was discretionary until that time. In most cases, inadvertently discovered *iwi kūpuna* were removed from Resort property and held in a State Historic Preservation Division repository until a suitable location for re-interment near to the original burial location was decided.

In response to *iwi kūpuna* that had been exposed in the Kahuku area over the years and not properly cared for, a group of local *kūpuna* formed a committee to deliberate over the proper treatment of their ancestral remains. This group eventually formed the Kahuku Burial Committee (KBC), which is currently entrusted with the decision making process over the proper treatment of disturbed and displaced *iwi kūpuna* by the general community of Kahuku and surrounding *ahupuaʻa*. Distinguished members of the KBC are well respected *kūpuna* and cultural practitioners with ties to area, by blood and *hānai* (traditional Hawaiian practice of adoption), such as Richard and Lynette Paglinawan, Pua Colburn, Ralph Makaiau, Nova-Jean McKenzie, and several other prominent *kūpuna* of the greater Kahuku area. While individuals who claim relations by *hānai* are currently not recognized by the Oʻahu Island Burial Council (OIBC), many Native Hawaiians have *hānai* family members and would not think of them as anything but family.

Several years ago, TBR consulted with the KBC over *iwi kūpuna* encountered on Resort property with the main goal of proper treatment of *iwi kūpuna* and privacy of the descendents. From that period on, KBC has met regularly for several years with TBR, deliberating over the most proper and peaceful resting places of the *iwi kūpuna* – preferably within the *ahupuaʻa* of origin and in a context that allows the descendents access and privacy. Great care is taken during these deliberations to examine each case and look into every reburial option to ensure that the treatment is *pono* (righteous) for each *iwi kūpuna.* Furthermore, KBC has committed to securing permanent re-interment locations within the *ahupuaʻa* of origin under the TBR proposed *ahupuaʻa* configuration of ʻŌpana-Kawela, Hanakaʻoe, and Kahuku, which will ensure that inadvertent discoveries are reinterred in a suitable location within a reasonable timeframe that is discrete and accessible to the descendants. Currently, TBR is drafting a BTP with the aid of KBC, which will then be submitted to the State Historic Preservation Division (SHPD) and the OIBC for approval. While the official decision over how the *iwi kūpuna* are finally laid to rest is left to the OIBC, the KBC is the consultant body to which the OIBC will likely defer.

The archaeological documentation of *iwi kūpuna* was summarized by Haun (2011:68), where the discovery, recordation, and treatment of *iwi kūpuna* (ancestral skeletal remains) has been compiled for the project area from 1984 to 1993 (Bath *et al.* 1984; Neller 1984, 1989; Walker *et al.* 1988a, 1988b; Sullivan 1990; Kennedy 1992; Carson *et al.* 1996, 1999). According to the SAIS conducted by Haun & Associates in 2012, the skeletal remains of 27 individuals have been discovered in the project area during sand mining of dunes, vehicular disturbances to sand dunes, subsurface testing, and archaeological monitoring of hotel construction activities. Following is a summary of the identified burials. Of the 27 individuals, two (2) were discovered during the 2012 supplemental archaeological inventory survey, as discussed in Section I.1.e.1 above.

Table 2-15: Burials Identified in the SAIS for Turtle Bay Resort

Site Number	Sequential Burial Number	Number of Burials
4488*	11-14, 17	8
6410	1	1
6410	2	1
6410	3-6, 9	5
6423	7	1
6423	8, 10	2
6411	15, 19	5
6411	16, 18	2
7288	(Haun 2012)	1
7289	(Haun 2012)	1
		Total: 27

F.2. e. Contemporary Cultural Use of the Land and Sea

The following contemporary cultural uses of the property have been identified, based upon the archival research and oral history interviews conducted for the CIA.

As cultures are neither static, nor impervious to outside influence, the SEIS Lands and surrounding lands and waters are currently used for Hawaiian traditional practices, traditional practices from abroad, modern practices, modern versions of traditional practices, and any manner of combination or hybrid of these practices. Thus, the lines between traditional cultural practices as they exist in modern times have become obscured. This section provides a summary of traditional Hawaiian and non-traditional cultural activities associated with the subject area as they are practiced in the modern era.

Traditional Practices: An array of traditional activities are currently being practiced on the Resort coast and surrounding areas.

Fishing and Marine Resource Gathering: Fishing as well as the collecting of shellfish and *limu* (seaweed) were crucial activities in maintaining the traditional Hawaiian diet. While pig, dog, chicken, and wild birds were sources for protein in the diet, fish and shellfish were the main protein sources (Titcomb 1977). According to John Clark (2003), the Resort coast contains several popular and/or traditional fishing sites, including:

- **Kauhala:** Located on the eastern extreme of what is now referred to as Kuilima Bay, next to Kahuku Point (John Clark 2003:167).

- **Ono Ledge (also known as "The Ledge").** This ledge follows the 240-foot marine contour line between Kahuku and Ka'ena Points. Trolling for *ono,* or wahoo, is common here (John Clark 2003:272).

Fishing in these waters has numerous forms, including: pole, throw-net, netting, trapping, spearing. While a significant portion of fishermen and women are local, a diverse group of people come from near and far to fish using traditional methods in these waters.

Swimming and Diving: *Au or ʻaukai* (swimming) for sport, referred to as *hei-hei-au*, is an ancient Hawaiian tradition according to anthropologist, Stewart Culin (1899:211), where males were known to race each other in competition and at times for prizes or wagers. Diving, for sustenance has long been a tradition in Hawaiʻi. John Clark (2003) also lists a number of popular and traditional sites within the Resort coast to swim and dive, including:

- **Kahuku Ledge:** Located three-quarters of a mile off of Kahuku Point at 70 foot marine contour line and parallel to shore. Popular diving ledge (John Clark 2003:139).
- **Kalokoiki (also known as Keyhole):** A sandy beach and protected cove between Kalaeokaunu (Kuilima Point) and Kalaeokamanu (John Clark 2003:385).
- A swimming pond and beach located east of Kawela Bay (John Clark 2003:385).
- **Wild Beach:** Located between Kawela Bay and Kuilima Point. The name refers to the irregular or "wild" wave patterns during high surf. Swimming and diving (John Clark 2003:390).

Surfing: *Heʻe nalu* (surfing boarding) and *kaha nalu*(body surfing) are also longstanding Hawaiian traditions (Finney 1959). According to Pukui and Korn (1973:36), in ancient Hawaiʻi, surfing was a way of life and a "discipline for heroes."

The *papa heʻe nalu* (surfboard) was also an important possession in ancient times. Pukui and Korn (1973) maintain that "Both males and females regarded surfboards as prized pieces of property and selecting their names required much thought." (Pukui and Korn 1973:36). Culin (1899:212) describes the *papa heʻe nalu* of the historic era as made of wood from the *wiliwili* (*Erythrina corallodendrum*), *ʻulu* (breadfruit; *Artocarpus altilis*), or *koa* (*Acacia koa*) trees. He adds that the boards measured up to six feet long and a little over a foot wide, occasionally flat, but often slightly convex on top and bottom. These boards were typically stained black and after each use, it dried and rubbed down with coconut oil then wrapped in cloth and suspended in the owner's house (Culin 1899:212).

According to John Clark (2003), the Resort coast contains several surf breaks, including:

- **Gordieland:** Located off the north point of Kawela Bay (John Clark 2002:81).
- **Marconi:** Located between Kahuku Point and Kalaeuila, or High Rock (John Clark 2003:238).
- **John Jack:** Located adjacent to Kahuku Point (John Clark 2003:129).
- **Wilds:** Located between Kawela Bay and the Turtle Bay Hilton Hotel (John Clark 2003:390).

Canoeing: Canoe racing, or *he'e wa'a*, was also observed as a traditional Hawaiian sport in the late 1800s (Culin 1899:211), that has continued to be practiced today in waters off of the Resort's coasts. In the Historic period, "Two or more canoes race, usually out to sea, the course being a mile or a mile and a half out and around a flag buoy and return…" (Culin 1899:211). Paddlers, with outriggers ranging from single rider to crew size, continue this ancient tradition. One access location for canoe paddling is Kalokoiki (also known as Keyhole). People are permitted to launch larger outrigger canoes, but the access is small and crowded.

Contemporary Activities: While the Resort provides an array of recreational activities for its guests and visitors, the vast coastline and public access areas allow the local community to perform cultural practices as well as recreate on the Resort property. A number of popular and/or traditional activity areas are located along the Resort coast. Traditional activities include surfing, swimming, diving, and paddling. Other marine activities that are not attributed to traditional Hawaiian practices, but are now popular are snorkeling and kayaking.

Marine Activities: With such an extensive and varied coastline, in terms of water access, water conditions, presence or absence of reef or sand, etc., there are a plethora of marine sports and recreational activities that occur on the Resort's coast. Throughout this area, Resort guests, visitors, and area residents can be observed on any given day participating in the following activities, some of which are also performed by traditional cultural practitioners:

Some areas are key access areas for various marine sports and recreational activities. The cove known as Kalokoiki and Keyhole, between Kalaeokaunu (Kuilima Point) and Kalaeokamanu is easily accessible to canoes and kayaks.

With regard to wildlife, endangered species such as the *honu* (sea turtle) and *`ilioholoikauaua* (seal) are known to frequent the area, as documented in Chapter Two of the SEIS. While viewing these endangered species has become a popular activity for visitors as well as locals, these animals have, in the past, cultural significance to Native Hawaiians as a food source and in the case of the *honu*, an *`auma`kua* for some families and individuals as well as a source material for a variety of traditional tools (Maly and Maly 2003; Kittinger et al. 2011).

Fishing	Surfing	Motor Boating
Collecting	Kite Surfing	Tropical Fish Collecting
Swimming	Wind Surfing	Sunbathing
Snorkeling	Stand-Up Paddling	Picnicking
Scuba Diving	Paddling	Taking Photos and Video
Free Diving	Kayaking	Wildlife Viewing
Body Surfing	Canoeing	Walking/Jogging
Skim Boarding	Sailing	Body Boarding

Terrestrial Activities: The Resort offers several recreational activities on land for its patrons, including horseback riding, biking, Segway riding, jogging, walking for recreation and fitness, hiking, group fitness classes, tennis and golfing are all activities that are currently occurring on landside of the property. Weddings and memorials often take place on the property as well. In addition, film makers from near and far have used the property for films, television shows, and commercials.

F. 3. Socio-Economic Conditions

A Socio-Economic Impact Analysis, prepared by Belt Collins Hawaii LLC, was conducted for the Proposed Action and is included in the SEIS as Appendix H. Following is a summary of its findings concerning the existing social and economic setting. Chapter Five of the SEIS includes a summary of the report's findings concerning the Proposed Action's socio-economic impacts. Chapter Four of the SEIS includes a summary of the report's comparative evaluation of the Proposed Action and the Alternatives.

F.3. a. Regional Setting

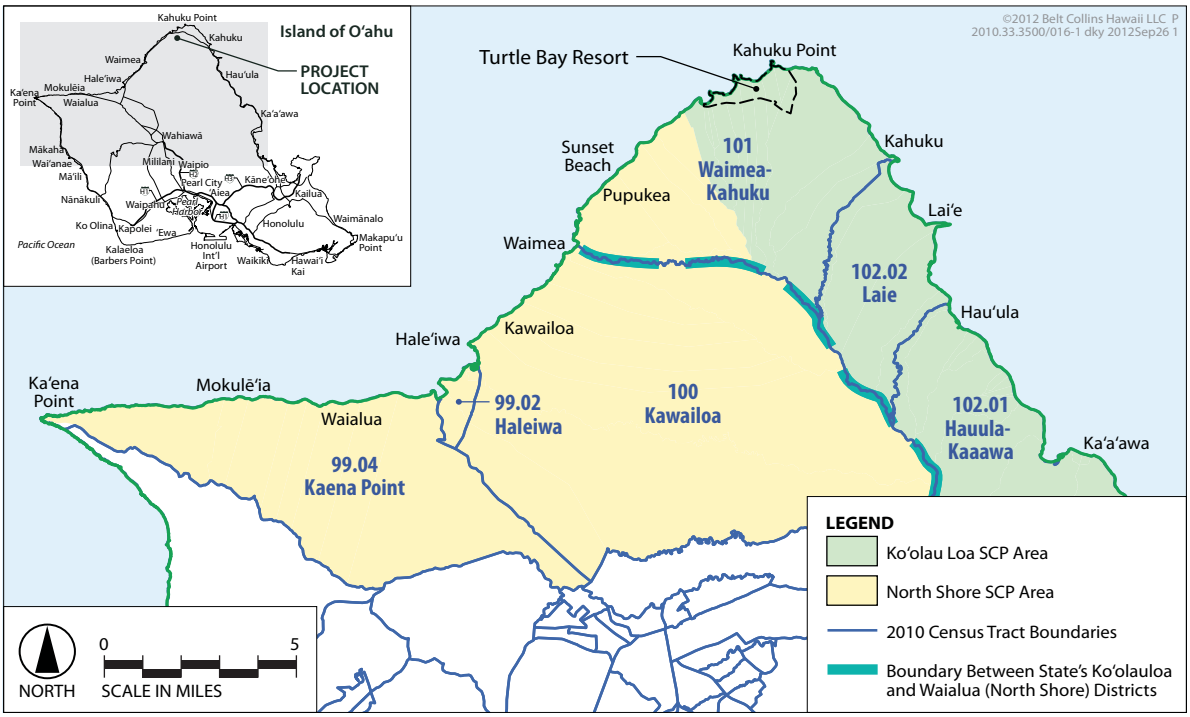
The Resort is located outside the town of Kahuku and near the boundary between the Koʻolau Loa and Waialua (or North Shore) Districts. For the purposes of the SEIS, the combined districts – the Koʻolau Loa/North Shore (KNS) region – will be treated as the area most likely to be affected by change at the Resort. However, the economic consequences of development would extend beyond the region to the remainder of the City and County of Honolulu and the State of Hawaiʻi. County and State governments are charged with providing public services to the region; they collect taxes and fees from the development.

Figure 2-60 shows the region, major communities, and subareas recognized by the U.S. Census and local government. It shows also a source of possible confusion: State and City definitions of local regions diverge. The City and County of Honolulu recognizes Sustainable Communities Plan (SCP) Areas, with a boundary just west of the Resort; the State of Hawaiʻi recognizes judicial districts – and, following the state, the U.S. Census identifies census tracts – with Waimea Bay at the western limit of the Koʻolauloa District.[7]

The two SCP Areas, North Shore and Koʻolau Loa, can be contrasted, with Koʻolau Loa characterized as a network of small, rural communities, while the North Shore is deeply affected by its role as the surfing capital of the world. However, in many ways, residents of the region as a whole share a commitment to their area and to a rural lifestyle.

[7] Appendix A, Table A-1 of the Socio-Economic Impact Analysis identifies the relationship between specific communities and the various federal, state and county boundaries. The City and County of Honolulu uses the spelling Koʻolau Loa, while the State uses Koʻolauloa. The former spelling is used here except when referring to the State's judicial district. The City's approach, which treats Sunset Beach and Pupukea as part of the North Shore, rather than of Koʻolau Loa, seems to fit most regional residents' views better than the State's boundaries.

Figure 2-60: Regional Map



F.3. b. The KNS Regional Economy

Local employers support at least some 6,200 jobs. (Many additional jobs exist in the region, but the employers – for example, the State Department of Education – are located elsewhere. In addition, agricultural jobs are not included in Table 2-16 because comparable data is not available.). Figure 2-61 shows the Zip Code areas in the region.

The largest employers are found in the Lāʻie and Kahuku ZipCode tabulation areas. These include the Polynesian Cultural Center, BYUH, Kahuku Medical Center and Turtle Bay Resort. Kahuku, with the Resort and the Medical Center, has the highest average wage. Haleʻiwa is home to mid-sized retail and food service establishments. Alluvion, which grows and ships plants from Kawailoa, is also in the Haleʻiwa ZipCode area. On the other hand, few businesses are located along the coastline from Kaʻaʻawa through Hauʻula, and their workforce amounts only to 208 persons.

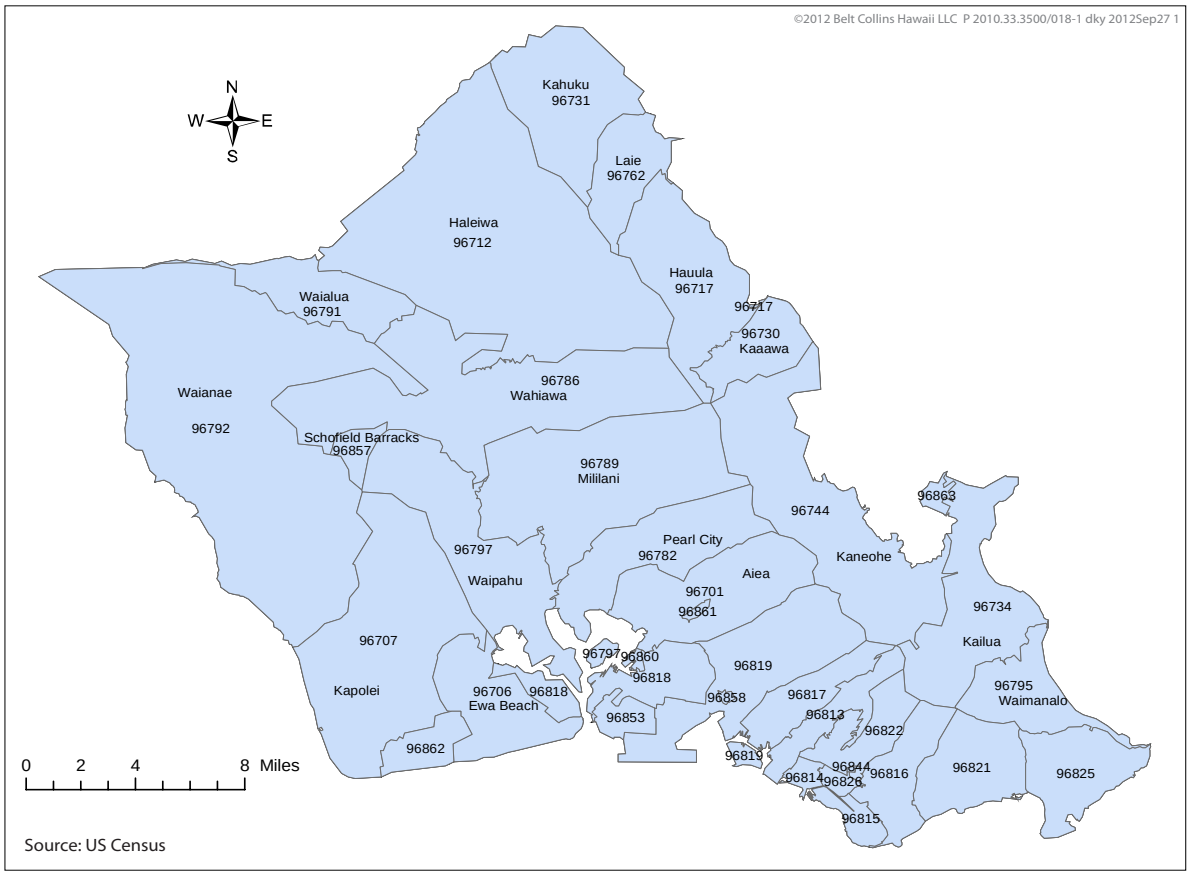
Table 2-17 provides more information on the employment categories for residents of the KNS region. The share of the workforce in the construction industry continues to be substantial, especially in the North Shore Census Tracts. On the Koʻolau Loa side of the region, workers in the accommodation/food service/arts and recreation sector are especially numerous. A large share of the jobs in Lāʻie are in education, with a private university as well as public schools. Throughout the region, few workers are in the financial and real estate sector. Data on class of workers indicates that self-employment is high in the region, especially in CT 101 (Waimea-Kahuku). 40% of employees travel to and from the Resort from the Koʻolau Loa side, and about 60% travel along the highway on the North Shore.

While agriculture was once the local mainstay, its role is smaller in the 21st Century. In Waialua District, much of the land that once was used by Waialua Sugar is now planted in seed corn. Coffee production, floriculture and vegetable farming have also developed. Cows and horses are still raised in the region, although the local dairy closed in the 1990s. On the Koʻolau Loa side of the region, the remaining farms are mostly small-scale operations. Aquaculture has been developed in the Kahuku region, focusing on shrimp, with mixed success. Lunch trucks offering shrimp plates have done well, and now are a common stop on circle-island tours.

Table 2-16: Employment Patterns by Zip Code of Establishment, 2009

		2009 Business Patterns Data					
Area	**ZipCode**	**Business Establishments**	**Workforce**	**Average No. Workers per Establishment**	**Average Annual Wage**	**Number of Establishments 50 to 99 Workers**	**Number of Establishments 100 or more Workers**
Kaaawa	96730	10	60	6.0	$27,833	-	-
Hauula	96717	30	148	4.9	$25,601	-	-
Laie	96762	41	2,904	70.8	$18,826	4	2
Kahuku	96731	46	1,251	27.2	$33,160	1	3
Haleiwa	96712	202	1,491	7.4	$25,452	6	-
Waialua	96791	68	349	5.1	$31,350	-	-

Figure 2-61: Zip Code Tabulation Areas



The major industry in the local economy is tourism. The North Shore is a destination for visitors' day-trips because it is renowned as the home of big-wave surfing, spectacular beaches, Haleʻiwa Town, and deep-water marine activities. The PCC in Lāʻie and Waimea Falls Park also attract visitors on circle-island trips. The Resort not only serves its overnight guests, but attracts tourists staying elsewhere and local residents to its beaches, amenities, golf courses, retail, and restaurants.

Retail and other commercial establishments are concentrated in Haleʻiwa. In Koʻolau Loa, only Lāʻie supports a retail center larger than a strip mall. The region had industrial centers at the sugar mills in Waialua and Kahuku. The Kahuku Sugar Mill now houses a mix of commercial establishments and civic offices, while the Waialua Mill site is home to a mix of small businesses, including surfboard makers, a soap factory, and food vendors. Coffee, chocolate and soda are manufactured in Waialua.

In the KNS region, much of the upland area is used by the U.S. Army and the Marines for training. The training areas may be reached through roads from Central Oʻahu not used by the

Table 2-17: Industry and Class of Worker, 2006-2010

	City and County of Honolulu	KNS Region	Census Tract 102.01 Hauula-Kaaawa	Census Tract 102.02 Laie	Census Tract 101 Waimea-Kahuku	Census Tract 100 Kawailoa	Census Tract 99.02 Haleiwa	Census Tract 99.04 Kaena Point
Employed Civilian Workers	439,691	14,960	2,394	3,254	3,584	881	1,872	2,975
Industry								
Agriculture	0.8%	2.1%	1.5%	0.4%	1.2%	0.0%	6.0%	3.7%
Construction	7.2%	12.4%	13.7%	7.3%	15.3%	8.7%	9.1%	16.6%
Manufacturing	3.5%	2.3%	3.3%	1.0%	2.5%	3.4%	2.3%	2.6%
Wholesale trade	2.9%	1.7%	2.3%	0.7%	1.3%	0.2%	1.8%	3.4%
Retail trade	11.1%	10.0%	7.8%	7.9%	12.6%	6.0%	14.2%	9.7%
Transportation, Warehousing, Utilities	6.0%	3.3%	2.9%	3.3%	2.2%	3.7%	4.3%	4.3%
Information	2.1%	1.7%	1.6%	1.2%	2.0%	0.9%	0.5%	3.1%
Finance, Insurance, Real estate	7.2%	4.0%	4.8%	3.7%	3.8%	0.0%	4.4%	4.7%
Professional, administrative services	10.2%	7.3%	7.4%	6.3%	2.8%	18.8%	10.6%	8.2%
Education and Health	21.7%	25.5%	28.8%	39.0%	23.2%	19.4%	17.6%	17.7%
Accommodation, Food Service, Arts, Recreation	13.6%	19.8%	14.5%	26.1%	23.3%	21.3%	17.3%	14.1%
Public Administration	9.5%	5.7%	8.8%	1.7%	4.5%	12.6%	8.6%	5.3%
Other services	4.3%	4.0%	2.7%	1.5%	5.3%	4.8%	3.2%	6.6%
Class of worler								
Private wage & salary	71.5%	70.9%	67.1%	80.7%	64.9%	67.1%	72.8%	70.3%
Government	21.9%	18.6%	23.1%	13.6%	18.1%	25.3%	17.7%	19.5%
Self-Employed	6.4%	10.5%	9.9%	5.5%	17.0%	7.6%	9.5%	9.9%
Unpaid family workers	0.2%	0.1%	0.0%	0.2%	0.1%	0.0%	0.0%	0.2%

NOTE: The ACS is based on a series of samples, not an enumeration of the whole population, and is less reliable for cells with small counts. The table refers to residents of the region, who may work in the region or elsewhere.
SOURCE: American Community Survey data, 2006-2010, downloaded from www.census.gov.

general public, by convoys on public highways, or by air, with helicopters traveling over the water most of the way from Marine Corps Base Hawaii Kaneohe Bay, then crossing the shoreline area near Kahuku Point or Kawailoa to reach training areas. Also, a military housing area is located at Helemano, just within the North Shore SCP area.

For the region's establishments, the average reported wage in 2009 was $24,263. The ACS employed civilian labor force of about 14,960 is more than twice as large as the job count in Table 2-16: most regional workers must travel outside the KNS region to find work. Reported commute times are longer than the island average (except in the Lāʻie and the Kawailoa CTs).

The two major developments that could affect the local economy and employment are the expansion of the Resort and Envision Lāʻie, a planning process sponsored by Hawaii Reserves, Inc., the landowner. Both would support job growth and provide housing. The Proposed Action would provide new jobs for residents throughout the KNS region.

Job growth through Envision Lāʻie would be more narrowly targeted, since Lāʻie's job centers are closely tied to the Mormon Church and educational activities. If new housing is provided by Envision Lāʻie for workers in the Lāʻie job centers, it could address crowding in that community with only limited impact on problems of cost and crowding elsewhere in the region. However, it is important to note that the project presently being discussed in the community has not yet applied for or been granted any development permits or approvals. Some 1,260 units have been proposed to be built over 25 years.[8] If implemented, the proposed development would nearly double the Lāʻie housing stock. It could add far more housing to the regional stock than the Proposed Action.

The new inn at Lāʻie would have up to 224 rooms and limited amenities (e.g., a coffee shop rather than a full restaurant). It is not intended to be a resort that would be comparable to Turtle Bay. It would primarily serve PCC and BYUH visitors and visitors to Koʻolau Loa families.

The Honolulu City Council approved the Special Management Area permit for the new hotel in 2011. New land use approvals would be needed for Envision Lāʻie's proposed university expansion and new residential area towards Malaekahana, so the scope and timing of these is currently unknown.

In the Haleʻiwa area, the major landowner, Kamehameha Schools, completed a Master Plan for its North Shore lands in 2008. It includes renovation and expansion of commercial areas in Haleʻiwa, along with limited new residential development. On Kamehameha Schools land, the Kawailoa

[8] This figure was included in revisions to the Draft Koʻolau Loa SCP supported by several Lāʻie and Kahuku members of the SCP advisory group in 2009 (posted at http://envisionlaie.com/wp-content/downloads/kscp_proposed_amendment.pdf). The developer has not recently provided a revised total for housing to be built at Malaekahana.

Wind project is now beginning construction. It would generate approximately 70 MW of power, and be Hawai'i's largest wind power facility. The towers are to be located well inland, and would be far less visible than the facility now[8] operating at Kahuku, which was also built by First Wind.

Other new major projects that have been proposed (and opposed) include:

- Relocation of the Hau'ula fire station to commercial land acquired from local owners;
- A second wind farm project in Kahuku, which has been opposed by local stakeholders because its proponents failed to consult the community but claimed to have done so;
- A 75,000-square foot commercial development near the Sunset Beach supermarket was proposed, but plans are on hold, and the developer, Honu Group Inc., no longer mentions this project on its website; and
- A small hotel to be located near the shore at Hale'iwa: This would occupy part of the land that the City and County had bought for park expansion; the proposal has inspired intense discussion in the community.

The North Shore Sustainable Communities Plan, passed by the Honolulu City Council in 2011, incorporates plans for revitalization of Hale'iwa and Waialua as country towns, with new housing allowed nearby. In Hale'iwa, the landowner and stakeholders support continuing retail development and creation of a community gathering place. For Waialua, industrial redevelopment at the mill site is supported.

F.3. c. Social Setting

While all of O'ahu is a single political entity (the City and County of Honolulu), smaller areas have representatives on the City Council and in the State Legislature. Local decision-making and advisory bodies that express and shape local views include two Neighborhood Boards. Neighborhood Board No. 28 (Ko'olau Loa) covers the Ko'olau Loa SCP area (i.e., Ka'a'awa to Kawela), and Neighborhood Board No. 27 (North Shore) serves communities from Sunset Beach to Ka'ena Point. Board members on O'ahu often are recognized local stakeholders, and many go on to serve in political offices. The Boards' role is defined as advisory, but they are regularly asked to comment on development proposals. They provide an arena for local issues and debates.

Community Advisory Committees were formed in support of City Department of Planning and Permitting's ongoing update program the SCPs, including the North Shore and Ko'olau Loa Sustainable Communities Plans.

The North Shore Chamber of Commerce has grown from its origins as Hale'iwa Main Street to represent local commercial interests throughout the KNS region. It arranges events such as the annual Arts Festival.

Other local groups include community associations, which vary greatly in their level of activity. The Waialua Community Association (WCA) was incorporated in 1937. It built the WCA gymnasium in Haleʻiwa and continues to operate this facility, serving the entire North Shore. A separate group, Friends of Waialua, sponsored a master plan for the Waialua Town Center (developed with City and County funding). The Lāʻie Community Association has participated extensively in the Envision Lāʻie process, supporting expansion of BYUH and the building of a larger hotel to replace the Laie Inn. Other community associations deal with issues of concern in the towns along the coast. Local institutions may have active groups of associates and supporters. Waimea Valley has provided a venue for Hawaiian cultural practitioners in the region. Kahuku High & Intermediate School has active community support, most visibly for its winning football team.

Concerns about development in the region have been voiced by groups of local stakeholders. Keep the North Shore Country was a plaintiff, along with the Sierra Club, in the suit challenging the Kuilima EIS as outdated. It is part of the Koʻolau Loa/North Shore Alliance and works with the Defend Oʻahu Coalition to oppose development at Turtle Bay and in Lāʻie.

The Kuilima/North Shore Strategic Planning Committee was formed in the 1980s to identify ways in which redevelopment of the Resort could benefit regional residents. It was involved in planning for community benefits after the Kuilima EIS was approved. It continues to meet and provide community input to redevelopment planning for the Resort.

Residents of the KNS region are proud of their communities. The North Shore is renowned for its surf and surfing lifestyle. Koʻolau Loa is less well known. Both areas are viewed as "country" by Oʻahu residents, and many agree that they should be protected from urbanization.

However, these "country" areas are far from isolated. Many workers commute daily outside the region. The North Shore exports surfboards and agricultural products worldwide. Retail and recreational businesses in Haleʻiwa cater to tourists traveling around the island. During the winter surf season, local traffic is even more congested than usual because of the influx of spectators to surfing competitions. Koʻolau Loa includes both major visitor facilities (the PCC and the Resort) and institutions central to Hawaiʻi's Mormon community. BYUH has attracted students and residents from the island communities of Polynesia as well as Hawaiʻi.

Few useful generalizations about quality of life can be made for the entire region. Persons, families, and communities vary over time as they encounter challenges or enjoy prosperity and wellbeing. A few indicators may help to suggest ways that the region's reputation, economy and community life inform residents' lives:

- Unemployment is higher in the KNS region than the island average, and average wages (as distinct from household income as a whole) are lower;

- Surveys of students, parents and teachers indicate that family ties and family involvement in schools are strong in the Kahuku High School catchment area (i.e., mainly Koʻolau Loa). Young people report that they have close neighborhood ties. When data from schools throughout Hawaiʻi were compiled, the Kahuku community was ranked ninth of 42 communities in "protective factors" tending to support young people's success in life.[3]

  Responses from the Waialua High School area are closer to the island and state average. The summary report suggests some of the strengths of the area: [9]

  > ***In a Statewide survey of students, more than half of the adolescents responding in the Waialua Area reported problems in family relationships. However, most of the adolescents reported strong neighborhood ties and that their schoolwork was interesting and meaningful. The graduation rate in this community is high, and most high school seniors plan to attend college.[10]***

- Respondents to the Behavioral Risk Factor Surveillance Survey from the KNS region were more likely than ones from any other community in Hawaiʻi to report their general health status as good to excellent. They also ranked highest as experiencing social and emotional support. On the other hand, the community also ranked high in reports of high blood pressure.[4]

The recognized communities of the KNS region vary in ways rooted in their histories. Kahuku and Waialua were each once[11] .e centers of sugar plantations. They retain remnants of mill infrastructure. They have public secondary schools. Their residents include retirees from the plantations, and the children and grandchildren of plantation workers. Lāʻie was acquired as a center for the Church of Jesus Christ of Latter-day Saints in 1865. It remains the center of Mormon worship and education in Hawaiʻi. Haleʻiwa and Sunset Beach have become famous as the home of North Shore surfing. They are mainly tourist and surf industry destinations, especially during the winter season, and are the base for major surfing contests.

The two SCP areas share "country" lifestyles, but these are realized in different ways in different communities.

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[9] Center on the Family, University of Hawaiʻi, Kahuku Area Community Profile. Honolulu, HI: 2003

[10] City and County of Honolulu, Department of Planning and Permitting, Koʻolau Loa Sustainable Communities Plan Five-Year Review: Public Review Draft. Honolulu, HI: 2010, p. 2-1.

[11] Hawaiʻi State Department of Health, interactive database with data for 2005 to 2010, posted at http://hawaii.gov/health/statistics/brfss/HBRFSS-IA9/atlas.html. The region's respondents had less extreme results for asthma and other health problems.

The racial data in Table 2-18 below show the KNS region, as a whole, being distinctive on the island of Oʻahu for its lower share of Asian residents and its large proportion of White residents. Koʻolau Loa has a higher proportion of Native Hawaiʻian and Pacific Island residents than the island as a whole.

Koʻolau Loa and North Shore stakeholders, working with the City and County's planners, have developed similar long-term visions for their areas:

> ***… Koʻolau Loa seeks to preserve the region's rural character and its natural, cultural and scenic resources. The community envisions a safe and healthy environment based on strong family values, where residents have access to quality jobs, affordable housing, and ample recreational opportunities within the region. Koʻolau Loa will remain country, characterized by small towns and villages with distinctive identities that exist in harmony with the natural settings, defined by the mountain ridges and scenic open spaces which help to give the region its unique form of organization.***[12]
>
> ***The North Shore in the year 2035 retains the unique qualities that have long defined its attractiveness to residents and visitors alike. Scenic open spaces are protected and maintained, coastal resources are enhanced, and the region's Native Hawaiian heritage, cultural diversity, and plantation past have been carried forward in the revitalization of its communities.***[13]

The former vision emphasizes the continuing wellbeing of local communities rooted in existing towns; the latter emphasizes open space, and treats towns as sites to be "revitalized." This difference is not new, and it is not simply a difference between the two SCP Areas within the region.[14] Areas where many residents value their coastal strip and ocean as "country" include Kaʻaʻawa and Punaluʻu in Koʻolau Loa as well as most of the North Shore. Similarly, "community" orientation and the hope of continuity for families and neighborhoods, from the plantation past to an uncertain present and future, is found as much in Waialua as in Kahuku or Lāʻie.

Local stakeholders in Haleʻiwa and Waialua see their communities as distinct towns with economic hubs to be supported, i.e., Haleʻiwa's mix of tourist retail and other businesses, and

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[12] City and County of Honolulu, Department of Planning and Permitting, Koʻolau Loa Sustainable Communities Plan Five-Year Review: Public Review Draft. Honolulu, HI: 2010, p. 2-1.

[13] City and County of Honolulu, Department of Planning and Permitting, North Shore Sustainable Communities Plan: Public Review Draft. Honolulu, HI: 2010, p.2-2

[14] The Socio-Economic Impact Assessment for the Kuilima EIS made much the same point in 1984: "At a very general level, there is an apparent value difference between residents who are primarily concerned with preserving a 'country' feeling and those who are more concerned with preserving a current 'community' for existing family and friends. While most people would like both, they tend to lean to one or the other if forced to choose." (Community Resources, Inc. and A. Lono Lyman, Inc., Appendix J to the Kuilima EIS, page 4).

Table 2-18: Selected Population Characteristics, 2006-2010

	City and County of Honolulu	KNS Region	Census Tract 102.01 Hauula-Kaaawa	Census Tract 102.02 Laie	Census Tract 101 Waimea-Kahuku	Census Tract 100 Kawailoa	Census Tract 99.02 Haleiwa	Census Tract 99.04 Kaena Point
Population	936,984	32,700	5,286	6,940	7,408	3,179	3,729	6,158
Median Age	37.5	NA	32.0	23.8	33.3	24.5	37.5	39.0
Racial/Hispanic Identification (1)								
White	36.8%	56.2%	58.2%	46.1%	64.3%	77.5%	46.2%	51.4%
Black or African American	3.4%	2.6%	4.5%	0.5%	0.9%	8.4%	1.9%	3.0%
American Indian and Alaska Native	2.1%	4.4%	6.7%	2.1%	5.0%	7.9%	4.2%	2.9%
Asian	61.8%	37.7%	34.4%	25.1%	37.9%	20.8%	53.3%	53.8%
Native Hawaiian and Other Pacific Islander	23.1%	37.0%	55.0%	61.2%	30.3%	7.1%	27.9%	23.3%
Some Other Race	2.4%	1.5%	1.3%	0.7%	1.2%	4.0%	1.7%	1.7%
Hispanic	7.9%	9.3%	8.4%	4.5%	9.8%	13.6%	9.9%	12.1%
Persons below Poverty Level								
Share of Population	8.8%	10.4%	14.1%	10.0%	9.2%	19.5%	7.8%	6.2%
Population 16 and over	752,343	24,982	4,020	4,885	5,889	2,158	2,936	5,094
In Labor Force	501,779	17,106	2,580	3,382	3,935	1,516	2,217	3,476
In Civilian Labor Force	462,843	16,079	2,566	3,372	3,822	977	2,208	3,134
Civilian Labor Force Participation	61.5%	64.4%	63.8%	69.0%	64.9%	45.3%	75.2%	61.5%
Mean Travel Time to Work, Civilian Labor Force (minutes)	27.0	NA	37.4	17.9	35.1	23.7	27.4	32.2
Unemployment Rate, Civilian Labor Force	5.0%	6.5%	6.7%	3.5%	6.2%	9.8%	15.2%	5.1%
Households	304,827	9,135	1,546	1,225	2,297	1,034	1,091	1,942
Median Household Income	$70,093	NA	$66,500	$75,417	$64,623	$40,441	$74,719	$73,883
Population in households	902,832	31,111	5,236	5,978	7,277	3,096	3,729	5,795
Population in group quarters	34,152	1,589	50	962	131	83	-	363

NOTE: (1) Based on "Race alone or in combination with other races" tally. Percentages add up to more than 100% since persons may claim more than one race. SOURCE: U.S. Census, American Community Survey combined samples for 2006 through 2010, downloaded from American FactFinder at *www.census.gov*.

Waialua's Sugar Mill redevelopment area. Much the same could be said of Kahuku and Hauʻula in Koʻolau Loa, but their commercial areas appear less successful. Lāʻie stands out because its major employers are closely interrelated. The Polynesian Cultural Center (PCC) depends on Brigham Young University – Hawaii (BYUH) for much of its workforce, while it provides financial support to the university. Its economic organization follows from its role as a church center.

The growth of surfing and the surf industry has brought a younger population and an orientation to the ocean, more than to land resources, to the North Shore. The high levels of unemployment in the Haleʻiwa and Kawailoa Census Tracts (identified in Table 2-18 above) is understandable if

many residents live on the North Shore to enjoy the ocean, and do not need to support families or are willing to accept marginal economic conditions so long as they can live there. Many on the North Shore see their environment as a resource for the island and the entire world, not just for their own community. Accordingly, they may be more concerned with environmental protection than with economic sustainability. However, residents of communities throughout the region support both of these values and assess new initiatives in light of them both.

F.3. d. Population Characteristics

The KNS region has experienced population growth in every decade since 1980. However, that growth has been largely on the Koʻolau Loa side and in the Kawailoa area between Waimea

Table 2-19: Population Trends, 1980-2010

	1980	1990	2000	2010
City and County of Honolulu	762,565	836,231	876,156	953,207
KNS Region	27,352	29,992	32,926	34,452
Koʻolualoa District	14,195	18,443	18,899	21,406
CT 102.01 [Hauula-Kaaawa]	3,952	4,608	5,312	5,882
CT 102.02 [Laie]	5,752	6,926	6,100	7,643
CT 101 [Waimea-Kahuku}	4,491	6,909	7,487	7,881
Waialua District	13,157	11,549	14,027	13,046
CT 100 [Kawailoa]	1,879	1,801	4,338	3,320
CT 99.02 [Haleiwa]	5,350	3,956	3,958	3,740
CT 99.04 [Kaena Point]	5,928	5,792	5,731	5,986
	Average Annual Increase, over the decade ending in:			
		1990	2000	2010
City and County of Honolulu		0.9%	0.5%	0.8%
KNS Region		0.9%	0.9%	0.5%
Koʻolualoa District		2.7%	0.2%	1.3%
CT 102.01 [Hauula-Kaaawa]		1.5%	1.4%	1.0%
CT 102.02 [Laie]		1.9%	-1.3%	2.3%
CT 101 [Waimea-Kahuku}		4.4%	0.8%	0.5%
Waialua District		-1.3%	2.0%	-0.7%
CT 100 [Kawailoa]		-0.4%	9.2%	-2.6%
CT 99.02 [Haleiwa]		-3.0%	0.0%	-0.6%
CT 99.04 [Kaena Point]		-0.2%	-0.1%	0.4%

SOURCE: U.S. Census, as reported in State Data Center reports and Data Books.

and Haleʻiwa (Census Tract [CT] 100, labeled in Figure 2-64. The resident population of Haleʻiwa has declined, while the population of the Waialua area has been stable. For the entire KNS region, the result has been population growth at much the same rate as for the island as a whole over thirty years. (See Table 2-19 3-1.)

As Table 2-20 3-2 indicates, some characteristics of the population of the regional census tracts vary greatly. Lāʻie and Kawailoa stand out as having young populations. In Lāʻie, youths form a large part of the population. In Kawailoa, the young demographic is mostly over 18 years old. Throughout the region, the share of seniors in the population is lower than for Oʻahu as a whole.

The racial data in Table 2-20 3-2 reflects (a) broad Federal categories and (b) multiple claims to racial identity. Region-wide, White claims are more frequent, and Asian identification less frequent, than island-wide. The share of residents claiming Native Hawaiian or Pacific Islander status is much higher in Koʻolau Loa than island-wide. The Native Hawaiian or Pacific Islander share of the population is highest in the Hauʻula-Kaʻaʻawa and Lāʻie CTs. Claims to more than one racial identity are higher in the former tract (CT 102.01). The share of the population identifying as Hispanic is higher in the three North Shore Census Tracts than the island average.

Schools assign a single ethnicity to each student for statistical purposes. The secondary school data in Table 2-21 3-3 show significant numbers of Native Hawaiians and Samoans at Kahuku High & Intermediate School (i.e., in Koʻolau Loa). At Waialua High & Intermediate School, Filipinos form the largest recognized population. Only about a fifth of the population in either school is categorized as White.

The difference between the racial data in Table 2-20 and in Table 2-21 is due in part to methodology and in part to the fact that many of the Whites in the region are young adults, not school-aged youth.

Table 2-21 also shows that very few students have limited English proficiency, while nearly half of the students in either school can qualify for free or reduced-priced lunch because of low family income. These indicators point to a low-income family population with a small number of immigrants from non-English-speaking lands.

The group-quarters population in Lāʻie consists of students at Brigham Young University – Hawaii (BYUH) in dormitories. The persons in group-quarters in the Kaena Point tract (CT 99.04) are largely military (at Helemano). Both nursing homes and other, not categorized, facilities house the group-quarters population of CT 101.

Table 2-20: Selected Population Characteristics, 2011

	City and County of Honolulu	KNS Region	Census Tract 102.01 Hauula-Kaaawa	Census Tract 102.02 Laie	Census Tract 101 Waimea-Kahuku	Census Tract 100 Kawailoa	Census Tract 99.02 Haleiwa	Census Tract 99.04 Kaena Point
Population	936,984	32,700	5,286	6,940	7,408	3,179	3,729	6,158
Median Age	37.5	NA	32.0	23.8	33.3	24.5	37.5	39.0
Racial/Hispanic Identification (1)								
White	36.8%	56.2%	58.2%	46.1%	64.3%	77.5%	46.2%	51.4%
Black or African American	3.4%	2.6%	4.5%	0.5%	0.9%	8.4%	1.9%	3.0%
American Indian and Alaska Native	2.1%	4.4%	6.7%	2.1%	5.0%	7.9%	4.2%	2.9%
Asian	61.8%	37.7%	34.4%	25.1%	37.9%	20.8%	53.3%	53.8%
Native Hawaiian and Other Pacific Islander	23.1%	37.0%	55.0%	61.2%	30.3%	7.1%	27.9%	23.3%
Some Other Race	2.4%	1.5%	1.3%	0.7%	1.2%	4.0%	1.7%	1.7%
Hispanic	7.9%	9.3%	8.4%	4.5%	9.8%	13.6%	9.9%	12.1%
Persons below Poverty Level Share of Population	8.8%	10.4%	14.1%	10.0%	9.2%	19.5%	7.8%	6.2%
Population 16 and over	752,343	24,982	4,020	4,885	5,889	2,158	2,936	5,094
In Labor Force	501,779	17,106	2,580	3,382	3,935	1,516	2,217	3,476
In Civilian Labor Force	462,843	16,079	2,566	3,372	3,822	977	2,208	3,134
Civilian Labor Force Participation	61.5%	64.4%	63.8%	69.0%	64.9%	45.3%	75.2%	61.5%
Mean Travel Time to Work, Civilian Labor Force (minutes)	27.0	NA	37.4	17.9	35.1	23.7	27.4	32.2
Unemployment Rate, Civilian Labor Force	5.0%	6.5%	6.7%	3.5%	6.2%	9.8%	15.2%	5.1%
Households	304,827	9,135	1,546	1,225	2,297	1,034	1,091	1,942
Median Household Income	$70,093	NA	$66,500	$75,417	$64,623	$40,441	$74,719	$73,883
Population in households	902,832	31,111	5,236	5,978	7,277	3,096	3,729	5,795
Population in group quarters	34,152	1,589	50	962	131	83	-	363

NOTE:
(1) Based on "Race alone or in combination with other races" tally. Percentages add up to more than 100% since persons may claim more than one race.

SOURCE: U.S. Census, American Community Survey combined samples for 2006 through 2010, downloaded from American FactFinder at www.census.gov.

Table 2-21: School Population Characteristics, 2011

	Kahuku	Waialua
Major recognized ethnicities (Percentage of student body)		
Filipino	6.1%	35.8%
Native Hawaiian	40.0%	27.3%
Samoan	13.5%	1.6%
White	20.7%	19.5%
Students with Limited English Proficiency	3.6%	6.2%
Students qualifying for Free or Reduced Price Lunch	49.2%	45.0%

SOURCE: School Status and Improvement Reports, 2011, for Kahuku High and Intermediate School and for Waialua High and Intermediate School, posted at *http://doe.k12.hi.us/*.

F.3. e. Housing Characteristics

The region has seen growth in both households and housing units since 1980 (as shown in Table 2-22). Much of the housing is dedicated to vacation or part time resident housing due to the surfing and other recreational attractions of the area. (The large majority of the "vacant" units counted by the various Censuses in the region are second homes or vacation rentals.) Rentals form a larger share of the housing stock than in the rest of O'ahu, especially in the Kawailoa Census Tract (as shown in Table 2-23). This is due in part to the area's appeal to surfers, many of whom rent for longer periods than other vacationers.

Limited availability of affordable housing for local working families has been a concern for decades in the region (and island-wide). Key reasons include limited availability of zoned residential land, and the high cost of land and construction.

General housing trends for the area include an increase in the total number of units in both districts of the KNS region since 1980, with a decline in the Waialua district after 2000. The number of occupied housing units grew throughout the period in the Ko'olau Loa District, but only through 2000 in Waialua District. The number of housing units has increased at a faster rate than the resident population in the region, but increased housing prices have made most new homes too expensive for working families. This phenomenon is understandable in light of the North Shore's appeal as a surfing destination with broad expanses of beaches that are attractive year round.

Vacation rentals affect the availability of housing for residents. The City and County of Honolulu recognizes some 70 units with Non-Conforming Use Certificates in Ko'olau Loa and 10 in the North Shore. These are vacation rentals or bed-and-breakfast establishments that have received

Table 2-22: Housing and Occupancy, 1980 to 2010

	1980	1990	2000	2010
Total Housing Units				
City and County of Honolulu	250,864	281,683	315,988	336,899
KNS Region	7,877	9,709	11,121	11,562
Ko'olualoa District	4,679	5,939	6,199	6,808
CT 102.01 [Hauula-Kaaawa]		1,826	1,932	2,098
CT 102.02 [Laie]		1,517	1,452	1,560
CT 101 [Waimea-Kahuku}		2,596	2,815	3,150
Waialua District	3,198	3,770	4,922	4,754
CT 100 [Kawailoa]		559	1,517	1,309
CT 99.02 [Haleiwa]		1,187	1,247	1,231
CT 99.04 [Kaena Point]		2,024	2,158	2,214
Occupied Housing Units (Households)				
City and County of Honolulu	230,214	265,304	286,450	311,047
KNS Region	6,586	8,403	9,575	9,675
Ko'olualoa District	3,742	4,935	5,172	5,483
CT 102.01 [Hauula-Kaaawa]	1,166	1,458	1,571	1,684
CT 102.02 [Laie]	1,080	1,350	1,274	1,342
CT 101 [Waimea-Kahuku}	1,496	2,127	2,327	2,457
Waialua District	2,844	3,468	4,403	4,192
CT 100 [Kawailoa]	478	491	1,375	1,163
CT 99.02 [Haleiwa]	753	1,113	1,145	1,112
CT 99.04 [Kaena Point]	1,613	1,864	1,883	1,917
Vacant Units as Share of Total Units				
City and County of Honolulu	8.2%	5.8%	9.3%	7.7%
KNS Region	16.4%	13.5%	13.9%	16.3%
Ko'olualoa District	20.0%	16.9%	16.6%	19.5%
CT 102.01 [Hauula-Kaaawa]		20.2%	18.7%	19.7%
CT 102.02 [Laie]		11.0%	12.3%	14.0%
CT 101 [Waimea-Kahuku}		18.1%	17.3%	22.0%
Waialua District	11.1%	8.0%	10.5%	11.8%
CT 100 [Kawailoa]		12.2%	9.4%	11.2%
CT 99.02 [Haleiwa]		6.2%	8.2%	9.7%
CT 99.04 [Kaena Point]		7.9%	12.7%	13.4%

SOURCES: Kuilima EIS, Appendix J and American FactFinder (*www.census.gov*).

legal transient accommodation permits. Many more units are rented illegally. One resident has estimated that the Haleʻiwa or North Shore area includes 450 illegal rentals.[15]

In the period from 1985 through 2010, a total of 1,077 new single-family homes were built in the KNS region.[16] On average, some 18 houses were built each year in the area from Kaʻaʻawa through Kahuku, 12 in the area from Turtle Bay through Waimea Bay, and 11 in the remaining North Shore area.

Average single family housing prices in that time increased faster in the KNS region than island-wide, as shown in Figure 2-62. The increase in average single-family home prices since 2000 is consistent with rapid growth of a non-resident market in the region. At the peak of the recent high sales period, KNS single-family sales averaged 189% of island-wide sales. (In 2006, the regional average was $1,472,726, and the island average was $778,393. Since then, the regional average has returned to levels close to the island average.)

In most of the region, about half of the occupied households are owner-occupied, except in CT 100. (See Table 2-23) Household sizes for owner-occupied households are larger than the island average (again, except in CT 100), with households in Lāʻie appreciably larger than elsewhere. Renters in Lāʻie also have large households. In other tracts in the region, average renter household sizes are close to the island average.

The Kawela Bay Census Designated Place (CDP) includes the Resort and some neighboring residential sites. In 2010, it was home to 330 persons in 153 households: the average household size was 2.16 persons per household. Owners lived in 87 (56.9 %) of these units; renters occupied the remaining 66 units. The CDP included a total of 518 housing units, so the occupied units accounted for only 29.5 percent of the housing stock.[17]

By 2012, the Honolulu Real Property Tax files recognized 366 parcels with taxable housing units within Kuilima Estates.[18] Of these, some 52 (14.2 %) were listed as owner-occupied. This share

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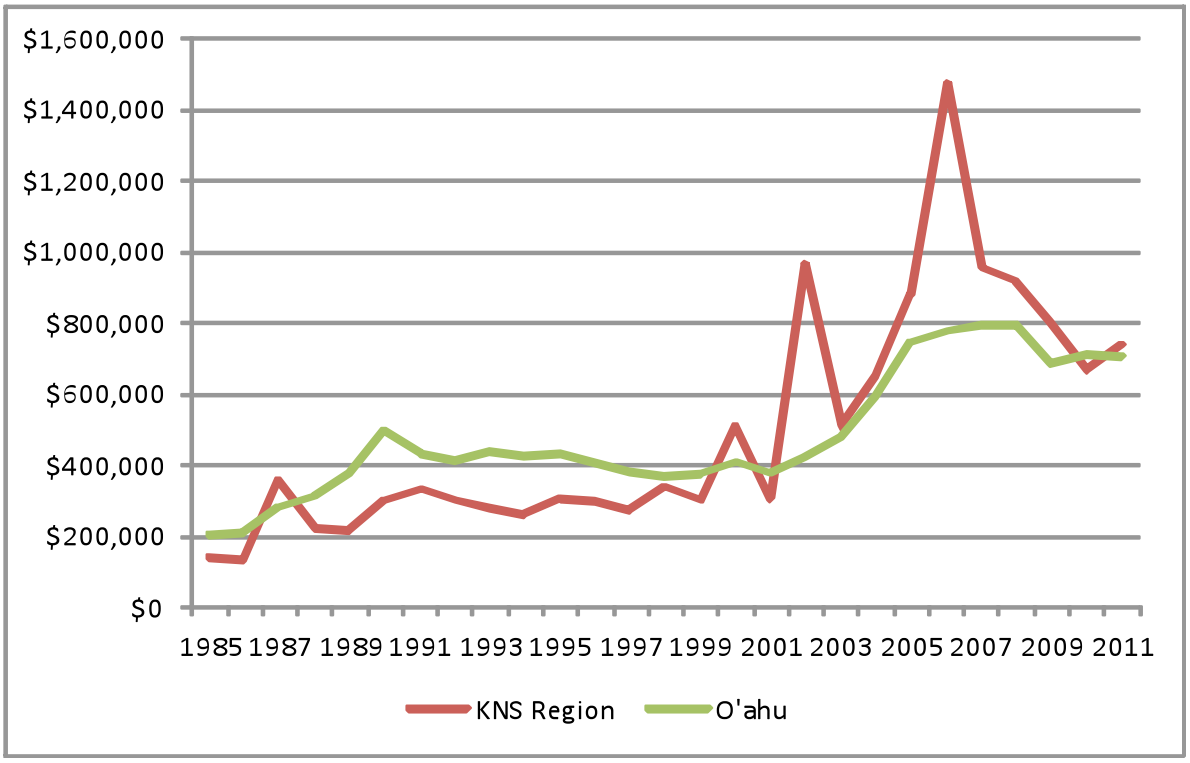
[15] Outside of resort districts, housing can be rented for six months or more at a time. Shorter rentals – "transient vacation rentals" – are sources of income for some homeowners, but may be irritants for others in their neighborhoods. Only long-standing transient vacation rentals can be recognized as legal so long as the use continues from before current zoning rules were enacted. The count of recognized Non-Conforming Uses is from http://honoluludpp.org/HotIssues/NUCreport.pdf. The resident cited in the text is B. Ready, "Illegal Vacation Rentals behind Opposition to Haleiwa Inn?" Hawaiʻi Free Press. June 26, 2012. Posted at http:www.hawaiifreepress.com/ArticlesMain/Tabid/56/ArticleType/CategoryView/categoryID/47/Oahu-News.aspx.

[16] Hawaii Information Service download, analyzed by Belt Collins Hawaii. Only single family units were analyzed because information about the year condominium units were built was not consistently available.

[17] US Census, Summary File 1. Data posted at http://hawaii.gov/dbedt/info/census/Census_2010/SF1/DEC_10_SF1_GCT_CDP.xls.

[18] There are 368 total units in the Kuilima Estates, but two of them are management units.

Figure 2-62: Average Annual Sales Prices, Single Family Homes, KNS Area and O'ahu



NOTE: Average (mean) prices are used rather than medians in order to compare data from different sources. For small areas, average prices can be affected significantly by outliers, i.e., a few extreme cases. This obviously occurred in 2002 and 2006. Still, the overall trend is that the KNS average, once below the island average price, now tends to exceed the island average.
SOURCES: Honolulu Board of Realtors; download from Hawaii Information Service.

Table 2-23: Households and Household Size, 2010

	City and County of Honolulu	KNS Region	Census Tract 102.01 Hauula-Kaaawa	Census Tract 102.02 Laie	Census Tract 101 Waimea-Kahuku	Census Tract 100 Kawailoa	Census Tract 99.02 Haleiwa	Census Tract 99.04 Kaena Point
Population in Households	917,907	31,656	5,531	5,776	7,848	3,170	3,683	5,648
Households	311,047	9,675	1,684	1,342	2,457	1,163	1,112	1,917
Owner-occupied	56.1%	47.0%	50.8%	44.7%	52.3%	18.9%	53.5%	51.5%
Rented	43.9%	53.0%	49.2%	55.3%	47.7%	81.1%	46.5%	48.5%
Average household size								
All households	2.95	3.27	3.28	4.30	3.19	2.73	3.31	2.95
Owner-occupied	3.11		3.59	4.60	3.58	2.79	3.64	3.15
Rented	2.75		2.97	4.06	2.78	2.71	2.94	2.73

is slightly lower than the share counted by the Census in 2010 for the CDP as a whole (87 of 518 units, or 16.8%).[19]

The TMK database shows that less than half of dwellings in the region are registered as owner-occupied for tax purposes, and the share of all housing units registered as owner-occupied is especially low in the region between Turtle Bay and Waimea Bay. In other words, rentals, second homes and vacation units are more prevalent in this area than elsewhere in the region.[20] Illegal rentals are also said to be common. All of these uses for housing, which tend to limit the supply affordable for residents, are consistent with the North Shore's appeal as a surfing and beach destination.

F.3. f. Health Services

Kahuku Medical Center is the only hospital in the region. It is approximately four (4) miles from the Resort and provides 24-hour emergency care. The medical center is part of the Hawaii Health Systems Corporation, a state organization providing primary care in underserved areas.

Koʻolauloa Community Health and Wellness Center, a federally qualified health center, has a clinic in Hauʻula and offices at the Kahuku Medical Center. Wahiawa General Hospital, in Central Oʻahu, also serves North Shore patients, while Castle Medical Center in Kailua serves some Koʻolau Loa patients. Honolulu hospitals provide specialty services and care.

In the Kahuku area, Kahuku Medical Center has 31 beds, and Crawford's Convalescent Home has 55. Kahuku Medical Center's occupancy varied by bed type: surgical care (11 beds, 5% occupancy in 2009), acute/specialized nursing care (11 beds, 55% occupancy), and intensive care (10 beds, 98% occupancy).[21]

On the Behavioral Risk Factor Surveillance survey, KNS respondents usually report high levels of health care coverage, although an indicator of usage ("Visited doctor for a routine checkup during the past year") shows mixed results from 2005 through 2010.[22]

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[19] Information for TMK 1-5-7:27 and 1-5-7:29, downloaded from Hawaii Information Service in June 2012.

[20] The count of single-family dwellings in the TMK database is much smaller than the housing units counted in the 2010 Census. As a result, only the general statement of findings noted in the text seems warranted.

[21] Occupancy estimates for 2009 from Hawaii State Department of Health, posted at http://hawaii.gov/shpda/resources-publications/health-care-utilization-reports/updates-and-results/2009-data/table-6. The figures for acute and long-term care are below the county averages for that year.

[22] Hawaii State Department of Health website, access April 26, 2012 http://hawaii.gov/health/statistics/brfss/HBRFSS-IA9/atlas.html.

F.3. g. Education Facilities

Two public high/intermediate schools, Waialua High and Intermediate and Kahuku High and Intermediate, serve the region, along with seven (7) elementary schools. Each school is part of separate regional systems delineated by the State Department of Education. Table 2-24 summarizes the two regional systems and their current enrollment.

Table 2-24: Enrollment in KNS Public Schools, September 2011

	Enrollment
Leilehua-Mililani-Waialua Complex Area	
Waialua High and Intermediate School	642
Haleiwa Elementary School	180
Waialua Elementary School	506
Castle-Kahuku Complex Area	
Kahuku High and Intermediate School	1,491
Hauula Elementary School	267
Kaaawa Elementary School	141
Kahuku Elementary School	490
Laie Elementary School	658
Sunset Beach Elementary School	451
Total Enrollment, KNS public schools	*4,826*

SOURCE: Hawaii Department of Education website

St. Michael's School in Waialua and Sunset Beach Christian both provide private elementary education. Plans for a high school near Haleʻiwa, Aloha Ke Akua, have been advanced, but the initiative appears to have stalled for lack of financial support.

A new school based in Hauʻula, Hawaii Active Learning Academy, combines on-line classes with projects led by teachers. Its application for charter school status was denied in 2011. It functions now as a private school.

Kahuku High School graduated 250 students in 2009, while Waialua High School graduated 98.[23] Over 80 percent of graduating students from Kahuku have planned to continue schooling, but most planned to combine school and work.[24]

[23] Hawaii State Department of Education report posted at http://doe.k12.hi.us/reports/highschoolcompleter0809.pdf

[24] Based on School Exit Plans Survey, last conducted in spring 2008, for Kahuku High School, http://arch.k12.hi.us/PDFs/resources/archive/seps/2008/SEPS307.pdf.

Preschools

Early child-care facilities in Hawai'i are licensed or, if small, license-exempt. Ten licensed programs are located in the KNS region: four Head Start programs, two programs associated with local churches, two non-denominational private programs, a Hawaiian language preschool and a preschool run by a charity serving low-income families. All run day programs only.

In recent years, preschools in the region have not operated at capacity according to Mr. Steve Albert of Rainbow Schools. With the economic downturn, state funds to support preschools were cut and family budgets tightened.

F.3. h. Recreation Facilities and Attractions

The North Shore's coastline supports surfing, boating activities, swimming and, in calm weather, snorkeling and scuba diving. It is a destination for surfers from the island, elsewhere in the state, and worldwide. The region is host to international surfing events including the Triple Crown of Surfing competition and the Quiksilver in Memory of Eddie Aikau surfing competition held at Waimea Bay only when waves are consistently over 20 feet. The North Shore surf also attracts tourists, whether as beachgoers or observers, throughout the year, but especially during the winter season.

In 2010, some 1.5 million beachgoers were counted by Water Safety Officers at guarded beaches in the KNS region, 9.6% of the total O'ahu beach count.[3] Approximately 17% of the surfing accidents and rescues reported island-wide were at KNS[25] beaches. These counts do not cover the Resort beaches.

Kawela Bay is currently used by KNS area residents for beach going, fishing and water sports as documented in the SEIS report on Marine Resource Impacts (Appendix E).

In recent years, turtle and seal populations have increased in Hawai'i. Turtles are sighted regularly by visitors along the KNS coastline. The marine resources impact analysis discussed above in this Chapter documents an increase in turtle and seal populations at Kawela Bay since 1985. Laniākea Beach (also known as Turtle Beach), approximately nine miles west of Resort, has become an extremely popular destination for tour buses and free-and-independent travelers (F.I.T.) to view turtles basking on the shore and swimming in the near shore area.

The KNS region has a wide range of recreation sites. Beach parks are dotted along the entire coast, notably near famous surf breaks. District parks at Kahuku and Waialua include sports fields. (Kahuku District Park, about three miles from the Resort, has baseball and softball fields,

[25] KNS guarded beaches are Hale'iwa Ali'i, 'Ehukai, KeWaena, Sunset and Waimea. Other popular beaches are found throughout the region. DBEDT, 2010 State of Hawaii Data Book, Table 7.51.

Table 2-25: Persons Interviewed for This Report

First	Last	Affiliation Notes
Kat	Adcox	Kuilima Estates resident Waimea Valley employee
Steve	Albert	Rainbow School
Eric	Beaver	President, Hawaii Reserves, Inc. Past Chairman, Kahuku Hospital
Tinker	Bloomfield	Pupukea resident; Waimea Valley employee
Clifton C.	Cassity	Managing Agent, Villa Management at Turtle Bay Resort
Mona	Chang-Vierra	Waimea Valley
Mitch	Costino	Kuilima Estates West Association - President
Tom	Cross	Turtle Bay Resort, Resort Manager
Joann	Dicion	Turtle Bay Resort employee
Kent	Fonoimoana	Koʻolauloa Neighborhood Board; Defend Oahu Coalition
Danna	Holck	Turtle Bay Resort, General Manager
Randal	Hoopai	Waimea Valley Facilities Manager; Waimea resident
Elaine	Hornal	Turtle Bay Resort employee
Patsy	Izumo	Waimea Valley
Choon	James	Marconi Road resident
Jeff	Johnston	Turtle Bay Resort employee
Barbara	Kahana	Koʻolaulea Neighborhood Board
Kent	Kamiya	Kamiya Papaya Farm
Dee Ann	Kekahuna	Waimea Valley Human Resource Manager; Kahuku resident
Daniel	Kerwin	Unite Here! Local 5 Hawaii, Organizer
Bob	Leinau	North Shore Neighborhood Board
DeeDee	Letts	Koʻolauloa Neighborhood Board; Koʻolauloa North Shore Alliance; Specialty Courts Coordinator; Mutual Housing Board - President
Melvin	Matsuda	Kahuku Brand Farms
Susan	Matsushima	Alluvion Inc, CEO (North Shore)
Creighton	Mattoon	Koʻolauloa Neighborhood Board: Kahuku Medical Center Board of Directors, Vice President; Koʻolauloa North Shore Alliance; Punaluʻu Community Association; Koʻolauloa Hawaiian Civic Club; Keep the Country Country
Cathleen	Mattoon	Koʔolauloa Hawaiian Civic Club; Punaluʔu Community Association
Lt Tasman	McKee	Honolulu Police Department
Elena	Meehan	Turtle Bay Resort employee
Antya	Miller	North Shore Neighborhood Board; North Shore Chamber of Commerce; Haleiwa Main Street; Wailua Community Association
Bob	Nakata	Former State Representative; Former State Senator; Kahaluu United Methodist Church, Sr. Pastor; Kahalu'u resident
Josanda	Napeahi	Turtle Bay Resort employee
Jay	Oku	North Shore Disaster Preparedness Committee
Kathleen	Pahinui	North Shore Neighborhood Board; Wailua Community Association
Junior	Primacio	North Shore Strategy Planning Committee; Former Koolualoa NB, No 28; General Manager of former Kahuku Housing Corporation
Ben	Shafer	Kahana Valley resident
Captain D.	Tsuchida	Honolulu Police Department
Bernadette	Tyrell	Principal, Sunset Elementary School
Stephanie	Vaioleti	Administrative Director, Kahuku Medical Center; Board Member, Koolauloa Educational Alliance Corp
Jeff	Wallace	Honolulu Fire Department; Caretaker for Continental Properties on Marconi Road
Ronald	Weidenbach	Hawaii Fish Company
Sadia	Wilkins	Turtle Bay Resort employee
Harvey	Wong	Turtle Bay Resort employee
Anonymous	(three persons)	Kuilima Estates residents

NOTE: Affiliations are given to suggest how particular stakeholders helped the interviewers understand issues and concerns in the region. When an organization or agency is mentioned, no claim is made here that it supports the Proposed Action, or that it has made any official response to the Resort redevelopment. BCH interviewers sought to elicit interviewees' knowledge and perspectives, not their support or opposition to the Proposed Action.

and a volleyball court.) Malaekahana State Recreation Area supports camping by the beach. The Friends of Malaekahana provide patrolled camping sites, yurts, and other overnight shelters for rent.

Within Koʻolau Loa, the Ahupuaʻa o Kahana State Park is an entire valley dedicated as a cultural park, with marked trails for walkers. Waimea Valley, on the North Shore, has extensive horticultural plantings and cultural exhibits. I t is operated as a visitor attraction. Dillingham Airfield has glider rides.

In addition to the two championship public resort golf courses at Turtle Bay, Kahuku has a nine-hole public course.

The Polynesian Cultural Center (PCC) is a visitor destination, with "villages" representing several island societies, *luʻau* dinners, and an evening show. The PCC reported 692,081 visitors in 2010.[26] Just south of the KNS region, Kualoa Ranch offers a range of outdoor activities for visitors, including horse rides and all-terrain vehicle tours.

F.3. i. Community Issues and Concerns

For the SEIS's social impact analysis, the author, Belt Collins Hawaii LLC (BCH), relied upon public records of discussions and planning documents produced with community input, and on a series of interviews with key stakeholders. Most of the interviews were conducted in October through December 2011. Table 2-25 lists the interviewees who shared their views and those of others in their communities. Following is a summary of the report's findings. (The report is included in Appendix H as part of the socio-economic impact analysis.)

Many of the stakeholders interviewed have previously expressed strong views about the Proposed Action or earlier plans for expansion. Several are members of organizations that have challenged expansion plans in court and in community discussions. The interviewer sought to learn from a wide range of knowledgeable members of the KNS population, not just those with a particular stand on the Proposed Action.

[26] DBEDT, 2010 State of Hawaiʻi Data Book, Table 7.43.

Issues and Concerns Independent of Project - For the social impact analysis, the author reviewed the minutes of the two Neighborhood Boards in the region for 2010 through early 2012 to learn of current concerns. Recurring themes that arose in the discussions included:

- Congested roadways: On the North Shore, this issue largely involves tourist traffic and visitors parking near beach sites, especially Laniākea. In Koʻolau Loa, residents were concerned about roadways where resident parking obstructed traffic, and about possible future expansion of the highway that could affect abutting properties.

- Concern about proposed development and redevelopment: Many residents in both areas expressed opposition to new development projects, including Envision Lāʻie, the expansion of the Resort, and the proposed Haleʻiwa hotel. The Kamehameha Schools' project to renovate commercial areas in Haleʻiwa was viewed critically as affecting existing businesses, while the proposed move of the Hauʻula fire station was seen as taking limited commercially-zoned land out of private hands.

- Appreciation for developers who listen to local stakeholders: While community members expressed concern about wind farm development at Kahuku and Kawailoa, they also expressed appreciation for the involvement of First Wind, the developer of both the currently operating Kahuku wind farm and the Kawailoa wind farm, now under construction. Similarly, community stakeholders have welcomed the open attitude of TBR in introducing and sharing information about the Proposed Action and the SEIS process.

- Members of both boards support agriculture and preservation of land for agriculture.

- Outside agencies may make decisions that ignore local views and concerns. Discussion of the Koʻolau Loa Sustainable Communities Plan has recently focused on the fact that the Public Review Draft, issued by the City Department of Planning and Permitting (DPP), supports the Envision Lāʻie plans, while the earlier draft vetted by an advisory committee did not. The change was repeatedly attributed to meetings "behind closed doors." Similarly, the Department of Education has threatened to close Kaʻaʻawa Elementary School despite community opposition.

- Residents are concerned about the effects of limited government budgets on local facilities and resources. Schools, parks, and civil defense budgets may all be affected.

- Disaster planning has emerged as a local initiative throughout the region, with an emphasis on stockpiling supplies needed in the event of emergencies.

- Tensions clearly exist among community leaders. These were evident when a petition to dissolve Neighborhood Board No. 28 in Koʻolau Loa was discussed, and in accounts of various parties involved in housing redevelopment in Kahuku who failed to meet to develop shared goals and proposals. However, Neighborhood Board meetings appear to have proceeded without disruption, unlike more contentious boards elsewhere on Oʻahu. (The North Shore Board convened a meeting on the Haleʻiwa Hotel proposal that became rowdy and was quickly adjourned. In this case, members of the audience were disruptive.)

In the course of interviews, respondents emphasized their deep commitment to "country" lifestyles. They list difficulties for local residents ranging from the inconvenient – Sears delivery service only on Sundays – to traffic congestion that can make the highway impassible during surf season. Still, no interviewee went on to suggest that they or their friends would leave the region because of such problems.

Interviewees mentioned the cost of housing and the limited availability of housing for residents as significant problems for the region. Illegal vacation rentals were sometimes mentioned as part of the problem, both as disruptive in residential neighborhoods and as affecting housing supply and prices.

The ideas of sustainability and food security, much discussed in Hawaiʻi recently, have taken local form in the KNS region. First, much of the opposition to development has been expressed in terms of preserving the North Shore as a shared resource, a unique area enjoyed by the whole island and tourists from around the world. Second, many stakeholders are interested in maintaining the region's agricultural resources. Third, major landowners – notably Kamehameha Schools and Hawaii Reserves Inc. – have identified the need for their regional resources to be increasingly self-sustaining.

Redevelopment at the Resort has been discussed in the KNS region for decades. The Proposed Action is seen by residents in relation to earlier proposals and discussions. The original master plan for the Kuilima Resort was welcomed by some as assuring economic stability, continuing jobs in the region, and opposed by others as bringing too much development, too many tourists, and too much traffic to the North Shore. Since the 1980s, public debates over development vs. open space have arisen again, notably with regard to plans for Lihi Lani, a recreational community, just north of Pupukea, for a proposed eco-camping resort at Puaʻena, and, more recently, for a proposed Haleʻiwa hotel.

Smaller residential subdivisions have been developed along the North Shore coastline. Along the Koʻolau Loa side of the region, major new development has been proposed only by Hawaiʻi Reserves, Inc., as part of the Envision Lāʻie process, and little has been put in place.

At the Resort, the 2005 announcement by the Resort's previous owner that the Resort would carry out the development proposed in the Kuilima EIS revived old arguments, and several

stakeholders developed the legal challenge that resulted in the Hawai'i Supreme Court ruling that set the Kuilima EIS aside. The draft of the *Ko'olau Loa Sustainable Communities Plan* spells out the concerns expressed in response to the proposal for expansion to the extent allowed in the late 1980s:[27]

> … many residents of Ko'olau Loa do not support the resort expansion due to concerns about traffic impacts on the two-lanes of Kamehameha Highway, the capacities of existing infrastructure systems and public services to accommodate the future projected demand (e.g., water, wastewater, electrical systems, police and fire protection, and emergency services) and the potential impacts to archaeological, cultural and natural resources. Labor force issues related to population growth, housing demand and transportation, as well as a desire to preserve the undeveloped shoreline and scenic view planes and maintain the region's rural character are also concerns. Although there is general support for the existing hotel operations, community discussions about the future development of the resort continues [*sic*], pending completion of an updated EIS. Community concerns about the proposed resort expansion include:
>
> - Preserving the uninterrupted shoreline and scenic view plane, as well as the cultural and historic significance of the area for future generations;
> - Providing for appropriate recreational and other uses that are compatible with existing land uses;
> - Maintaining the viability of the existing Resort, restaurants, condominiums and golf courses as an employment base for the region;
> - Minimizing the impacts of future development;
> - Developing design guidelines for any proposed additional structures to assure their compatibility with the rural character of the region;
> - Providing for appropriate agricultural and other compatible uses in the *mauka* area; and
> - Acknowledging existing land use designations and development approvals that have already been granted.

[27] City and County of Honolulu, Department of Planning and Permitting, Ko'olauloa Sustainable Communities Plan Five-Year Review: Public Review Draft. Honolulu, HI: 2010. The language quoted here was crafted largely in response to proposals by the previous resort owner, Kuilima Development Company, which sought development as permitted by a Unilateral Agreement (further discussed in Chapter Three of the SEIS). The Sustainable Communities Plan now in force and the draft update are generally more supportive of resort expansion than the stakeholders whose views are described in the above quotation.

This entire discussion is included here both because it reflects input from local stakeholders on the Community Advisory Committee for the planning process and because it covers the range of concerns about the Resort that arose in recent interviews. (The interviewer advises there was no did discussions of design guidelines, but people were concerned that the Resort be in keeping with the region's rural character.) Interviewees emphasized traffic congestion as the leading problem for the region. Some went on to discuss the Resort expansion in relation to the need for jobs and housing in the region, and to inadequate infrastructure and public facilities. Others saw it as bringing too many tourists to the area, and as not needed.

The quotation above downplays differences in views of regional residents that could be heard in the course of interviews:

- The draft texts from the Department of Planning and Permitting emphasize opposition to the Resort expansion; in interviews for the socio-economic impact analysis, both support and opposition were expressed. Many residents continue to see job creation as needed to support local communities, and welcome Resort expansion for that reason.

- While view planes at Turtle Bay are important to some residents, others' attention focuses above all on their own home communities. Most interviewees said little about the appearance of the Resort.

Comments on the SEIS Preparation Notice and at public events have covered the points raised above. Issues of concern to many include traffic congestion and protection of marine life (green sea turtles and Hawaiian monk seals). Demands for careful archaeological studies and cultural sensitivity have been made forcefully; the archaeological inventory and cultural impact assessment conducted for the Resort are part of TBR's response.

Some interviewees raised questions about the impact of Resort development, especially resort residential development, on property values nearby.

Interviewees were also asked what steps they thought would be appropriate to mitigate effects of the Proposed Action. Some responses dealt with mitigation of specific anticipated impacts; others simply identified ways in which the Resort could be of greater benefit to stakeholders:

- **Community housing**: KNS residents largely see "affordable housing" built to government pricing guidelines as unaffordable. Many do not trust the government or any developer to build homes that meet the needs of the regional community.

- **Unionization:** Several Resort workers viewed the Proposed Action narrowly in relation to ongoing contract talks with the major union representing workers at the Resort. They accused the hotel operators of increasing workloads in order to set a low baseline for future expansion. They viewed expansion as likely to involve facilities that were not unionized, where wages, benefits and working conditions could be worse than at the current hotel.

- **Disaster planning:** Some residents suggested that the Resort could help surrounding communities by providing a evacuation site upland or by supporting work to maintain resources that would help the community in case of disasters. A related concern was that additional visitors at the Resort would make evacuation even more difficult for the region than it is already.

- **Control over parks**: Conversion of land at Kawela Bay and Kahuku Point to City and County parks would involve increased access for visitors as well as nearby residents. Some question whether the City and County would be able to maintain these parks well. One Kawela Bay resident has spoken publically of his desire for limited access to Kawela, and for policing of any park by the Resort. Others may share his hope that new park areas would be kept clean and park usage would be monitored without aiming to limit local access.

- **Pedestrian and bicycle routes**: Some interviewees pointed to the Malaekahana bike path as a valuable addition to the community, and sought to see it extended from Kahuku past the Resort toward Sunset Beach. They mentioned this as bringing together people from Kahuku and Lāʻie who enjoy it as a new pedestrian link between their communities.

These comments should be understood as pointing towards desired goals as much as an analysis of the merits of the Proposed Action or alternatives.

In addition to the issues identified by the interviewees, specific infrastructure projects unrelated to the Resort have influenced or will influence the socio-economic character of the region.

As a two-lane roadway, Kamehameha Highway's size limits traffic flow throughout the KNS region. The Haleʻiwa Bypass (Joseph P. Leong Highway) provided a local response to congestion. At Waimea Bay, road improvements and cliff stabilization were needed after a major rock fall in 2000, but another fall in 2007 resulted in a brief closure.[28] The City and County's Parks and Recreation Department has plans for support parks, notably at Laniakea, which could reduce roadside parking and unmanaged pedestrian crossings.

A new pedestrian and bike path opened in 2011 in Malaekahana, linking Lāʻie and Kahuku, as part of the Envision Lāʻie initiative.

The City and County of Honolulu has been seeking a new municipal sanitary landfill site to replace Waimanalo Gulch. A citizen committee has recently identified criteria for preliminary ranking of potential sites before land owner, city, state and federal guidelines are evaluated.

[28] Park, G. "Waimea Bay Rocked Again." Honolulu Star-Bulletin. April 8, 2007. Posted at *http://archives.starbulletin.com/2007/04/08/news/story01.html*

Based on their input, a site immediately upland from the Resort has emerged as the preferred location for a new landfill.[29] The site is under the control of the federal government, and is part of the Army's Kahuku Training Area. The City and County of Honolulu does not have the authority to take Army land without federal consent. Apparently, no consultation with federal authorities had occurred at the time of the study because the analysis was limited to an evaluation of physical land characteristics and did not take into account land ownership.

F.3. j. Comparison of Current Socio-Economic Trends with Those Discussed in the 1985 Kuilima EIS

F.3.j. [1] THE SEIS LANDS AND THE RESORT

Before the Kuilima EIS was completed in 1985, parts of the Resort property now identified as the SEIS Lands were under short-term agricultural or residential leases. The leases were not renewed, and beach cottages along the eastern half of Kawela Bay on the SEIS Lands were demolished. A major difference between the current situation and that in 1985 is that the Proposed Action does not involve displacement of private homes or activities.

In the early 1980s, the Kuilima Hotel (now the Turtle Bay Hotel) had low occupancy levels, and the development permits existing at that time did not, in the view of the owners, allow for adequate growth to achieve a prosperous level of operations. After the 1985 EIS was accepted and new development approvals were granted, the owners took steps towards implementing a Resort expansion plan but soon found they could not proceed with their plans for macro-economic reasons.

In the intervening years, the hotel was refurbished in the year 2000 and has experienced higher occupancy levels. The Ocean Villas have expanded the Resort's offerings. The Resort is now a viable resort operation. It has development permits for expansion and the owners plan to implement a phased development plan.

F.1.j. [2] REGIONAL ECONOMY

In the 1980s, the KNS region was characterized by lower incomes and employment than the rest of the City and County of Honolulu, and by a narrow economic base. The region stood out as the center for aquaculture in Hawai'i. Tourism was recognized as offering "the greatest promise for providing new employment and business opportunities" on O'ahu.[30] While the region included major visitor attractions (at PCC and Waimea Valley), the Kuilima EIS identified area residents as more dependent on agriculture and fishing than tourism. Since then, the surf and visitor industries of the region have expanded, and the North Shore's reputation has grown. Only 2.1% of the civilian workforce is in agriculture (as shown in Table 2-17).

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[29] Pacific Business News, April 25, 2012. *http://www.bizjournals.com/pacific/news/2012/04/25/kahuku-sites-now-top-oahu-landfill.html*

[30] Community Resources, Inc. and A. Lono Lyman, Inc. op. cit., page 6.

Tourism is now the region's leading industry. Household incomes for most of the region approach or exceed the island median. However, regional unemployment remains above the island average. Commute times for most of the region are still longer than for other parts of Oʻahu and are now longer than reported in 1980.

F.3.j. [3] POPULATIONS AND COMMUNITIES IN THE REGION

Demographic changes include population growth and aging of the overall population (from medians in the region of about 25 years in 1980 to about 32 years of age in 2010). Changes in ethnic composition are not easily specified, since classification schemes for race and ethnicity have changed, but a marked increase in the share of the population identified as (at least in part) White has occurred. However, occupancy rates have changed little.

F.3.j. [4] HOUSING MARKET

Housing costs on Oʻahu have increased greatly over the last thirty years, and the ratio of housing costs to incomes has increased as well. In parts of the KNS region, the practice of renting homes and/or apartments to vacationers or surfers has tended to increase rents and limit the inventory available to KNS area residents. Elsewhere on Oʻahu, single-family housing and condominiums have been built in large new subdivisions, but housing development in the KNS region has been far slower than in Central Oʻahu and ʻEwa. This is largely due to population distribution standards enacted by the City in the mid-1980s. Available housing within the KNS region is even more limited and costly than before.

F.3.j. [5] EMERGING TRENDS

The 1985 EIS dealt at length with the demographics, economy and aspirations of the region. At that time, the closing of Kahuku Sugar had transformed the economy of Koʻolau Loa, and it was clear that Waialua Sugar would close in the near future. Tourism was recognized then as a critical source of new jobs for the region.

The social impact analysis presented in the 1985 EIS emphasized that the City and County *General Plan* guidelines called for slow population and housing growth – but that existing approvals already provided capacity for a population of approximately 30,400 by 2000. (In retrospect, the actual 2000 population was 108% of the estimated capacity.)

The traffic analysis conducted for the 1985 EIS incorporated assumptions of continuing growth of traffic in the region: traffic was seen as increasing faster than population or housing.

These facts can be read in two ways in relation to the current situation in the region. On the one hand, the problems of a limited economic base, inadequate housing supply, and traffic congestion remain. Expansion of the Resort is a source of jobs for many and some homes affordable for KNS families. To the extent that the expanded Resort will provide recreation and other activities for its visitors, in the long-term it might not add much to, and might even reduce, the circle-island visitor

traffic in the region. However, some observers emphasize traffic congestion and housing demand, and claim that the need for an alternative job base is no longer pressing. They value the existing Resort as a regional amenity but question the need for expansion.

But the data reviewed above indicate that local job sources fail to meet the employment needs of many KNS residents, limiting employment for some and forcing others to commute long distances or to leave the region to find work. Both local employment demand and traffic congestion indicate that the main themes of the regional socio-economic analysis provided in the 1985 EIS are still valid.

F. 4. Transportation

The following discussion addresses existing transportation conditions in the region and at Resort. A discussion of the Proposed Action's impacts on transportation infrastructure is presented in Chapter Five of the SEIS.

F.4. a. Vehicular Traffic

F.4.a. [1] KAMEHAMEHA HIGHWAY

Access to the Resort is provided by Kamehameha Highway, a primary arterial highway owned and maintained by the State of Hawai'i. It is a two-way, two-lane, undivided highway with posted speeds of 35 mph west of the Resort and 45 mph east of the Resort. The portion of Kamehameha Highway extending from Hale`iwa to Kane`ohe is identified as Route 83 (see Figure 2-63. The highway generally follows the coastline, except for the Kahuku area and the Hale'iwa area where it turns inland. The highway consists of a 50-foot wide right-of way with pavement widths of 20 to 24 feet and unpaved shoulders. In most areas, there are no sidewalks and pedestrians must walk on the shoulders.

The Resort is currently served by TheBus Route 55 (Kaneohe Circle Island) and Route 88A (North Shore Express). Route 52 in Wahiawa connects to Route 55 and provides more direct service to the Resort from downtown Honolulu, but requires a transfer. Ala Moana Shopping Center in Honolulu is the terminus of these services. Travel to the Resort using local routes takes from 2 hours to 2 hours 35 minutes depending on the time of day. Express service reduces this time to between 1 hour 30 minutes and 1 hour 50 minutes, but only includes two trips each during the morning and evening commute periods.

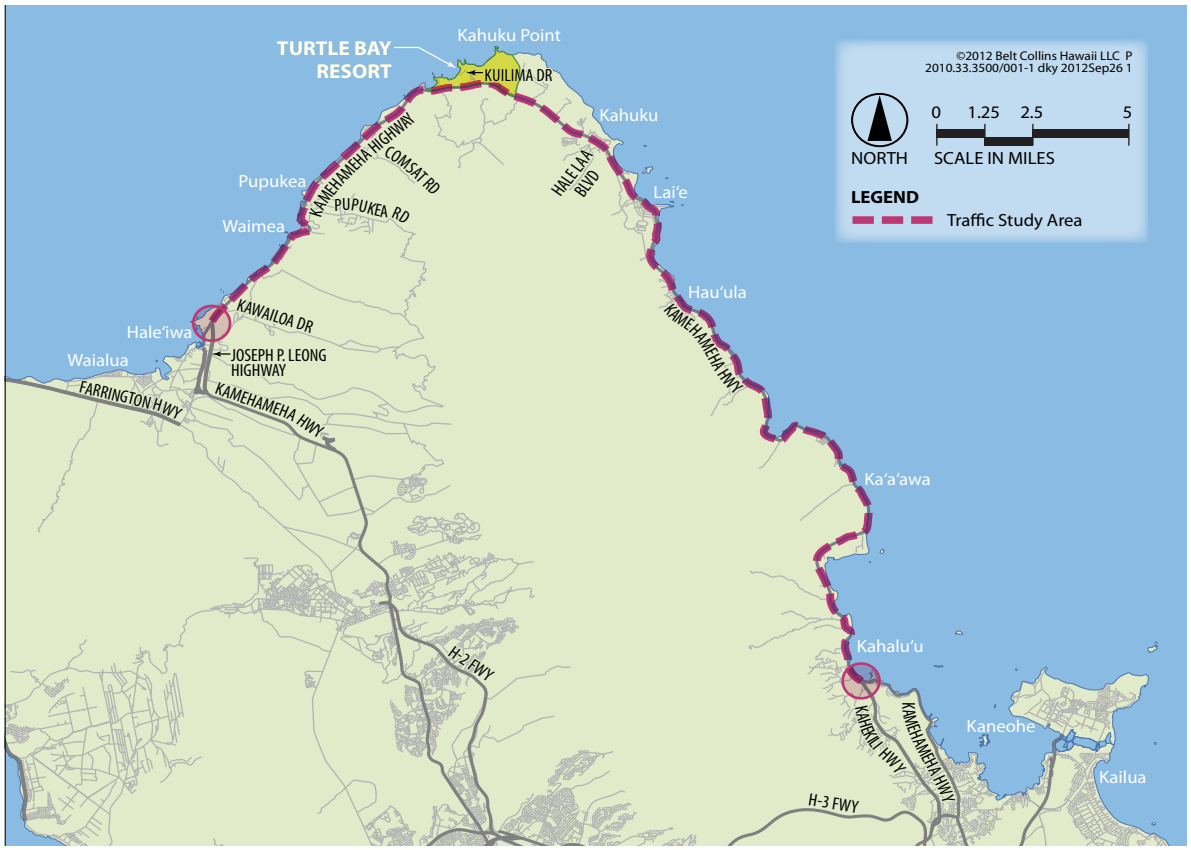
From Honolulu International Airport, travel to the Resort takes approximately 2 hours and 15 minutes. Travelers can take Routes 19, 31 or 62 and transfer to Route 52 near the Middle Street/ Nimitz Highway intersection. Recent routing and scheduling changes were implemented in June 2012 to increase system efficiencies and reduce operating costs for TheBus. No major service changes are expected in the near future for the transit routes serving the Resort.

Travel from the Airport to the Resort by car takes approximately 1 hour via H-1, H-2, and Kamehameha Highway, or via H-3, Kahekili Highway, and Kamehameha Highway. Other

transportation options to access the Resort are provided by David's Limo, Charley's Taxi, Turtle Bay Airport Shuttle Express, and other private companies. These services charge $85 to $160 one-way for two to four passengers.

Once at the Resort, guests can currently rent a car from Enterprise Rent a Car, and the cost is a minimum of $50 per day and varies depending on the vehicle type, demand, and insurance. Short-term rentals of a few hours are not available because a full day rental is currently required.

Figure 2-63: Regional Traffic Study



The following table shows the average cost for a family of four to travel from Honolulu to Turtle Bay using a private rental car, taxi, TheBus, or a shuttle. All of the services listed above are currently provided as options for guests.

As discussed in the 1985 EIS, in most of the communities between Haleiwa and Punalu'u, the great majority of residents live within a few blocks of the highway. The highway is each community's link to the rest of O'ahu. Although population growth in the combined North Shore/Ko'olau Loa area has been relatively stable over the past 30 years, a combination of factors has led to an increase in traffic congestion on the highway. Increasing traffic congestion is a major source of concern for area residents and community leaders.

Table 2-26: Transportation Options for Resort Guests

Travel Type	Travel costs (one way)	Round Trip Guest Cost (family of 4)	Travel Time	Ride Type
Car Rental (5 days)	$50 per day + Fuel	$250	60 min	Private Vehicle
Star Taxi	$85 (up to 4 passengers)	$170	60 min	Direct Private Vehicle
Oahu Airport Shuttle	$110 (up to 4 passengers)	$220	60 min	Direct Private Shuttle
TheBus	$2.50/person	$20	120 min	Shared ride, multiple stops and transfers
Oahu Airport Shuttle	$89 for first customer + $9 per additional (up to 6 per van)	$209	60 min	Varies, direct to Resort

In the 1985 EIS, Haleʻiwa Town and Waimea Bay were identified as the primary constraints on regional traffic congestion. The narrow Anahulu Bridge located near Haleʻiwa Beach Park requires opposing streams of vehicles to slow down. Within the town, pedestrians crossing the highway at various points between the roadway intersections in the town also impact the speed of vehicles. And because of the two-lane character of the highway, left-turning vehicle impact traffic flow in both directions.

A similar condition was observed at the entrance to Waimea Bay. Motorists parking along the roadside or turning left into Waimea Beach Park or Waimea Valley Road create traffic delays in both directions. The curvilinear alignment of the highway along the bay also causes vehicles to slow down.

Similar conditions were also noted in the 1985 EIS along the highway between Waimea Bay and the Resort wherever there is a beach park or a driveway. Motorists executing a left-turn movement create traffic delays in both directions. Motorists parking along the shoulder on the mauka side of the highway and then exiting their vehicle to cross the highway to view the surf or go to the beach cause traffic delays. This experience is exacerbated during organized surfing competitions, large beach gatherings, and high surf events. Traffic flow along the highway is also slowed by municipal buses that frequently stop along the highway to drop off or pick up passengers.

Since the 1985 EIS was prepared, two additional constraints on traffic flow have occurred. First, Lanikea Beach (aka Turtle Beach), approximately 9 miles west of the Resort, has emerged as a significant visitor and local resident destination. Tour buses, shuttles, vans, as well as F.I.T travelers and local residents frequent the beach seven days a week to view green sea turtles basking on the shoreline or swimming in the near shore area. This is the direct result of the

marked increase in the turtle populations since the mid-1980s, as noted earlier in this chapter. Because there is no improved parking area at the beach and no provisions for traffic or pedestrian control (traffic signals, pedestrian crossings, etc.), motorists are forced to park along the mauka side of the highway and then cross the highway to make their way down the slope to the beach. Left-turning motorists and pedestrians slow traffic in both directions.

Second, since the 1980s, the success of many aquacultural enterprises between the Resort and Kahuku has resulted in a marked increase in the number of roadside shrimp vendors. These vendors are typically located on the makai side of the highway with generally adequate parking areas nearby. Thus, although they do not appear to generate the same volumes of pedestrians needing to cross the highway as Laniakea visitors, motorists traveling in an eastern direction need to execute a left-turn across the highway, thereby slowing traffic in both directions.

The average daily number of visitors on Oʻahu has increased by over 23,000; from 65,280 in 1985 to 88,979 in 2011. During the same period, the resident population has increased by about 150,000. As a result, there are more people driving on the islands roads and likely visiting the North Shore. The cumulative result of these population increases, together with traffic impediments that existed in 1985 and new impediments have emerged since then, has generated considerable frustration among area residents about the general state of traffic congestion on Kamehameha Highway.

The State DOT has no plans to widen Kamehameha Highway or construct a second regional highway to serve the area. But it continues to maintain a policy of reserving right-of-way. Improvements to the highway have been, and will likely continue to be, limited to safety related improvements.

F.4.a. [2] KUILIMA DRIVE

Kuilima Drive provides access to the existing Turtle Bay Hotel, Kuilima Estates, and golf courses for Resort guests, visitors, residents, golfers, and hotel service vehicles. It is a privately owned and maintained four-lane, two-way divided roadway that intersects Kamehameha Highway at a stop sign controlled T-intersection. It is constructed to City and County of Honolulu standards and includes pavement, curbs, gutters, and sidewalks within an 80-foot right of way that widens at the Kamehameha Highway intersection. Kamehameha Highway does not have presently have provisions for exclusive turning lanes at Kuilima Drive.

F.4.a. [3] MARCONI ROAD

Marconi Road abuts the eastern boundary of the Resort. It is a privately owned two-lane, two-way roadway that intersects Kamehameha Highway at a stop sign controlled T-intersection.

F.4.a. [4] SERVICE ROADS

Two service driveways, situated between Kuilima Drive and Marconi Road, provide access from the Highway to portions of the Resort. One provides access to the Palmer Golf Course maintenance facility for golf course employees only. The other provides access for large vehicles that service the golf course.

Service and access roads constructed within the Resort are considered driveways by the City.

F.4. b. Parking

The hotel has approximately 509 employees, of which 260 to 350 are on-site at one time. The number varies depending on events and occupancy. Shift changes for employees typically occur between 7:00 and 8:00 AM and again between 10:00 and 11:00 PM. Employee parking is located in designated areas and in the golf overflow parking area. Parking areas are typically one-quarter to one-half full. The areas of most concern for commuting employees are general traffic, surf traffic, parking location, and parking surface (some parking is on grass).

Guest parking is generally accommodated even at 80% plus occupancy at the Resort. Guest parking occupancy typically ranges from 60% to 100% on the weekends. Conventions and conferences make up approximately 20% of the activity at the Resort. During special events, overflow parking is accommodated on vacant lands to the west (and south of the highway if needed).

F.4. c. Pedestrians

F.4.c. [1] REGIONAL

As mentioned above, most of Kamehameha Highway has unimproved shoulders with no sidewalks, forcing pedestrians to walk on the shoulder or along the edge of the highway pavement. With the exception of a new 1.2 mile paved pedestrian path and bikeway along the mauka side of the highway between Lāʻie and Kahuku that was completed several years ago, this hazardous condition has persisted since the mid-1980s.

F.4.c. [2] LOCAL

Near the Resort, Kamehameha Highway does not currently have sidewalks, however pedestrian access within the Resort is currently provided via attached sidewalks along streets and a network of paths and trails.

Moped, Segway, and electric bicycle rentals are available to Resort guests. The rental operation is run by a Hele Huli Adventure Rentals. Two wheel or three wheel mopeds are available for hourly or daily rental with prices starting at $30 and $59 for up to 24 hours. Segway tours are also available. A 30-minute demo tour costs $45 and a 90-minute adventure tour costs $99. Electric bicycles with up to 30 miles of battery power are available for $20 the first hour and $10 per additional hour.

F.4. d. Bicyclists

Bicycle access to and from the Resort to other nearby destinations is currently available by sharing the lane with vehicles on Kamehameha Highway. The State DOT bike map shows this facility as suggested route for experienced bicyclists. An existing multi-use path is located along the highway beginning approximately 2.5 miles west of the Resort entrance, and a second multi-use path is located along the highway beginning in Kahuku approximately 3.9 miles to the southeast. However, the posted speed limits on the roadway vary between 35 and 45 miles per hour and the lack of additional pavement width at selected locations make bicycling a challenge, especially for less-experienced riders.

The draft Oahu Bike Plan map shows Kamehameha Highway as a proposed official bike route but additional improvements including bike lanes or separated bike paths have not been proposed near the Resort.

Within the Resort, bicycle rentals are available to hotel guests who, together with some residents of the Kuilima Estates, use them to travel the miles of pedestrian paths along the shoreline.

F.4. e. Previous Traffic Studies

A traffic study for the Resort was prepared in 1985 and presented as part of the 1985 EIS. Subsequent to the acceptance of the 1985 EIS, land use approvals and entitlements were granted allowing the development of 3,500 new units at the Resort. As the result of these approvals, the State DOT required the Resort owner to conduct additional traffic studies to address proposed traffic improvements. Following is a summary of the studies that have been conducted since 1985.

An update of the 1985 EIS traffic study entitled, *Traffic Impact Analysis Report for the Proposed Kuilima Resort Expansion*, dated July 25, 1991, was prepared by The Traffic Management Consultant (TMC). It focused on the access to the Resort.

A subsequent update entitled, *Traffic Impact Analysis Report Update for the Proposed Turtle Bay Resort Master Plan*, dated September 9, 2005, was prepared by TMC. The purpose of the TIAR Update was to support the design of the proposed Resort access intersections along Kamehameha Highway.

On February 14, 2006, TMC completed Addendum No. 1 to the 2005 TIAR Update. The addendum analyzed the channelization design of the new intersection at Kamehameha Highway (now called Kaihalulu Drive).

At the request of the City and County of Honolulu's Department of Planning and Permitting, TMC prepared a second addendum (Addendum No. 2) to the 2005 TIAR Update. It was dated April 21, 2006 and addressed the issue of whether Kaihalulu Drive should be widened from two to four lanes within the Resort.

On August 25, 2006, TMC completed a third addendum (Addendum No. 3) to the 2005 TIAR. It addressed a second phase of improvements on Kamehameha Highway at the Kuilima Drive intersection and at the proposed Kaihalulu Drive intersection.

On June 27, 2007, TMC completed a fourth addendum (Addendum No. 4) to the 2005 TIAR to determine the first phase of development where access would be provided by the improved Kuilima Drive intersection.

On April 16, 2009, TMC completed a revision of the 2005 TIAR Update, entitled *Revised Traffic Impact Analysis Report Update for the Proposed Turtle Bay Resort Master Plan.* The Revised TIAR was formally accepted by the State Department of Transportation in a letter dated July 9, 2009.

All eight traffic studies conducted between 1985 and 2009 addressed the proposed expansion of the Resort approved after the 1985 EIS was accepted.

F.4. f. Existing Traffic Conditions

To address traffic conditions that will result from the implementation of the Proposed Action discussed in this SEIS, TMC has prepared a new traffic study that evaluates current traffic conditions and forecasts traffic impacts in the year 2025. The report, entitled *Traffic Impact Analysis Report for the Proposed Turtle Bay Resort Master Plan,* dated September 18, 2012 (hereinafter, "the 2012 TIAR"), is presented in the SEIS as Appendix I. The results of the current study that pertain to existing conditions are summarized below. The traffic impact study's findings and recommendations are presented in Chapter Five of the SEIS.

F.4.f. [1] METHODOLOGY

The adequacy of a roadway to accommodate vehicular traffic flow is measured in two ways: a determination of the Level of Service (LOS), and an evaluation of the capacity of a roadway (expressed as a volume-to-capacity, or "v/c, ratio"). The former generally evaluates how roadway intersections perform. The latter evaluates how stretches of roadway perform.

Several factors determine LOS, including speed, travel time, freedom to maneuver, traffic interruptions, driver comfort, and convenience. The LOS is expressed in letters A through F, where A, B, and C are considered to be satisfactory levels of service at an intersection. The letter D expresses what is generally considered to be a "desirable minimum" operating level of service. LOS "E" is an undesirable condition and LOS "F" is an unacceptable condition. It should be noted that a single intersection can, however, have more than one LOS rating. For example, an intersection may generally perform at LOS "A", but a cars attempting to turn left at the intersection might experience a LOS level of "C" or "D".

Volume-to-capacity ratio is a measure indicating the relative traffic demand to the roadway's capacity. In technical terms, it is defined as "the maximum number of vehicles that can pass a given point during a specific period under prevailing roadway, traffic flow, and traffic control conditions." A "v/c ratio" of 0.50 indicates that the traffic demand is using half (50%) of the

roadway's capacity. A "v/c ratio" of 1.00 indicates that the traffic demand exceeds the capacity of the roadway.

The process of determining whether an intersection should be signalized is called "warranting". Traffic agencies typically will not require that a traffic signal be installed at an intersection unless it is "warranted", meaning that an engineering study must be conducted to determine if several specific measurement factors are met. These factors include the volume of traffic an intersection handles over an eight-hour period and whether traffic is so heavy that drivers experience excessive delays or conflicts entering or crossing an intersection.

The 2012 TIAR addresses traffic conditions on Kamehameha Highway from Hale'iwa to Kane'ohe. As recommended by the State DOT, the study extended over 35 miles from the intersection Joseph P. Leong Highway and Kamehameha Highway east to the intersection of Kamehameha Highway and Kahekili Highway. These two end points were chosen because beyond them motorists have a choice of routes, but between them motorists are confined to Kamehameha Highway. Peak period traffic count surveys were conducted at these intersections on October 29, 2011 (a Saturday) and on November 1, 2011 (a Monday).

Traffic counts were conducted on Kamehameha Drive intersections at Kuilima Drive and at Marconi Road by TMC on November 3, 2011 (a Thursday) and on November 5, 2011 (a Saturday). Turning movements at Kuilima Drive were recorded from 6am to 6pm on the Thursday, and from 9am to 6pm on the Saturday. Turning movements at Marconi Road were taken during what was determined to be the peak period of traffic flow on Kamehameha Highway.

A week-long traffic count survey was conducted at the intersection of Kuilima Drive and Kamehameha Highway and at the Turtle Bay Hotel entrance from Sunday, October 30, 2011 to Sunday, November 6, 2011. The purpose of the survey was to develop trip generation characteristics for the existing Resort hotel (Turtle Bay Hotel) and resort residential units (Kuilima Estates). The traffic count survey was coordinated with a travel interview survey conducted by SMS Research and Marketing Services, Inc. from November 1, 2011 through November 6, 2011. The purpose of the interview survey was to determine the origins and destinations of all traffic entering and existing the Resort, and resulted in the interviewing of about 4,800 motorists during the eight-day period. The interview survey is presented as Appendix J to this SEIS.

F.4.f. [2] EXISTING AM PEAK HOUR WEEKDAY TRAFFIC CONDITIONS

Traffic engineers measure traffic conditions by determining the peak hour of traffic in the morning and the afternoon, and using that peak hour to generally characterize traffic on the given roadway. In urban Honolulu, the peak morning period extends generally from 6:00 AM to 9:00 AM: the "rush hour". However, in the vicinity of the Resort, an analysis of traffic conditions on Kamehameha Highway determined that a traditional morning "rush hour" is virtually non-existent.

Rather, the AM peak hour of weekday traffic on Kamehameha Highway occurred between 11:00 AM and 12:00 Noon. During that period, the highway carried about 500 vehicles per hour (vph), total for both directions. That volume continued to increase in the afternoon hours.

In the vicinity of the Resort, Kamehameha Highway operated at LOS "C", with a v/c ratio of 0.18 during the morning peak hour. The left turn movement at Kuilima Drive operated at LOS "C" and the right turn movement operated at LOS "B" during that same period. Turning movements at Marconi Road operated at LOS B.

At the intersection of Joseph P. Leong Highway and Kamehameha Highway in Haleʻiwa, the AM peak hour for weekday traffic occurred between 10:45 AM and 11:45 AM, or about 15 minutes earlier than at the Resort. Kamehameha Highway carried about 900 vph, total in both directions, or about 80% more vehicles than the stretch of highway fronting the Resort during the peak morning hour. Kamehameha Highway operated at LOS "D" with a v/c ratio of 0.35 north of the intersection (meaning towards the Resort). The intersection operated at LOS "B".

At the intersection of Kamehameha Highway and Kahekili Highway in Kahaluʻu, the peak morning hour occurred between 6:45 AM and 7:45 AM, with Kamehameha Highway carrying about 1,200 vph, total for both directions, or 140% more than vehicles than at the Resort. North of the intersection, Kamehameha Highway operated at LOS "D" with a v/c ratio of 0.41. The east leg of the highway operated at LOS "F". The other turning movements were determined to be "satisfactory" levels of service.

F.4.f. [3] EXISTING PM PEAK HOUR WEEKDAY TRAFFIC CONDITIONS

At the Resort, the PM peak hour of weekday traffic on Kamehameha Highway occurred between 2:00 PM and 3:00 PM. During that period, the highway carried about 700 vehicles per hour (vph), total for both directions. Kamehameha Highway operated at LOS "C ", with a v/c ratio of 0.26 during the afternoon peak hour. The left turn movement at Kuilima Drive operated at LOS "C" and the right turn movement operated at LOS "B" during that same period. Turning movements at Marconi Road operated at LOS B.

At the intersection of Joseph P. Leong Highway and Kamehameha Highway in Haleʻiwa, the afternoon peak hour for weekday traffic occurred between 2:45 PM and 3:45 PM. Kamehameha Highway carried over 1,400 vph, total in both directions, or twice the number of vehicles than the stretch of highway fronting the Resort carried during the peak afternoon hour. Kamehameha Highway operated at LOS "D", with a v/c ratio of 0.48. The intersection operated at LOS "B".

At the intersection of Kamehameha Highway and Kahekili Highway in Kahaluʻu, the peak afternoon hour occurred between 3:30 PM and 4:30 PM, with Kamehameha Highway carrying about 1,500 vph, total for both directions, or over twice the vehicles that the highway carries at the Resort during its peak PM hour. Kamehameha Highway operated at LOS "D" with a v/c ratio of 0.48. The traffic movements all operated at a satisfactory level.

F.4.f. [4] EXISTING PEAK HOUR WEEKEND TRAFFIC CONDITIONS

Weekend traffic is typically represented by a single peak hour on Saturday and Sunday. The existing weekend traffic data indicated that Saturday traffic was higher than Sunday traffic. The difference is attributed to the fact that the PCC does not operate on Sundays. During consultation with the State Department of Transportation, it was agreed that the Saturday peak hour could be used to represent the weekend traffic conditions in the study area.

In the vicinity of the Resort, the peak hour of weekend traffic occurred between 2:00 PM and 3:00 PM. Kamehameha Highway carried almost 900 vph, total for both directions. Kamehameha Highway operated at LOS "C", with a v/c capacity of 0.29. The left turn movement at Kuilima Drive operated at LOS "D" and the right-turn movement operated at LOS "B" Marconi Road operated at LOS "B".

At the intersection of Joseph P. Leong Highway and Kamehameha Highway in Haleʻiwa, the weekend peak hour occurred between 11:45 AM and 12:45 PM. Kamehameha Highway carried almost 1,600 vph, total in both directions. Kamehameha Highway operated at LOS "D" with a v/c ratio of 0.53 north of Haleʻiwa. The intersection operated at LOS "B", with the left-turn movement operating at LOS "D" and the other turning movements operating at satisfactory levels of service.

At the intersection of Kamehameha Highway and Kahekili Highway in Kahaluʻu, the peak weekend hour occurred between 2:15 PM and 3:15 PM, with Kamehameha Highway carrying about 1,200 vph, total for both directions. Kamehameha Highway operated at LOS "D" with a v/c ratio of 0.50, or 0.02 higher than the peak PM weekday hour. The traffic movements all operated at a satisfactory level.

F.4.f. [5] SUMMARY OF EXISTING TRAFFIC CONDITIONS

Existing traffic conditions on Kamehameha Highway in the vicinity of the Resort can be compared to those that existed in 1985 when the expansion of the Resort was first proposed.

The traffic study in the 1985 EIS identified Kamehameha Highway at the Resort as operating at LOS "A" during the PM peak hour of 1:15 to 2:15 PM with the left turn movement at Kuilima Drive operating at LOS "C". The 1985 EIS did not present v/c ratios. However, the study did present traffic counts. The following table compares the PM Peak Hour Weekday traffic counts on Kamehameha Highway and Kuilima Drive taken in 1985 to those taken in 2011 for the SEIS. The 1985 EIS did not identify traffic movements at Marconi Road, in Haleʻiwa, or at Kahaluʻu.

The annual growth rate of traffic on Kamehameha Highway between Kahalu`u and Hale`iwa is generally in line with the O`ahu Regional Transportation Plan (ORTP) forecasts.

Table 2-27: Comparison of Existing PM Peak Hour Traffic Volumes; 1985 & 2011

Traffic Direction/Movement	1985 Traffic Study	2012 Traffic Study	Average Annual Rate of Growth	Difference
East Bound on Kamehameha Hwy. approaching Kuilima Drive	236	344	1.8%	108 (46%)
Left Turn into Kuilima Drive	65	104	2.3%	39 (60%)
Left Turn out of Kuilima Drive onto Kamehameha Hwy.	41	70	2.9%	31 (76%)
Left Turn into Marconi Road	N.A.	2		N.A
Left Turn out of Marconi Road onto Kamehameha Hwy.	N.A.	7		N.A
East Bound on Kamehameha Hwy. after Marconi Road	277	311	0.5%	34 (12%)
West Bound on Kamehameha Hwy. approaching Marconi Road	246	352	1.7%	106 (43%)
Right Turn into Marconi Road	N.A.	7		N.A.
Right Turn out of Marconi Road	N.A.	3		N.A.
Right Turn into Kuilima Drive	65	76	0.7%	11 (17%)
Right Turn out of Kuilima Drive	74	91	0.9%	17 (23%)
West Bound on Kamehameha Hwy. after Kuilima Drive	242	362	1.9%	120 (50%)

Note: N.A. means Not Available.

F. 5. Air Quality

An Air Quality Impact Study was conducted for the Proposed Action by B. D. Neal & Associates and is presented in Appendix J. A summary of the report's description of the existing air quality at the SEIS Lands and in the region is presented below. The impacts of the Proposed Action on air quality are discussed in Chapter Five, the SEIS chapter addressing impacts.

F.5. a. National and State Standards

Ambient concentrations of air pollution are regulated by both national and state ambient air quality standards (AAQS). National AAQS are specified in Section 40, Part 50 of the Code of Federal Regulations (CFR), while State of Hawaii AAQS are defined in Chapter 11-59 of the

Hawaii Administrative Rules. Table 2-28 summarizes both the national and the state AAQS that are specified in the cited documents. As indicated in the table, national and state AAQS have been established for particulate matter, sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone and lead. The state has also set a standard for hydrogen sulfide. National AAQS are stated in terms of both primary and secondary standards for most of the regulated air pollutants.

Table 2-28: Summary of State of Hawai'i and National Ambient Air Quality Standards

Pollutant	Units	Averaging Time	Maximum Allowable Concentration		
			National Primary	National Secondary	State of Hawaii
Particulate Matter (<10 microns)	μg/m³	Annual 24 Hours	- 150[a]	- 150[a]	50 150[b]
Particulate Matter (<2.5 microns)	μg/m³	Annual 24 Hours	15[c] 35[d]	15[c] 35[d]	- -
Sulfur Dioxide	ppm	Annual 24 Hours 3 Hours 1 Hour	- - - 0.075[e]	- - 0.5[b] -	0.03 0.14[b] 0.5[b] -
Nitrogen Dioxide	ppm	Annual 1 Hour	0.053 0.100[f]	0.053 -	0.04 -
Carbon Monoxide	ppm	8 Hours 1 Hour	9[b] 35[b]	- -	4.4[b] 9[b]
Ozone	ppm	8 Hours	0.075[g]	0.075[g]	0.08[g]
Lead	μg/m³	3 Months Quarter	0.15[h] 1.5[i]	0.15[h] 1.5[i]	- 1.5[i]
Hydrogen Sulfide	ppm	1 Hour	-	-	0.035[b]

a Not to be exceeded more than once per year on average over three years.
b Not to be exceeded more than once per year.
c Three-year average of the weighted annual arithmetic mean.
d 98th percentile value of the 24-hour concentrations averaged over three years.
e Three-year average of annual fourth-highest daily 1-hour maximum.
f 98th percentile value of the daily 1-hour maximum averaged over three years.
g Three-year average of annual fourth-highest daily 8-hour maximum.
h Rolling 3-month average.
i Quarterly average.

National primary standards are designed to protect the public health with an "adequate margin of safety". National secondary standards, on the other hand, define levels of air quality necessary to protect the public welfare from "any known or anticipated adverse effects of a pollutant". Secondary public welfare impacts may include such effects as decreased visibility, diminished comfort levels, or other potential injury to the natural or man-made environment, e.g., soiling of materials, damage to vegetation or other economic damage. In contrast to the national AAQS, Hawaii State AAQS are given in terms of a single standard that is designed "to protect public health and welfare and to prevent the significant deterioration of air quality".

Each of the regulated air pollutants has the potential to create or exacerbate some form of adverse health effect or to produce environmental degradation when present in sufficiently high concentration for prolonged periods of time. The AAQS specify a maximum allowable concentration for a given air pollutant for one or more averaging times to prevent harmful effects. Averaging times vary from one hour to one year depending on the pollutant and type of exposure necessary to cause adverse effects. In the case of the short-term (i.e., 1- to 24-hour) AAQS, both national and state standards allow a specified number of times a standard can be exceeded each year.

The Hawai'i AAQS are in some cases considerably more stringent than the comparable national AAQS. In particular, the Hawaii 1-hour AAQS for carbon monoxide is four times more stringent than the comparable national limit.

The national AAQS are reviewed periodically, and multiple revisions have occurred over the past 30 years. In general, the national AAQS have become more stringent with the passage of time and as more information and evidence become available concerning the detrimental effects of air pollution. Changes to the Hawaii AAQS over the past several years have tended to follow revisions to the national AAQS, making several of the Hawaii AAQS the same as the national AAQS.

F.5. b. Regional and Local Climatology

Regional and local climatology significantly affects the air quality of a given location. Wind, temperature, atmospheric turbulence, mixing height and rainfall all influence air quality. Although the climate of Hawai'i is relatively moderate throughout most of the state, significant differences in these parameters may occur from one location to another. Most differences in regional and local climates within the state are caused by the mountainous topography.

Hawaii lies well within the belt of northeasterly trade winds generated by the semi-permanent Pacific high-pressure cell to the north and east. On the island of O'ahu, the Ko'olau and Waianae Mountain Ranges are oriented almost perpendicular to the trade winds, which accounts for much of the variation in the local climatology of the island.

The site of the Proposed Action is located on the windward side of the Ko'olau Mountains at the northern tip of Oahu near Kahuku Point. There are no published wind data for this area of

Oahu. However, based on the project location and the good exposure to the trade wind flow, ventilation can be expected to be good much of the time. Wind energy resource maps for the Kahuku area suggest that wind speeds are frequently in the upper range. (AWS Truewind, LLC: 2004). Winds can be expected to come mostly from the east or northeast direction due to the prevailing trade wind flow and to the local terrain effects.

Air pollution emissions from motor vehicles, the formation of photochemical smog, and smoke plume rise all depend in part on air temperature. Colder temperatures tend to result in higher emissions of contaminants from automobiles but lower concentrations of photochemical smog and ground-level concentrations of air pollution from elevated plumes. In Hawai`i, the annual and daily variation of temperature depend to a large degree on elevation above sea level, distance inland, and exposure to the trade winds. Average temperatures at locations near sea level generally are warmer than those at higher elevations. Areas exposed to the trade winds tend to have the least temperature variation, while inland and leeward areas often have the most. The Proposed Action's coastal, windward location results in relatively persistent and moderate temperatures.

Small scale, random motions in the atmosphere (turbulence) cause air pollutants to be dispersed as a function of distance or time from the point of emission. Turbulence is caused by both mechanical and thermal forces in the atmosphere. It is oftentimes measured and described in terms of Pasquill-Gifford stability class. Stability class 1 is the most turbulent and class 6 the least. Thus, air pollution dissipates the best during stability class 1 conditions and the worst when stability class 6 prevails. In the Kahuku area, stability class 5 or 6 is generally the highest stability class that occurs, developing during clear, calm nighttime or early morning hours when temperature inversions form due to radiational cooling. Stability classes 1 through 4 occur during the daytime, depending mainly on the amount of cloud cover and incoming solar radiation and the onset and extent of the sea breeze.

Mixing height is defined as the height above the surface through which relatively vigorous vertical mixing occurs. Low mixing heights can result in high ground-level air pollution concentrations because contaminants emitted from or near the surface can become trapped within the mixing layer. In Hawaiʻi, the mixing heights tend to be high because of mechanical mixing caused by the trade winds and because of the temperature moderating effect of the surrounding ocean. Low mixing heights may sometimes occur, however, at inland locations and even at times along coastal areas early in the morning following a clear, cool, windless night. Coastal areas also may experience low mixing levels during sea breeze conditions when cooler ocean air rushes in over warmer land. Mixing heights in Hawaiʻi typically are above 3,000 feet (1,000 meters).

Rainfall can have a beneficial effect on the air quality of an area because it helps to suppress fugitive dust emissions, and it also may "washout" gaseous contaminants that are water-soluble. Rainfall in Hawaiʻi is highly variable depending on elevation and on location with respect to the trade wind. The Kahuku area receives moderate amounts of precipitation due to its windward and near sea level location.

F.5. c. Existing Air Quality Conditions

Present air quality in the project area is mostly affected by air pollutants from motor vehicles, agricultural operations and to a lesser extent by natural sources. Table 2-29 presents an air pollutant emission summary for the island of Oʻahu for calendar year 1993. This is the most recent information available. The State Department of Health operates a network of air quality monitoring stations at various locations on Oʻahu. Each station, however, typically does not monitor the full complement of air quality parameters, and no stations are located on the windward side of the island or anywhere near to the project site. Thus, air quality data from stations at leeward locations are presented, but this data is probably only marginally representative of the project area. The table shows annual summaries of air quality measurements that were made at leeward Oʻahu locations for several of the regulated air pollutants for the period 2006 through 2010. These are the most recent data that are currently available.

The emission rates shown in the table pertain to manmade emissions only, i.e., emissions from natural sources are not included. As suggested in the table, much of the particulate emissions on Oʻahu originate from area sources, such as the mineral products industry and agriculture. Sulfur oxides are emitted almost exclusively by point sources, such as power plants and refineries. Nitrogen oxides emissions emanate predominantly from industrial point sources, although area sources (mostly motor vehicle traffic) also contribute a significant share. The majority of carbon monoxide emissions occur from area sources (motor vehicle traffic), while hydrocarbons are emitted mainly from point sources. Based on previous emission inventories that have been reported for Oʻahu, emissions of particulate and nitrogen oxides may have increased during the past several years, while emissions of sulfur oxides, carbon monoxide and hydrocarbons probably have declined.

Kamehameha Highway, which passes near the project area to the south, is a major arterial roadway that presently carries moderate to heavy levels of vehicle traffic during peak traffic hours. Emissions from motor vehicles using this roadway, primarily nitrogen oxides and carbon monoxide, will tend to be carried away from the project site by the prevailing winds.

Natural sources of air pollution emissions that also could affect the project area but cannot be quantified very accurately include the ocean (sea spray), plants (aero-allergens), wind-blown dust, and perhaps distant volcanoes on the island of Hawaiʻi.

During the 2006-2010 period, sulfur dioxide was monitored by the State Department of Health at an air quality station located at Kapolei. Concentrations monitored were consistently low compared to the standards. Annual second-highest 3-hour concentrations (which are most relevant to the air quality standards) ranged from 0.004 to 0.011 parts per million (ppm), while the annual second-highest 24-hour concentrations ranged from 0.003 to 0.004 ppm. Annual average concentrations were only about 0.001 to 0.002 ppm. There were no exceedances of the state/national 3-hour or 24-hour AAQS for sulfur dioxide during the 5-year period. Data pertaining to the new 1-hour standard have not yet been reported.

Table 2-29: Annual Summaries of Air Quality Measurements for Monitoring Stations Nearest Turtle Bay Resort Expansion

Parameter / Location	2006	2007	2008	2009	2010
Sulfur Dioxide / Kapolei					
3-Hour Averaging Period:					
Highest Concentration (ppm)	0.005	0.010	0.009	0.010	0.012
2nd Highest Concentration (ppm)	0.004	0.008	0.009	0.007	0.011
No. of State AAQS Exceedances	0	0	0	0	0
24-Hour Averaging Period:					
Highest Concentration (ppm)	0.003	0.003	0.005	0.003	0.004
2nd Highest Concentration (ppm)	0.003	0.003	0.003	0.003	0.004
No. of State AAQS Exceedances	0	0	0	0	0
Annual Average Concentration (ppm)	0.002	0.002	0.001	0.001	0.001
Particulate (PM-10) / Kapolei					
24-Hour Averaging Period:					
Highest Concentration (μg/m³)	59	75(a)	61	37	59
2nd Highest Concentration (μg/m³)	58	57	44	36	58
No. of State AAQS Exceedances	0	0	0	0	0
Annual Average Concentration (μg/m³)	16	17	18	16	16
Particulate (PM-2.5) / Kapolei					
24-Hour Averaging Period:					
Highest Concentration (μg/m³)	34(a)	20	35	25	61(a)
98th percentile Concentration (μg/m³)	7	8	21	13	12
No. of State AAQS Exceedances	0	0	0	0	1(a)
Annual Average Concentration (μg/m³)	4	4	5	6	4
Carbon Monoxide / Kapolei					
1-Hour Averaging Period:					
Highest Concentration (ppm)	1.4	3.8	2.2	3.7	1.6
2nd Highest Concentration (ppm)	1.4	0.9	1.7	2.6	1.5
No. of State AAQS Exceedances	0	0	0	0	0
8-Hour Averaging Period:					
Highest Concentration (ppm)	1.0	0.8	0.7	1.2	1.0
2nd Highest Concentration (ppm)	1.0	0.7	0.7	1.2	0.8
No. of State AAQS Exceedances	0	0	0	0	0
Nitrogen Dioxide / Kapolei					
Annual Average Concentration (ppm)	0.005	0.005	0.004	0.004	0.003
Ozone / Sand Island					
8-Hour Averaging Period:					
Highest Concentration (ppm)	0.042	0.035	0.048	0.049	0.052
4th Highest Concentration (ppm)	0.042	0.033	0.043	0.048	0.047
No. of State AAQS Exceedances	0	0	0	0	0

(a) Data flagged due to fireworks. Source: State of Hawaii Department of Health, "Annual Summaries" Hawaii Air Quality Data, 2006 - 2010"

Particulate matter less than 10 microns in diameter (PM-10) is also measured at the Kapolei monitoring station. Annual second-highest 24-hour PM-10 concentrations ranged from 36 to 58 g/m^3 between 2006 and 2010. Average annual concentrations ranged from 16 to 18 g/m^3. All values reported were within the state and national AAQS.

Particulate matter less than 2.5 microns in diameter (PM-2.5) measured at the Kapolei monitoring station had annual 98th percentile 24-hour concentrations ranging from 7 to 21 g/m^3 between 2006 and 2010. Average annual concentrations ranged from 4 to 6 g/m^3. All values reported were within the state and national AAQS.

Carbon monoxide measurements were also made at the Kapolei monitoring station. The annual second-highest 1-hour concentrations ranged from 0.9 to 2.6 ppm. The annual second-highest 8-hour concentrations ranged from 0.7 to 1.2 ppm. These values are well within the standards, and no exceedances of the state or national 1-hour or 8-hour AAQS were reported.

Nitrogen dioxide is also monitored by the Department of Health at the Kapolei monitoring station. Annual average concentrations of this pollutant ranged from 0.003 to 0.005 ppm, safely inside the state and national AAQS.

The nearest available ozone measurements were obtained at Sand Island. The fourth-highest 8-hour concentrations (which are most relevant to the standard) for the period 2006 through 2010 ranged between 0.033 and 0.048 ppm, well inside the state and federal standards. The 8-hour standard for ozone did not exist prior to 2002. Prior to 2002, the now obsolete state 1-hour standard was typically exceeded several times each year.

Although not shown in the table, the nearest and most recent measurements of ambient lead concentrations that have been reported were made at the downtown Honolulu monitoring station between 1996 and 1997. Average quarterly concentrations were near or below the detection limit, and no exceedances of the state AAQS were recorded. Monitoring for this parameter was discontinued during 1997.

It is probable that air pollution concentrations measured at leeward locations are higher than those present on the windward coast where the project is located. Based on the data and discussion presented above, it appears likely that the State of Hawaii AAQS for sulfur dioxide, nitrogen dioxide, particulate matter, ozone and lead are currently being met in the project area. While carbon monoxide measurements at the Kapolei monitoring station suggest that concentrations are within the state and national standards, local "hot spots" may exist near traffic-congested intersections. The potential for this within the specific project area is addressed in the discussion of impacts in Chapter Five of the SEIS.

F. 6. Acoustic Environment

A Noise Impact Analysis was conducted for the Proposed Action by Y. Ebisu and Associates and is presented in Appendix K. A description of the existing acoustic environment is presented below and the results of the analysis detailing the anticipated impacts of the Proposed Action are presented in Chapter Five, the SEIS chapter addressing impacts.

F.6. a. Methodology

The noise descriptor currently used by federal agencies to assess environmental noise is the Day-Night Average Sound Level (DNL or Ldn). The DNL values represent the average noise during a typical day of the year. DNL exposure levels of 55 or less are typical of quiet rural or suburban areas. DNL exposure levels of 55 to 65 are typical of urbanized areas with medium to high levels of activity and street traffic. DNL exposure levels above 65 are representative of densely developed urban areas and areas fronting high volume roadways. A general consensus among federal agencies has developed whereby residential housing development is considered acceptable in areas where exterior noise does not exceed 65 DNL. This value of 65 DNL is used as a federal regulatory threshold for determining the necessity for special noise abatement measures when applications for federal funding assistance are made. For the purposes of determining noise acceptability for funding assistance from federal agencies, an exterior noise level of 65 DNL or lower is considered acceptable. These federal agencies include the Federal Aviation Administration (FAA), Department of Defense (DOD); Federal Housing Administration, Housing and Urban Development (FHA/HUD), and Veterans Administration (VA). This standard is applied nationally, including Hawai‘i.

In the State of Hawai‘i, the State Department of Health (DOH) regulates noise from on-site activities. State DOH noise regulations are expressed in maximum allowable property line noise limits rather than DNL. The noise limits apply on all islands of the State, including O‘ahu. Although they are not directly comparable to noise criteria expressed in DNL, State DOH noise limits for preservation/residential, apartment/commercial, and agricultural/industrial lands equate to approximately 55, 60, and 76 DNL, respectively.

Because the proposed project site is located on lands designated for single family and multifamily residential, commercial, and agricultural uses, various DOH noise limits would be applicable along the lot boundary lines or receptor locations for any stationary machinery, or equipment related to commercial or construction activities. These property line limits are 60 dBA and 50 dBA during the daytime and nighttime periods, respectively, for commercial lots or receptors. For multifamily or apartment use, the State DOH limits are also 60 dBA and 50 dBA during the daytime and nighttime periods, respectively. For single family residential and public facility uses, the State DOH limits are 55 dBA and 45 dBA during the daytime and nighttime periods, respectively. For agricultural uses, the State DOH limit is 70 dBA during both the daytime and nighttime periods. These noise limits cannot be exceeded for more than 2 minutes in any 20-minute time period under the State DOH noise regulations. The State DOH noise regulations do not apply to aircraft or motor vehicles.

Existing traffic and background ambient noise levels were measured at fifteen locations in the project environs to provide a basis for developing the traffic noise contours along Kamehameha Highway; and for determining the existing background ambient noise levels in the project area. The locations of the measurement sites are shown in Figure 1. Noise measurements were performed during February 2012. Traffic noise calculations for the existing conditions as well as noise predictions for the future conditions with and without the project were performed using the Federal Highway Administration (FHWA) Noise Prediction Model.

Traffic noise calculations for both the existing and future conditions in the project environs were developed for ground level receptors without the benefit of shielding effects. Traffic assignments with and without the project were obtained from the project's traffic analysis presented above. The forecasted increases in traffic noise levels over existing levels were calculated for both scenarios (with and without the Proposed Action), and noise impact risks evaluated. The relative contributions of non-project and project related traffic to the total noise levels were also calculated, and an evaluation was made of possible traffic noise impacts resulting from the project.

The results of the analysis are presented in a map that depicts contour lines depicting noise impacts from the major roadways in the area. If a noise receptor (a house, apartment, business, park or hotel) is determined to be in a noise contour of 65 Ldn or greater, the impact is determined to be significant and measures to mitigate that impact are recommended.

F.6. b. Existing Conditions

The existing traffic noise levels in the project environs are affected by traffic along Kamehameha Highway. Within the Resort property, existing background noise levels along the mauka boundaries are affected by traffic along Kamehameha Highway. Traffic along Kuilima Drive affects background ambient noise levels in the middle section of the Resort at the Kuilima Estates. Along the makai boundaries of the Resort, surf and Resort activities control the background ambient noise levels. Given the moderate speeds of prevailing winds and the presence of large groves of ironwood trees along coastal areas, ambient noise levels are also affected by wind noise.

The existing setback distances from the roadways' centerlines to their associated 65, 70, and 75 DNL contours were also calculated as shown in Table 2-30. The contour line setback distances do not take into account noise shielding effects or the additive contributions of traffic noise from intersecting street sections. Based on the results of Table 2-30, it was concluded that the existing 65 DNL traffic noise contour is located approximately 59 to 75 FT from the centerline of Kamehameha Highway west of Kuilima Drive, and approximately 57 to 100 FT from the centerline of Kamehameha Highway east of Kuilima Drive.

One existing residence located makai of Kamehameha Highway and approximately 0.70 miles east of Kuilima Drive is located within the existing 65 DNL traffic noise contour, with approximately 68 DNL noise exposure level.

Approximately thirteen existing residences located makai of Kamehameha Highway and between Pahipahialua Street and Pahipahialua Beach Park are located within the existing 65 DNL traffic noise contour, with traffic noise levels ranging from 66 to 70 DNL.

Existing traffic noise levels along Kuilima Drive at Kuilima Estates are less than 65 DNL along the Rights-of-Way, and the traffic noise contributions from Kuilima Drive range from approximately 54 to 59 DNL at the six multifamily dwelling units closest to Kuilima Drive.

Traffic noise contributions from Kamehameha Highway are relatively low, and less than 48 DNL at Kuilima Estates.

Existing background noise levels at the interior portions of the project site beyond 500 feet from Kamehameha Highway are low (between 45 and 55 DNL) due to their large setback distances from Kamehameha Highway. At these interior locations on the project site, distant traffic, helicopter noise, and the natural sounds of surf, birds, and winds in foliage are the dominant noise sources. Between traffic, helicopter, surf, bird, or wind noise events, background ambient noise levels drop to a range of 40 to 45 dBA. During calm wind periods, background ambient noise levels decrease to levels less than 45 dBA at the interior locations removed from Kamehameha Highway, Kuilima Drive, and the shoreline. The minimum background ambient noise levels at these interior locations are controlled by distant traffic, surf, and wind noise.

F.7. Public Emergencies and First Responders

This section identifies existing public facilities that provide first responses to natural and man-made emergencies. It then goes on to discuss the full scope of emergencies to which the State of Hawai‘i is exposed, and the extent to which the Resort is potentially exposed.

Table 2-30: Existing and CY 2025 Distances to 65, 70, and 75 DNL Contours

STREET SECTION	65 DNL SETBACK (FT)		70 DNL SETBACK (FT)		75 DNL SETBACK (FT)	
	EXISTING	CY 2025	EXISTING	CY 2025	EXISTING	CY 2025
Kamehameha Hwy. West of Kaihalulu Dr. (Posted 35 mph)	59	87	36	50	22	28
Kamehameha Hwy. West of Kaihalulu Dr. (Posted 45 mph)	75	122	46	66	28	37
Kamehameha Hwy. from Kaihalulu to Kuilima (With Median)	75	81	46	46	28	26
Kamehameha Hwy. from Kaihalulu to Kuilima (W/O Median)	75	82	46	45	28	25
Kamehameha Hwy. East of Kuilima Dr. (Posted 35 mph)	58	84	34	48	20	27
Kamehameha Hwy. East of Kuilima Dr. (Posted 45 mph)	73	116	44	63	27	35
Kamehameha Hwy. West of Marconi Dr. (Posted 35 mph)	57	84	34	48	20	27
Kamehameha Hwy. West of Marconi Dr. (Posted 45 mph)	73	116	44	63	26	35
Kamehameha Hwy. East of Marconi Dr. (Posted 35 mph)	58	84	34	48	20	27
Kamehameha Hwy. East of Marconi Dr. (Posted 45 mph)	100	173	60	90	36	49
Kaihalulu Dr. At Kamehameha Hwy.	N/A	29	N/A	15	N/A	7
Kuilima Dr. At Kamehameha Hwy.	23	33	12	17	7	9
Marconi Rd. At Kamehameha Hwy.	3	15	2	8	1	4

Notes:

(1) All setback distances are from the roadways' centerlines.
(2) See TABLES 3 and 5 for traffic volume, speed, and mix assumptions.
(3) Setback distances are for ground level receptors.
(4) "Loose Soil" conditions assumed along all roadways.
(5) DNL values represent 7-day, weekly averages.
(6) With medians and 35 mph posted within 600' of intersections on Kamehameha Highway.
(7) Without medians and 45 mph posted beyond 600' of intersections on Kamehameha Highway, except 35 mph posted between Kuilima Dr and Kaihalulu Dr.

F.7. a. Public Safety Services and Facilities

The City and County of Honolulu is responsible for providing public safety and first-responder services for non-federal properties on Oʻahu. Public notice of natural and man-made emergencies is provided by the Oʻahu Civil Defense agency, the Honolulu Police Department, the Department of Emergency Services. Federal agencies that provide early notification of potential emergencies include the National Weather Service (for tropical cyclones and storms) and the Pacific Tsunami Center (for tsunami events). The State of Hawaiʻi's DOH provides early notification for water contamination events (primarily sewage spills).

F.7.a. [1] POLICE AND SECURITY

The KNS region is within two police districts, with stations in Kāneʻohe and Wahiawā, outside the region. A substation in Kahuku, about five (5) miles from the Resort, serves the Koʻolau Loa side of the region. Island-wide, recruitment is adequate to keep police staffing constant, but not to expand to fill vacancies. The Kahuku substation is authorized to have five officers but has only three or four at a time.

Private security is provided at the Resort.

F.7.a. [2] FIRE PROTECTION

Fire stations are located in the KNS region at Kaʻaʻawa, Hauʻula, Kahuku, Sunset Beach, and Waialua. The Kahuku station is about five (5) miles from the Resort. The Fire Department plans to relocate the Hauʻula and Waialua stations to sites outside of the flood plain.

F.7.a. [3] EMERGENCY SERVICES

As discussed above, the Kahuku Medical Center provides 24-hour emergency services to the KNS region. It is located about five miles east of the Resort.

F.7.a. [4] EMERGENCY NOTIFICATION AND EVACUATION

The emergency warning system maintained by the Oʻahu Civil Defense agency includes an integrated system of warning sirens island wide that are activated in times of emergency, together with the broadcast of alerts and advisories on television and radio. An emergency siren is situated on Kamehameha Highway approximately one mile east of the existing Resort entrance.

Kamehameha Highway serves as the only evacuation route for the KNS region. The decision to evacuate an area as the Resort of a man-made threat or natural disaster rests with Oʻahu Civil Defense and the Honolulu Police Department.

F.7. b. Possibility of Environmental Accidents

There are at least three potential sources of environmental accidents that could occur in the vicinity of the Resort: an accident on Kamehameha Highway that involves a vehicle transporting toxic material (such as a gasoline tanker) which results in a spill; the accidental spillage of pesticides by a Resort resident, the golf course operator, or a farmer in the area *mauka* of the

Resort; or the accidental release of untreated sewage from the Resort's wastewater collection or the wastewater treatment plant *mauka* of the Resort.

If an environmental accident is reported, clean up crews from the Honolulu Fire Department are called into action. In the case of a sewage spill, the State Department of Health is notified and warning signs may be posted on the shoreline if the spill cannot be contained inland and makes its way to near shore waters.

The likelihood of a major roadway spill is quite limited. There have been no known reports of a fuel truck accident resulting in a serious spill in local memory. There are, however, frequent spillages of fuel or oil resulting from serious traffic accidents on Kamehameha Highway. While these incidents are not uncommon, they are limited in scope and usually do not result in a significant release of hazardous substances to the environment. First responders are usually able to alert the fire department in time.

The accidental spillage of pesticides by the golf course operator is considered to be very unlikely. The golf course maintenance crew is specifically trained in the handling of pesticides. The frequency of pesticide spillage by farmers or private homeowners is unknown as neither group is required to report such incidences. However, the volume of pesticides involved, especially with regard to homeowners, is quite low. While the environmental effects should not be discounted, they do not constitute a widespread environmental hazard.

The spillage of untreated sewage is possible, especially when wastewater collection system pipes are old. Sewage spills on O'ahu are a frequent occurrence, especially in the greater Honolulu area where some collection system pipelines date back to the early 1900s.

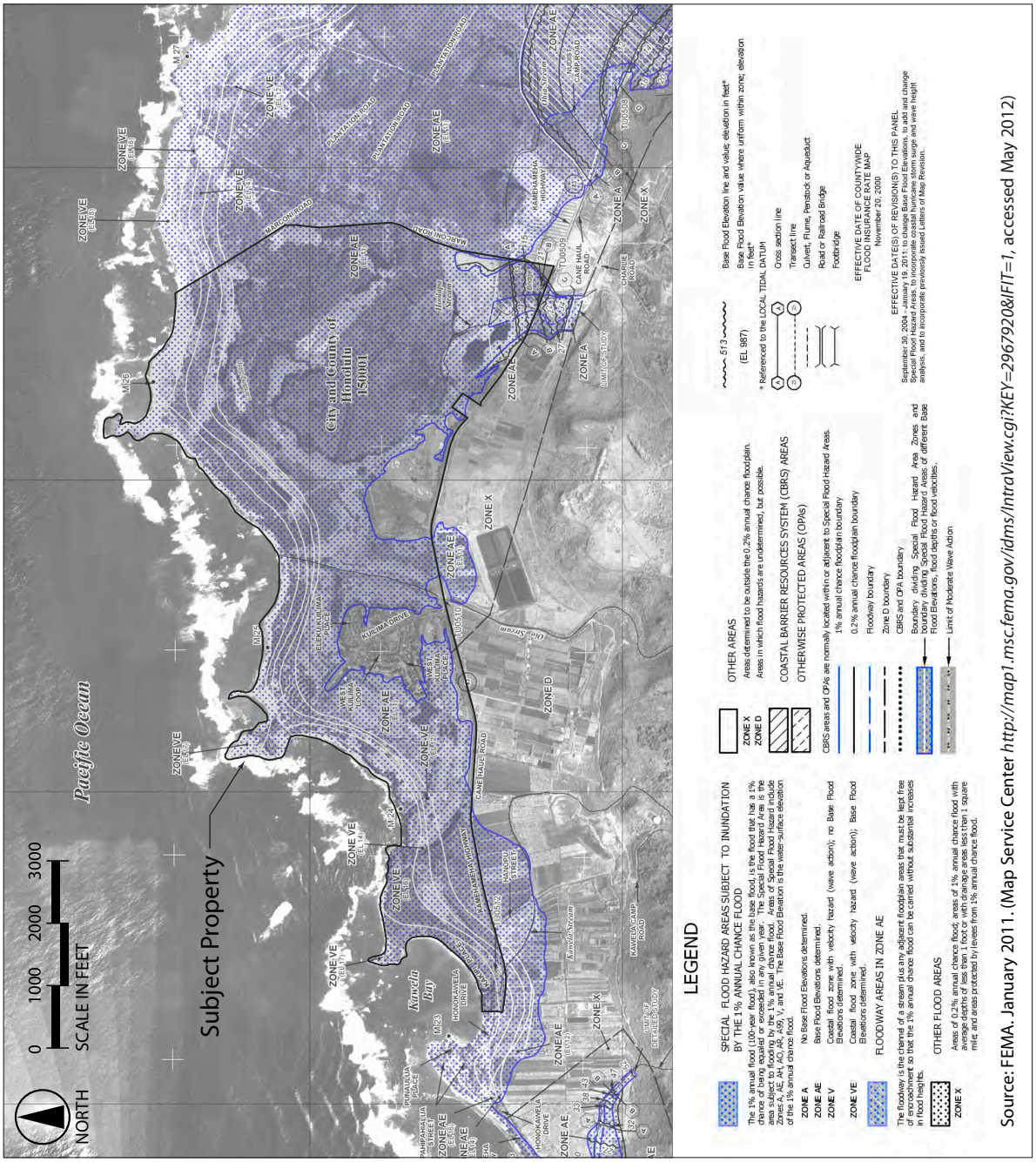
F.7. c. Flooding

Potential flood hazards are identified by the Federal Emergency Management Agency (FEMA) National Flood Insurance Program and are mapped on the Flood Insurance Rate Maps (FIRM). The maps classify land into four zones depending on the potential for flood inundation.

According to the 2011 FIRM (see Figure 2-64), the SEIS Lands include four flood zones: VE, AE, D and X. With the exception of the property occupied by the Kuilima Estates East and West, and a portion of the Palmer Golf Course of similar size just west of Punaho'olapa Marsh, the entire Resort property is designated as Zone AE, with base flood elevations determined to be approximately 11 feet. The coast of the Resort property is designated as Zone VE (Coastal Flood Zone with Velocity Hazard) with base flood elevations determined to be between 16 and 17 feet at the coast and 12 to 14 feet several hundred feet inland.

The FIRM map indicates that Ho'olapa Stream, the intermittent stream that enters the property at its southeastern corner, causes episodic flooding that correlates with high volume rain events.

Figure 2-64: FIRM Map



Source: FEMA. January 2011. (Map Service Center *http://map1.msc.fema.gov/idms/IntraView.cgi?KEY=2967920&IFIT=1*, accessed May 2012)

F.7. d. Tsunami

A tsunami is a series of very long-period waves that are usually triggered by a disturbance at the seafloor that displaces water (usually the result of an earthquake, undersea landslide or undersea volcano). These waves can move across the ocean at speeds approaching 500 miles per hour and inundate coastal areas with water reaching several meters in height and causing extensive destruction. However, tsunami can also occur locally as the result of a coastal landslide or coastal subsidence event.

The most severe tsunami known to reach the Hawaiian Islands occurred in 1946 as the result of an earthquake in the Aleutian Islands. It resulted in wave heights as high as 37 feet (at Laupahoehoe on the Island of Hawaiʻi). At the army's airfield at Kahuku (now the eastern portion of the SEIS Lands), wide spread inundation occurred with the sea flooding approximately 1.6 kilometers inland destroying many wooden structures and lifting large barracks buildings off their foundations, collapsing several. Vegetation was damaged by the waves. Sands from Kahuku beach and coastal sand dunes were dispersed throughout the inundation zone. (http://cedb.asce.org/cgi/WWWdisplay.cgi?162779)

On March 15, 2011, an 8.9 earthquake off the east coast of Japan resulted in a tsunami that caused unprecedented damage. Approximately six hours after the tsunami struck Japan, tsunami waves ranging in height from three to seven feet reached the Hawaiian Islands.

F.7. e. Volcanic Hazards

Hazards associated with volcanic eruptions include lava flows, tephra (airborne particulate matter ejected by a volcano), volcanic gases, and earthquakes (including ground cracks and subsidence). As there are no active or dormant volcanoes on Oʻahu, the threat of lava flow inundation is non-existent. The threat of tephra is usually limited to areas immediately downwind of an active eruption, and for that reason, Oʻahu is not subjected to tephra hazards. Ground cracks and subsidence of the earth can occur as the result of earthquake activity associated with volcanic eruptions, but these phenomenon are not known to impact Oʻahu.

Since the eruption of Puʻu Oʻo in Puna in 1984, continuous volcanic activity associated with that vent and sporadic activity in recent years at Kilauea crater has resulted in the near constant emission of volcanic gas composed of water vapor, carbon dioxide, and sulfur dioxide in the range of approximately 300 to 700 tonnes per day. During normal trade wind conditions, most of this volcanic gas, known as vog, is blown out to sea in a southwest direction. However, during those times when the winds shift to the southeast (blowing southeast to northwest), the plume of vog can reach Oʻahu, resulting in hazy atmospheric conditions that constitute a health concern for people suffering from acute asthma and lung-related illnesses.

F.7. f. Earthquakes and Seismic Activity

Earthquake activity on Oʻahu is linked to volcanic activity that is focused on the Island of Hawaiʻi and the surrounding seafloor. Earthquakes can occur before or during volcanic eruptions or when magma (molten rock) migrates underground without breaking through to the surface.

The largest known earthquake to occur in the Hawaiian Islands was an event with an estimated magnitude of 7.9 in Ka'u on the Island of Hawai'i in 1868. The next largest event was a 7.2 magnitude event on that island's Kalapana coast in 1975. However, smaller magnitude quakes on the Island of Hawai'i are capable of inflicting damage and disruption as far away as O'ahu. On October 15, 2006, a 6.7 earthquake under the seafloor just offshore of Hualalai on Hawaii Island caused a near total electrical blackout on O'ahu.

The United States Geological Service has designated four seismic hazard zones in the main Hawaiian Islands, ranging on a scale from 1 to 4 with 4 being the most severe. The island of Kaua'i is designated as Zone 1; O'ahu as Zone 2A; Maui County as Zone 2B; and the Island of Hawai'i as Zone 4. [USGS:1997]

F.7. g. Landslides, Rock-Falls and Subsidence

Landslides and rock-falls are typically associated with steep mountainous areas where prolonged rainfall events or strong earthquake activity can dislodge soil from the subsurface rock.

Subsidence, or the sudden collapse of soil in relatively flat coastal areas, is associated with strong earthquake activity. The most recent notable event of subsidence was during the 1972 Kalapana earthquake, when a large stretch of the Kalapana coastline collapses several feet, causing an immediate tsunami as the ocean rushed in to replace the void created by the collapsed beach. Subsidence also occurs regularly along the coast downslope from Pu'u O'o and Kilauea craters where lava drains into the sea. Where the lava enters the sea, it cools and over time forms a large shelf of new land. However, once the shelf reaches several acres in size, it tends to break off from the coast and sink. This event has occurred repeatedly over the past two decades.

F.7. h. Severe Winds

Air-borne debris dislodged by strong winds can pose a threat to life and property. In Hawai`i, strong winds can be caused by tropical cyclones, including tropical storms and hurricanes, by a steep air pressure gradient across the islands resulting from the proximity of a high pressure area, and by tornadoes or water spouts that make landfall.

The Hawaiian Islands are situated at the northern edge of the area extending north of the equator that is most closely associated with tropical cyclone activity in the North Pacific. During the period from May 15 to November 30 each year, tropical depressions tend to form in the warm waters off the western coast of Mexico and Central America, and then often move in a west to northwest direction. If climatic conditions are favorable for intensification, the depression can become a tropical storm or eventually a hurricane. In rare instances, these East Pacific storms are able to reach the Hawaiian Islands. However, because of cooler sea surface temperatures around Hawai`i, and due to the summer-time presence of the North Pacific high pressure area several hundred miles north of the islands that generates the trade winds, tropical cyclones originating in the East Pacific usually dissipate before reaching the islands. Nevertheless, the residual moisture associated with dissipated cyclones is an important contributor to summertime rainfall in the islands.

When tropical cyclones form west of 140 degrees longitude, they are considered to have formed in Hawaiian waters and are given Hawaiian names. While these storms are also exposed to the same influences that help to dissipate East Pacific storms, Hawaiian tropical cyclones pose a significant threat to the islands because of their tendency to form rapidly and move swiftly, resulting in as little as two to three days of warning time, as opposed to the 10 days or more it takes an East Pacific storm to cross the 2,000+ miles to the Hawaiian Islands.

The National Weather Service has established categories of wind speeds as a means of identifying the strength of a tropical cyclone. Tropical storm storm-force winds range in speed from 39 to 73 miles per hour (mph). If wind speeds exceed tropical storm force, the storm is classified as a hurricane. The Saffir-Simpson Hurricane Wind Scale for Hawaiʻi is a 1 to 5 categorization based on the intensity of a hurricane at a particular time. The scale was most recently modified on May 15, 2012.

- Category One: Sustained winds 74-95 mph. Hurricane Iwa (passing just northwest of Kauaʻi in 1982) and Hurricane Dot (landfall on Kauaʻi in 1959) are examples of category one cyclones.
- Category Two: Sustained winds 96-110 mph. There is no record of a category two cyclone directly impacting the Hawaiian Islands.
- Category Three: Sustained winds 111-129 mph. There is no record of a category three cyclone directly impact the Hawaiian Islands.
- Category Four: Sustained winds 130-156 mph. Hurricane Iniki, which made landfall on Kauai in 1992, is an example of a category four cyclone.
- Category Five: Sustained winds greater than 157 mph. There is no record of a category three cyclone directly impact the Hawaiian Islands.

Steep air pressure gradients across the islands can also generate strong winds. As air heats at the equator and rises, causing air pressure at the Earth's surface, it moves north towards the pole. But as it flows north at a high altitude, it cools and begins to sink back to Earth, creating high air pressure at the surface. The phenomenon of tropical air sinking back to Earth occurs around 30 degrees latitude in the North Pacific, several hundred miles north of Hawaiʻi. As this sinking air is then drawn back toward the low air pressure at the equator, it begins to warm, and when it reaches the equator it rises, creating a perpetual cycle of air, called the Hadley Cell, rotating up and down in the atmosphere. The Hadley Cell is predominant during the summer months, giving Hawaiʻi its trade winds. Although the trade winds are not particularly strong, they can reach speeds up to the high thirties (miles per hour). In leeward areas characterized by south or southwest facing mountain slopes, trade winds speeds can sometimes accelerate and damage roof shingles.

However, during the winter when the Hadley Cell is less active, winter storms blowing in from the west can occasionally create a low-pressure system west or northwest of the islands. Known as a Kona Low, this winter-time phenomenon is known for delivering strong winds and copious amounts of rain to the islands. Wind speeds associated with Kona Lows can approach 100 miles per hour. (These storms are not considered to be hurricanes because they do not form as tropical cyclones…and yet, they can have hurricane-force winds.)

At times during the winter season, large low-pressure systems set up west or northwest of the Hawaiian Islands that do not form into Kona Lows. Yet, because nature abhors a vacuum, air from the east is pulled in towards the low; creating a high-pressure gradient across the islands. Strong winds ranging from 50 to 60 miles per hour are associated with this phenomenon, which tends to occur in the period from January to March.

While tornadoes and water spouts have been known to occur in the Hawaiian Islands on rare occasions, they appear to have become more frequent in the past several years, for reasons not fully understood. On O ʻahu, tornadoes have been documented in Waipahu and Kunia. Most recently in 2011, a water spout made landfall in Lanikai, in the Koʻolaupoko district, and moved about a mile inland, causing incidental damage before dissipating.

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CHAPTER THREE:

PROPOSED ACTION

A. Overview of Market Demand

It is the opinion of HVS International Consulting and Evaluation (Golf and Resort Services), an internationally recognized firm specializing in real estate market assessment, that the current and projected market conditions for hotel units and resort residential real estate are sufficient to support the development of the Proposed Action, and that the development of the Proposed Action is financially feasible from the perspective of the master developer, as well as for the sale of improved properties to builders.

The economy in Hawai'i is heavily oriented towards the visitor industry, and tourism indicators have been trending up over the last several years. Visitation to the islands reached a plateau in 2005, 2006 and 2007; declined in 2008 and 2009; but started a recovery in 2010 that accelerated throughout 2011. Recent 2012 visitor information data indicates that the recovery has continued.

Robust increases in international visitation from Japan, Canada, China, and South Korea, and increasing domestic visitation beginning in the second half of 2011 created robust demand conditions in the islands' hotels and continued through 2012. New sources of visitors from China, Australia, Canada, and South Korea are expected to represent the growth area for Hawai`i visitation and the outlook for the next five years remains optimistic.

While the demand for primary residence is driven by market fundamentals, the market for resort real estate has been based upon investment resources and disposable income. The purchase decision is typically motivated by a number of different factors, including current lifestyle, future lifestyle or retirement, investment potential, and rental income.

The resort real estate market in the Hawaiian Islands has historically consisted of a large majority of speculative buyers for numerous reasons. The aging of the baby-boom generation is a major factor in almost all of the seasonal markets. These buyers are approaching their 'golden years' and are looking to live in a more relaxed resort environment with lifestyle improvements. These buyers are also conscious of the changing prices of real estate, and they desire prudent choice with upside potential in terms of equity growth. Despite the current soft markets, the Hawaiian Islands have had consistent growth. This fact, as well as the emergence of the Asian markets, should help to drive future growth in these markets in the long term.

Surveys of national second home buyers reveals two categories of these buyers; investment buyers and vacation buyers. According to the market assessment consultant, the nature of the market has changed substantially over the past several years, and much of the speculative

demand from investors has changed; the speculative demand that boosted home prices and demand through much of the late 1990s and early 2000s is absent from today's market. As such, less speculative demand for investment is expected in the early years of the development horizon. The main market for resort real estate will be the end-users of the properties, although some may speculate based upon investment or future retirement.

The long distance required to travel to the islands dictates that the prime markets for potential seasonal unit purchasers will be between 20-30 percent of the total market for seasonal homes, are from outside the Hawaiian Islands, and are dependent upon air travel to the region. However, a significant percentage of homes is purchased by buyers within close proximity to the development. For vacation buyers, this represents about 18 percent of purchasers, while for investment buyers this represents about 60 percent of buyers. The market assessment consultant concludes that a significant number of investors from Honolulu will be evaluating the opportunity from an investment perspective.

The demand for residential property at the Resort will come from several different markets. These include:

- National and international visitors looking for seasonal homes;
- Buyers looking for a retirement home; and
- Investment for future use or monetary gain.
- The local neighborhoods and permanent residents;
- Honolulu residents looking for a second home;

Honolulu will also provide a captive market for purchases of second homes. The secluded and natural environment of the Resort, similar to a neighbor island experience, creates a unique aspect to the Proposed Action that does not exist elsewhere on Oʻahu and will appeal to a significant number of purchasers.

This demand for seasonal units in the coming decade is estimated at about 685 units a year statewide. This will comprise approximately 11% of the 6,000 new units forecasted to be constructed annually within the state (based on an historical analysis of building trends over the past several decades). Oʻahu is expected to garner about 45 percent of these units, or about 313 annually. The market assessment consultant concludes that the Proposed Action will induce additional demand for seasonal units, as it will provide a purchasing alternative that does not currently exist in the market.

The market assessment consultant identified several comparable resort real estate projects located in the Hawaiian Islands, including Kukio, Waikoloa, and Mauna Lani on the Big Island, Ko Olina on Oʻahu, and Kaʻanapali on Maui. The peak in the sales of comparable projects' real estate markets occurred in advance of the overall tourism and hospitality markets, and was significantly more severe both in terms of the number of sales as well as pricing. Furthermore,

there has been a substantial re-orientation of the demand in the markets for these projects during that timeframe.

Condominium sales were a very small part of overall demand until 2004, and as the market for single-family homes declined, condominium sales have become the most significant component for comparable projects in the current market. For resort residential real estate, the sales of single-family homes and lots represented the vast majority of all sales through 2004, and accounted for close to 800 sales in 2003. In 2010 and 2011, the sales of lots and homes totaled about 150, or about 18 percent of the peak market, and about 35 percent of the average over the past decade.

The real estate markets are at or near the bottom in terms of sales volume, but the recovered market is likely to be significantly different as it emerges. Condominiums and low maintenance products will constitute a much larger portion of these projects, although single family will reemerge as a more significant component than in the current market. The recovery will likely be more pronounced once purchasers are comfortable that their investment in real estate will not deteriorate further, and sales levels will return towards a more sustainable level.

While the overall tourism visits in Hawai`i are projected to surpass pre-recession levels in the next year or two, it is expected that recov'ry in the housing market will take substantially longer, but that by the time sales are starting at the Resort, the housing market will be trending upwards.

Both the markets and value proposition for buyers have undergone significant changes since the original EIS for the Resort was completed in 1985. As such, the highest and best development opportunity for rest estate and hospitality development at the Resort has changed significantly. The market assessment consultant concludes that the full build out of the Resort that was envisioned in 1985 is not currently a financially viable development opportunity due to changes in market conditions. The density of development and the total number of units in the Full Build Out scenario were predicated upon creating sufficient mass for the development to create economies of scale. But comparable projects completed elsewhere in Hawai'i since 1985 have demonstrated that success can be achieved at a reduced scale while maintaining the special essence of the place that creates the demand.

B. Description of the Proposed Action

Following is a detailed description of the Proposed Action.

B. 1. Cultural Orientation

The Proposed Action is based in large part upon the traditional Hawaiian cultural resource management principles and values that sustained the *ahupua`a*, which the project team has developed into planning guidelines they refer to as, *Tomorrow's Ahupua'a*. In recognition of the objectives of *Tomorrow's Ahupua'a* discussed in Appendix A, and in view of the sensitivities of the community concerning maintaining the rural character of the SEIS Lands, the Proposed

Action represents an over 60% reduction from the density proposed in the original expansion project as formalized under the 1985 Unilateral Agreement.

The Proposed Action concentrates higher density development in the resort's existing core area – Ahupuaʻa O Hanakaʻoe - with two (2) new hotel sites and a new community Gathering Place in proximity to the existing Turtle Bay Hotel. See Figure 3-1. The previous five (5) sites originally proposed for hotel development in the Ahupuaʻa O ʻŌpana-Kawela (to the west) and Ahupuaʻa O Kahuku (to the east) will be developed instead with resort-residential units at much lower density developments; reduced by over 75% of what is allowable under existing zoning. Similarly, the Kahuku *ahupuaʻa* is planned for affordable community housing and resort-residential with over 60% less density than is allowed under existing entitlements. The result is the concentration of development in the central core of the SEIS Lands and the general preservation of a rural character to the east and west.

Further, the Proposed Action provides for two (2) hotel sites, rather than the five (5) approved in the current land use entitlements and the number of hotel units is reduced from 2,500 to 625. By implementing generous shoreline setbacks at 150 to 200 feet, the development concept achieves public access to the entire shoreline, as intended in the Unilateral Agreement, and further enhances the pedestrian experience of an unencumbered coastal area.

Following is a detailed discussion of how the components of the Proposed Action are distributed among the three *ahupuaʻa* contained within the SEIS Lands.

B. 2. Ahupua`a O ʻŌpana-Kawela

The 1986 SMA Use Permit for the Resort allows the development of up to 1,000 hotel units in Ahupuaʻa O ʻŌpana-Kawela. Based upon listening to the community, and balanced with economic viability, the Proposed Action reduces development in ʻŌpana-Kawela to two projects with a total of 225 resort residential units in an area of approximately 60 acres, at a net density of less than 3 units/acre.

To further demonstrate this commitment, along Kawela Bay, all buildings will be set back a minimum of 300 feet from the certified shoreline, consistent with the requirements of the property's approved land use entitlements. Along the shoreline east of Kawela Point, all buildings will be set back a minimum of 150 feet. Proposed building heights will be a maximum of four habitable floors/60 feet on the R-2 development site facing the Resort and three habitable floors/50 feet on the R-1 development site facing Kawela Bay.

B.2. a. Ahupuaʻa Orientations

The environmental, social, economic and cultural orientations of Ahupuaʻa O ʻŌpana-Kawela will be addressed in a manner that ensures the balanced use of its natural resources and the reciprocal relationships between man and nature within the ahupuaʼa. For example, monitoring and maintenance of Kawela stream from mauka to makai allows for proper stewardship; restoring its makai alignment to its historic route for the purpose of reducing

Figure 3-1: Proposed Action

Proposed Action

AREA	ACRES	UNITS/ACRE	UNITS
Hotel (H-1a, 1b)	25.9	14	375
Hotel (H-2, 2a)	19.0	13	250
Existing Turtle Bay Hotel	34.5	14	500
TOTAL HOTEL	79.4	14	1,125
Resort Residential (RR-1)	39.1	2	75
Resort Residential (RR-2a, 2b)	20.3	7	150
Resort Residential (RR-3a, 3b)	24.8	4	100
Resort Residential (RR-4a, 4b)	33.4	4	120
Resort Residential (RR-5)	25.6	4	100
Resort Residential (RR-6)	11.2	4	45
Resident Housing (RES-1)	12.4	9	112
Resident Housing (RES-2)	8.8	5	48
TOTAL RESIDENTIAL	175.6	4	750
Existing Kuilima Estates	33.1	11	368
Gathering Place (Piko)	9.6		
Existing Clubhouse	1.2		
New Clubhouse	2.3		
TOTAL OTHER	13.1		
Golf Course (G-1)	123.1		
Golf Course (G-2)	191.5		
Punahoolapa Wildlife Preserve	100.0		
Park (P-1)	4.8		
Park (P-2)	38.0		
Park (P-3) - Bird Sanctuary	6.0		
Park (P-4)	9.4		
Park (P-5)	11.3		
Equestrian Center	8.8		
Farmers' Market (east)	3.4		
Farmers' Market (west)	4.1		
Parcel 5-6-003:033	3.8		
AG Well (Lot 524)	2.0		
TOTAL OPEN SPACE	506.2		
Kuilima Drive (Existing)	4.5		
P-1 Access Road	0.4		
RR-1/2 Access Road	0.7		
Equestrian Road	2.6		
Marconi Road Expansion	11.3		
Kaihalulu Drive	24.8		
TOTAL ROADWAYS	44.3		
Parcel 5-7-003:072	0.2		
TOTAL SITE	**851.9**		

Note: Shoreline shown per 2006 Shoreline Certification

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siltation in Kawela Bay; and encouraging marine life preservation in Kawela Bay collectively will foster the restoration of this once significant fishery. Storm-water retention ponds in the kula lands will help control storm water run-off and contribute to the recovery of the fishery. And farm-to-table programs in the kula lands provide a fresh food supply, reduce carbon emissions, and stimulate the economy of local farmers and ranchers. Finally, the stories of the people and traditions of the *ahupuaʻa* will guide land use, and be integrated into park signage and storytelling programs.

B.2. b. Ahupuaʻa Elements

The focus in the *makai* lands encompassing Ahupuaʻa O ʻŌpana-Kawela will be the strategic distribution of low and medium density uses to respect the shoreline and Kawela Bay, which TBR proposes to use best efforts to promote the creation of a Marine Life Conservation District to improve water quality and the ecosystem of the bay. Linked open spaces and building shoreline setbacks will accommodate parks, preserves, and recreational and educational footpaths in this area.

Kaihalulu Drive (tentative name - final name to be determined) will intersect with Kamehameha Highway and continue through the *ahupuaʻa* until it connects with Hanakaʻoe. Kaihalulu Drive connects all three project-area ahupuaʻa, allowing the boundary areas adjacent to this roadway to function in a similar fashion as they might have in ancient times. As such, the plan includes market areas and other open spaces at each intersection of Kaihalulu Drive and a project area *ahupuaʼa* boundary. In the kula lands, farming and commercial agriculture will be enhanced with programs and facilities to promote exchange between ahupuaʼa. In the mauka lands in each of the *ahupuaʻa*, relationships with the U.S. military and other government agencies will be strengthened in order to promote, protect, and better steward area watershed.

B.2.b. [1] RESORT RESIDENTIAL

Because flood elevations in the Kawela Bay area range between eleven and fourteen feet above mean sea level in the locations where the units are proposed to be developed, the first habitable floor of each unit must be constructed above the designated flood elevation. To accomplish this construction, the resort residential units will likely consist of some combination of structures with single family, duplex, or low-density multi-family units. The 39.5-acre area designated as R-1 in Figure 3-1 will contain approximately 75 units built at a density of approximately two units per acre. (For comparison purposes, a typical single-family home in Ko`olau Loa or the North Shore built on a 7,500 square-foot lot results in a density of over five units per acre.) At the proposed density, development site R-1 will contain a maximum of 75 structures, if all are single family, or 38 structures (if each contains two units), and approximately 13 structures (if each contains six units). The actual number of structures will likely be a blend of two- four-, and, or six-unit buildings, and may include some single-family units as design and compliance allows. But regardless of the configuration of units in the final site plan that would be prepared at the time of development, the proposed density will result in the majority of the development

site being retained in open space. The resort-residential structures will be built no higher than 50 feet, meaning that they will likely be four stories in height with three habitable floors. Parking for the duplex and multi-unit structures will be located on the ground floor with the first habitable floor above.

Development site R-2, extending between Kamehameha Highway and the western side of the Resort contains a total of approximately 21 acres. Approximately 150 multi-family units are proposed for this site at a density of approximately seven units per acre. However, development may also include single-family units. The number of structures will depend upon the configuration of units per structure but will likely be similar to development site R-1. Building heights will be limited to 60 feet with four habitable floors.

Open space areas will include common area grounds, pedestrian paths, paved roadways and passive recreational areas.

Because of the proximity of development sites R-1 and R-2 to the shoreline, all outdoor lighting will be shielded to minimize glare when viewed from the ocean or the sky.

B.2.b. [2] PARK (P-1)

Over four acres of land will be set aside for a park at the western end of the resort property, fronting the center point of Kawela Bay. The park will have legal roadway access to Kamehameha Highway.

B.2.b. [3] KAWELA BAY MARINE LIFE CONSERVATION DISTRICT

In accordance with Condition 14 of the Unilateral Agreement, "Declarant shall use its best efforts to promote the creation of a Marine Life Conservation District (MLCD) at Kawela Bay", TBR intends to consult with the community to discuss the creation of MLCD at Kawela Bay. In the event the community wants TBR to pursue the creation of Kawela Bay as an MLCD, the team would propose that it be coordinated with an educational program for the visitors, residents, and guests of the resort to instruct them about the appropriate use of the bay and shoreline. TBR will consult with the community on the development of a culturally and environmentally appropriate educational program that is consistent with the Kawela Ahupuaʻa. Notwithstanding an educational program or MLCD designation, traditional and customary practices related to fishing and gathering will be preserved and protected in compliance with the constitutional protections as required by law.

B. 3. Ahupuaʻa O Hanakaʻoe

Ahupuaʻa O Hanakaʻoe is proposed as the physical and commercial center of the Turtle Bay Lands. Existing resort facilities are concentrated around Kuilima Point. In the Proposed Action, the Gathering Place, and all future hotel development are located within Hanakaʻoe and within

walking distance of existing facilities. All buildings on Development Sites H-1 and H-2 will be set back a minimum of 150 feet from the certified shoreline.

B.3. a. Ahupuaʻa Orientations

Ahupuaʻa O Hanaka`oe presents the greatest opportunity for employing the *Tomorrow's Ahupuaʻa* concept because of its existing density, mixed-use, and its built environment. The Proposed Action consolidates high density in this area in order to accommodate low density in the adjoining *ahupuaʻa*. The commercial core provides an opportunity for enhanced community amenities, and the existing hotel property creates an economic base to support this area as the gathering place. Appropriate water-oriented recreation businesses and other local business opportunities that serve hospitality and residential clients are anticipated. Stories of Hanakaʻoe will provide the foundation for cultural interpretation along pathways and in park signage as well as in hotel programs. And in a similar fashion to Ahupuaʻa O ʻŌpana-Kawela**,** the entire course of ʻŌʻio stream will be maintained from its source to its outflow into Kuilima bay.

B.3. b. Ahupuaʻa Elements

Ahupuaʻa O Hanaka'oe is bounded on the west by Ahupuaʻa O ʻŌpana-Kawela and on east by Ahupuaʻa O Kahuku. The makai land of the *ahupuaʻa* is the commercial core of the plan and serves as the central gathering place for commerce, events, and cultural programs. It is envisioned as the center of the Resort.

The area is proposed to provide the highest density within the SEIS Lands including two new hotel sites and consolidated commercial uses. Parks on the eastern and western boundaries define the limits of the central resort area and also serve as buffers to the adjoining *ahupua'a*. The west-side park will include space for farmer's markets supporting the farm-to-table program. The refurbished 9-hole golf course or open space recreational area will serve as an additional buffer between residences, the existing highway, and proposed hotel components. Similar to kula lands in Ahupuaʻa O ʻŌpana-Kawela, these kula lands will feature farming and commercial agriculture with enhanced programs and facilities. As stated previously, the *mauka* lands in Hanakaʻoe *ahupua'a* will reflect a strengthened relationship between the community and government agencies with a focus on protecting the watershed.

B.3.b. [1] HOTEL FACILITIES

On the H-2 development site east of the existing Ocean Villas, the Proposed Action includes a 250-unit hotel with a maximum height of five habitable floors/90 feet (See Figure 3-1). At this time, it is contemplated that the ownership structure is likely to be condominium, but could be a traditional hotel or timeshare.

West and *mauka* of The Cottages, the H-1 Development Site is bisected by a central Gathering Place. Roughly ten acres of the H-1 hotel site is designated for a commercial gathering place within the heart of the *ahupuaʻa*. Development Site H-1 is contemplated, at this time, as a timeshare project with a maximum 375 units and a maximum height of 90 feet. While the

ultimate ownership structure could also be condominium or traditional hotel, as with many timeshare projects elsewhere in Hawai'i, individual lock-off suites, or 'keys', within a unit may be rented or occupied separately depending upon market demand.

In total, these two sites are planned for 625 units. However, in no case will the number of hotel keys on Development Sites H-1 and H-2, including lock-off suites, exceed 1,000.

B.3.b. [2] THE GATHERING PLACE

The Resort is situated at the western edge of the Ko'olau Loa district and at the eastern end of a seven mile stretch of beach featuring many of the world's most famous surf breaks. The Gathering Place is at the nexus of these two rich and diverse areas and is intended to be a vibrant activity center welcoming the local communities to enjoy the Resort's spectacular setting together with its visitors.

Flanked by the two halves of the H-1 hotel site, the Gathering Place will be the focal point of the resort and draw deeply on the foundation of the host Hawaiian culture. This community core will feature a small collection of simple and authentic structures drawing inspiration from the *kama'aina* architectural heritage of the islands. Local shops and restaurants, a day care facility for resort employees, sunny lawns and groves of shade trees will all provide opportunities for locals and guests alike to gather and talk story.

The built component of the Gathering Place will include less than 40,000 square feet of conditioned space, primarily in single story buildings. The outdoor space in the Gathering Place will include raised lanai and porches linking the clustered arrangements of buildings. Nearest to the ocean will be an ocean sports club called the *Hale Kai*. This facility will host a wide range of ocean-based sports and activities, both cultural and contemporary in nature, and celebrate the resort area's significant history related to the water. All buildings will be set back a minimum of 150 feet from the certified shoreline.

B.3.b. [3] FARMERS' MARKET

Mauka of the shoreline park (Turtle Bay Park) at the western end of Ahupua'a O Hanaka'oe will be the farmers' market. Between market days, the farmers' market will include a small number of permanent market stands offering a convenient market outlet for local farmers. On market days and during other resort events such as the annual *Makahiki* celebration, the venue will fill in with additional stands offering Ko'olau Loa a farmer's market complimentary to the North Shore's very well regarded Hale'iwa market. The area for the Farmers' Market depicted on Figure 3-1 is bisected by the West Main Drain. At this point in the planning process, the final site plan for the market has yet to be determined, but will include a parking area (most likely on the portion of the market identified as Farmers' Market on the west side of the West Main Drain).

B. 4. Ahupuaʻa O Kahuku

Ahupuaʻa O Kahuku constitutes the eastern end of the Resort and is proposed to be developed with a low-density rural character. While its physical area is the largest of the three *ahupuaʻa*, much of the land is occupied by the Punahoʻolapa Marsh and the existing Palmer golf course.

Ahupuaʻa O Kahuku is intended to primarily offer new residential homes – 30% of which are targeted for community use. The Proposed Action includes up to a maximum of 160 affordable Community Housing units on Development Sites RES-1 and RES-2. The maximum height will be three floors/50 feet on Site RES-1 and two floors/40 feet on Site RES-2. TBR intends to work with the community, city, state, and others to determine methods to ensure realistic affordability for future occupants of these homes. TBR plans to work on providing innovative solutions to workforce/affordable housing by partnering with the community and leaders in the field including Habitat for Humanity or Enterprise Community. TRB believes that innovative programs with education for leasing and/ or sale of these units at 80% to 120% of the median income can provide significant assistance to many working families in the region who are seeking housing. The balance of homes, 365 in total, will be resort residential.

B.4. a. Ahupuaʻa Orientations

Interpretive signs in parks, paths, and along the bridle trail will tell the unique stories of the *ahupuaʻa* including the Hawaiian accounts of the kapa beater of Punahoʻolapa Marsh and the floating island of Kahuku. The low-density resort residential component fosters a sense of well-being, community, and proper stewardship. Respectful access to the marsh honors the importance of wetlands in the makai lands. And stewardship of the portion of Oʻio stream in the mauka lands of the *ahupuaʻa* ensure that the *makai* lands of Ahupuaʻa O Hanakaʻoe are not adversely impacted by sedimentation and run-off.

B.4. b. Ahupuaʻa Elements

Ahupuaʻa O Kahuku is the eastern-most *ahupuaʻa* in the Resort and is connected to Ahupuaʻa O Hanakaʻoe and Ahupuaʻa O ʻŌpana-Kawela by Kaihalulu Drive. The *makai* lands in the *ahupuaʻa* include a significant wetland at Punahoʻolapa Marsh that will be preserved and enhanced to benefit its waterfowl habitats, in coordination with the U.S. Fish and Wildlife service. The area will also include portions of the existing Palmer Golf Course, its clubhouse, an equestrian center with a bridle trail coursing through the natural environment, and parks as buffers to Ahupuaʻa O Hanakaʻoe. Kahuku Point will be preserved as a passive park in respect for its strong cultural association with these lands. Similar to the other two *ahupuaʻa*, the *kula* lands will feature improved relationships with neighboring farmers and the mauka lands require strengthening relationships with the U.S. military and other government agencies.

B.4.b. [1] RESORT RESIDENTIAL

The proposed development program for Ahupuaʻa O Kahuku is limited to 365 Resort Residential Units and 160 affordable Community Housing units, a significant reduction from the total of 1,695 units permitted under the 1986 SMA Use Permit.

In contrast to the 415-unit hotel project allowed for Development Site RR-3 fronting Kaihalulu Beach in the current entitlements, the Proposed Action includes a maximum of 100 resort residential units in buildings with a maximum height of three habitable floors/50 feet. All buildings will be set back a minimum of 150' from the certified shoreline along Kaihalulu Beach (see Figure 3-1). The designation of 3a and 3b on Site RR-3 denote a possibility for different phasing and market types.

Development on Sites RR-4, RR-5 and RR-6 will be limited to a maximum of 265 resort residential units with a maximum height of two habitable floors/40 feet. As is the case with RR-3, the designation of RR-4a and RR-4b denotes the possibility for phased development and different market types.

It should also be noted that the area identified as Lot 33 on Figure 3-1 has been delineated for the benefit of the reader because this tax map parcel was not included in the land area covered by the 1985 Revised Final EIS but has been included in the SEIS.

B.4.b. [2] COMMUNITY HOUSING

The proposed Community Housing Units will be situated on development sites RES-1 and RES-2 (see Figure 3-1). Under the proposed phasing plan, discussed in Section 11 below, approximately 44 units would be constructed in the first year, followed by 25 in the second year, and 19 each year for the next three years. Construction of additional units would then taper off until the community housing project is complete in 2022.

B.4.b. [3] PUNAHOʻOLAPA MARSH PRESERVATION AND ENHANCEMENT

The Punahoʻolapa Marsh is a spring fed wetland of approximately 100 acres that provides valuable habitat for a multitude of birds. In the early 1990's when the Palmer Golf Course was constructed, a moat was constructed around much of the perimeter of the marsh creating additional standing water for water birds. The Proposed Action will include further work to enhance the marsh wetlands for the benefit of endangered water bird species including the Hawaiian stilt, the Hawaiian coot, the Hawaiian common moorhen and the Hawaiian duck. This work will include the completion of the moat around the perimeter of the marsh and the creation of standing open water ponds within the central portion of the marsh, and will be coordinated with the U.S Fish and Wildlife Service. The applicant will develop a plan that may also include additional improvements such as an elevated walking path with viewing platforms.

B. 5. Recreational Amenities

The visitor destination area envisioned by the Oʻahu General Plan at the Resort has been operating successfully for four decades, thanks in great part to the recreational amenities it offers to its guests and the greater Oʻahu community. The proposed expansion of the resort will modify some of these facilities, but together they will remain an integral part of the resort.

B.5. a. Parks and Pedestrian Access

The 1986 Unilateral Agreement requires that four parks be provided at the resort together with a shoreline easement for public access be provided at stages of the resort expansion development (see Appendix B):

1. Kawela Bay Park (development site P-1): A four and eight tenths (4.8) acre park at Kawela Bay (to be dedicated to the City and County of Honolulu). As discussed earlier, this park will be developed at the center-point of the Kawela Bay shoreline (the western edge of the Resort). Planned facilities will include parking, showers, a comfort station, and picnic tables and lawns;
2. Hanakaʻilio Beach Park (development site P-2): A thirty-seven (37) acre park located from Kahuku Point to the eastern boundary of Hanaka`ilo Beach (to be dedicated to the City and County of Honolulu). In respect for the rich cultural heritage of Kahuku Point, this will be a passive park with facilities limited to parking, showers, and a comfort station. Development will focus on the restoration of indigenous vegetation;
3. Punahoʻolapa Park (development site P-3): A six (6) acre park abutting Punahoʻolapa Marsh (to be privately owned but open to the public). This will be a passive park with parking, a comfort station, interpretive signage, benches, landscaping, and a possible birding lookout; and
4. Kaihalulu Beach Park (development site P-4): A two (2) acre park located in the area surround the outlet for East Main Drain (to be privately owned but open to the public).

The shoreline park areas shall be linked, with the exception of the shoreline along the existing Turtle Bay Hotel, by a continuous shoreline easement (to be publicly-owned, privately-maintained, and open to the general public), which will be further augmented by pedestrian easements and the easement to Kalokoiki beach (Kuilima Cove).

While not required, the Proposed Action includes an additional 11.3-acre park (Turtle Bay Park) to be located adjacent to the outlet of the West Main Drain. This private park will be nearby and compliment the proposed Gathering Place. The focal point of the park will be a terraced lawn area and stage. This venue will have the flexibility to serve events of differing sizes. When not being used for public performances, the stage will be the home to the local *hula halau*. At other times, the amphitheater will serve as an intimate setting for concerts of both local and nationally recognized artists performing for audiences of resort guests and residents from nearby communities. Native plants and landscaping will enrich this park's cultural focus and the inclusion of a traditional canoe house, *halau waʻa*, will provide a connection, in look and in practice, to the rich cultural traditions of the past. To ensure appropriate management and control is in place to maximize the opportunity presented by the amphitheater, the park will be privately owned and maintained.

One of the Resort's primary attractions is its rugged coastline. It is TBR's *kuleana* (responsibility) to preserve and protect this environmentally sensitive and culturally important resource. The

Proposed Action will provide enhanced access to the shoreline for visitors, residents, and guests alike through the provision of the Shoreline Trail that will meander along the oceanfront in a 100-foot shoreline access easement. Under the Unilateral Agreement, a total of eight public shoreline access ways are to be provided. However, the Proposed Action includes an additional four public shoreline access ways, for a total of twelve.

B.5. b. Golf

The Proposed Action includes reconfiguring the 18-hole Fazio Golf Course to a nine-hole arrangement in the area indicated on Figure 3-1. The reconfiguration of the Fazio Golf Course might include the creation of additional water hazards, recreational paths and natural open space that would provide habitat for water birds and additional storm water retention. A new Golf Clubhouse is proposed for a site of approximately 3 acres adjacent to the 18th green of the Palmer Golf Course. The existing golf clubhouse will be retained as a commercial building. No material changes are proposed for the Palmer Golf Course.

B.5. c. Tennis

The Resort includes four tennis courts that are available to its visitors, guests, and the public. The courts are located adjacent to the existing Hotel. No significant changes to the tennis courts are contemplated. However, new hotel development may incorporate additional courts where appropriate.

B.5. d. Equestrian Center

The existing stables will be relocated to a site of approximately 9 acres adjacent to the Punahoʻolapa Marsh. The new stables facility will include a barn, fenced corrals, a small office, parking, snack bar, restrooms and appurtenant facilities. Best management practices will be employed to prevent stable and corral runoff from entering the moat and the marsh.

An equestrian trail network will be incorporated into the resort as part of the Proposed Action. The network will include a bridle path along one side of Kaihalulu Drive, a bridle path along Kaihalulu Beach set back a minimum of 50' from the certified shoreline, and a mixed use trail along the old rail grade through the Punahoʻolapa Marsh. The proposed Equestrian Center and trails will be graded and managed to minimize the risk of nutrient loading entering the Punahoʻolapa Marsh.

B.5. e. Open Space

The elements of the Proposed Action combine to preserve the open space character of the resort. The majority of the Resort property will be preserved in open space uses, including but not limited to golf course, parks, shoreline setback areas, Punahʻolapa Marsh, the Equestrian area, Farmers Market, parking, and the mauka agricultural lands. See Figure 3-2 Use WCIT Figure 9. The Proposed Action will also incorporate significant view corridors into the expansion project as depicted in Figure 3-2.

B. 6. Vehicular Circulation

As discussed in Chapter Two, a new access road, Kaihalulu Drive, will be constructed as the resort's principal east-west internal roadway. Its intersection with Kamehameha Highway will function as the resort's new entrance. Kuilima Drive will be preserved as the principal access to the existing hotel and to the Kuilima Estates. Marconi Road will also be improved to function as an access road for land uses along the eastern portion of the resort.

B. 7. Infrastructure and Utilities

B.7. a. Pedestrian & Bicycle Access

The Proposed Action includes the provision of an extensive pedestrian path and trail system within the resort that will provide access to the resort coastline for pedestrians and bicyclists.

B.7. b. Drainage

The golf course fairways are shaped to provide channelized routing to the golf course water features, the East and West Main Drains, or the coast. Runoff to the golf course water features are planned to provide supplemental make up water to sustain the created wetlands, with the wetlands being one of the Resort's *BMPs* to address long term water quality concerns relative to ocean discharges. The golf course water features and channelized routing through the landscape serve as *BMPs* prior to ocean discharge as sheet flow or through the East and West Main Drains.

Planned upgrades to the Fazio Golf Course include the re-contouring of the fairways to widen the West Main Drain and improve the flow of runoff through the existing breaks in the sand dunes and sheet flow areas, while still maintaining the storm water detention and water quality features of the course. Construction of the proposed Clubhouse adjacent to the East Main Drain also includes re-contouring of the fairways to improve the flow of runoff through the existing breaks in the sand dunes and sheet flow areas.

Besides the Fazio Golf Course and new Clubhouse, portions of the Palmer Golf Course are also being evaluated for further re-design to enhance the drainage system and the course. The proposed Community Housing RES-2 development could benefit from the re-contouring of the golf course between Kamehameha Highway and the lagoons in the Palmer Golf Course to reduce the Hoʻolapa Stream Floodway. Grassed lined channels can be incorporated into the re-design because the resort will be responsible for the maintenance of the channel. It is possible for the East and West Main Drains and the Punahoʻolapa Ditch to meander through the golf course, flowing through irregular channels with golf course features, on their way to the ocean.

As an enhancement to the regional drainage system, the east portion of the Fazio Golf Course and the entire Palmer Golf Course can accommodate the increase in runoff from the proposed developments through retention. The increase in runoff is calculated as the difference between the pre-development and post development runoff for the 24-hour 100-year storm. The increased runoff volume from the proposed developments on the east side of Kuilima Drive,

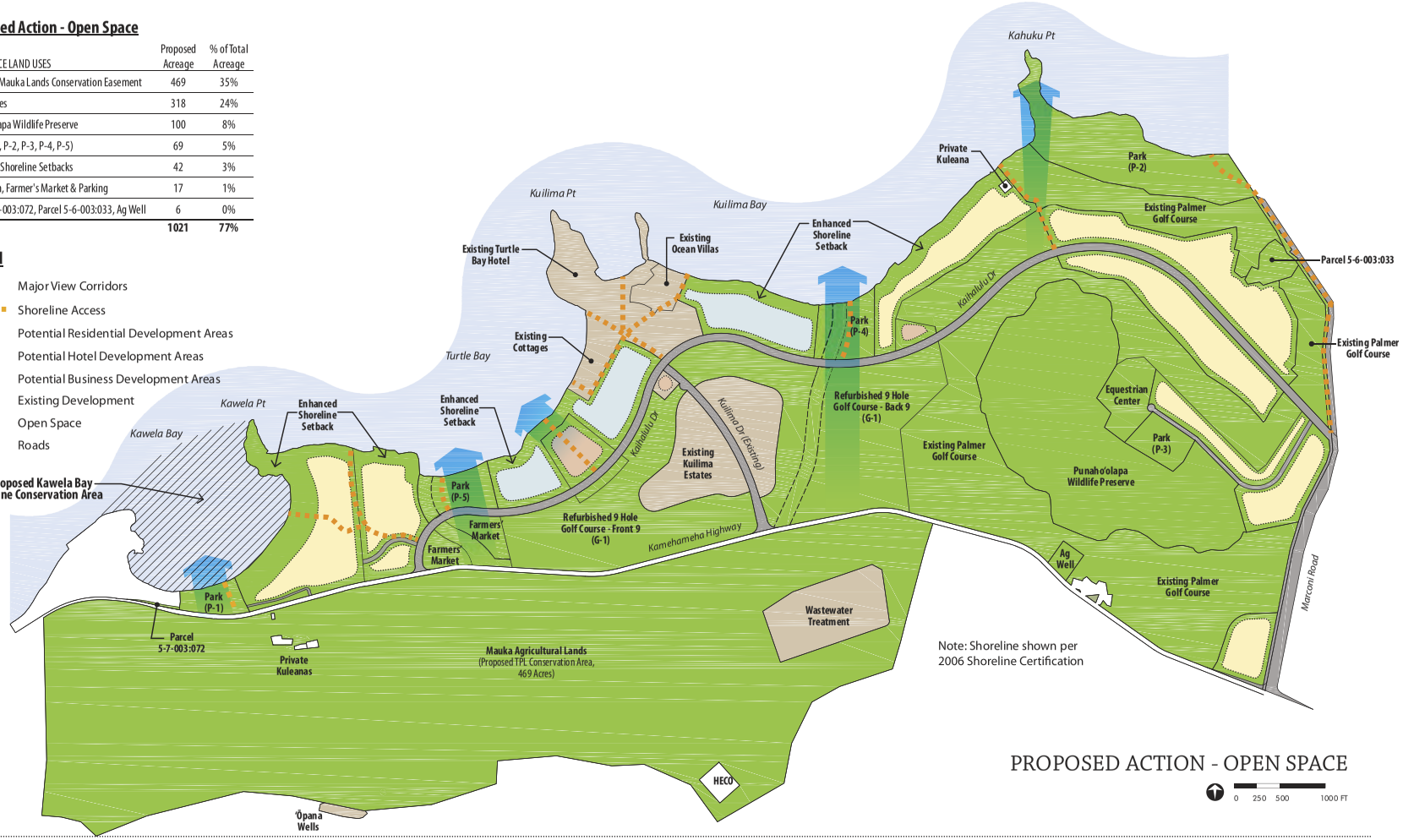
Figure 3-2: Proposed Action - Open Space

Proposed Action - Open Space

OPEN SPACE LAND USES	Proposed Acreage	% of Total Acreage
Proposed Mauka Lands Conservation Easement	469	35%
Golf Courses	318	24%
Punahoolapa Wildlife Preserve	100	8%
Parks (P-1, P-2, P-3, P-4, P-5)	69	5%
Enhanced Shoreline Setbacks	42	3%
Equestrian, Farmer's Market & Parking	17	1%
Parcel 5-7-003:072, Parcel 5-6-003:033, Ag Well	6	0%
TOTAL	**1021**	**77%**

Legend

- Major View Corridors
- Shoreline Access
- Potential Residential Development Areas
- Potential Hotel Development Areas
- Potential Business Development Areas
- Existing Development
- Open Space
- Roads



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which include the Golf Course Clubhouse, the new Hotel site H-2 and Resort Residential and Community Housing sites, RR-3 to 6 and RES-1 and RES-2, served by the East Main Drain, is still approximately 88.8 ac-ft. The Fazio Golf Course and Palmer Golf Course provide a total of 179.29 ac-ft east of Kuilima Drive at an elevation of 6 feet msl. Punahoʻolapa Marsh provides 96.8 ac-ft at elevation 6 feet msl, for a total of 276.09 ac-ft., which receive runoff from offsite properties that flows across Kamehameha Highway and the Palmer Golf Course into the marsh.

As an enhancement to the regional drainage system, the west portion of the Fazio Golf Course can accommodate the increase in runoff from the proposed developments on the west side of Kuilima Drive, Resort Residential sites RR-1 and RR-2, Hotel site H-1 and the Farmer's Market and Gathering Place through retention. The increased runoff volume west of Kuilima Drive, which includes Kawela Stream, West Main Drain, and West Kuilima Drain, is still approximately 48.9 ac-ft. The Fazio Golf Course provides 69.09 ac-ft west of Kuilima Drive at an elevation of 8 feet above mean sea level. Re-contouring of the golf course will be required in order to maintain retention when the hydraulic grade is lowered at the time the improvements to the West Main Drain are constructed.

B.7. c. Drinkable Water Storage and Transmission

B.7.c. [1] EXISTING POTABLE SYSTEM

The existing water supply, transmission, and distribution system is owned and operated by the Board of Water Supply (BWS). The existing infrastructure at the Resort has been constructed in accordance with BWS standards.

The existing Resort and the SEIS Lands are located within the Waialua-Kawela 228-foot service zone. Generally, the service zone is defined by the elevation of the reservoir serving the system (the Kawela reservoir). In this instance, the spillway of the reservoir was constructed at an elevation high enough to allow gravity to generate enough pressure to render the system operational. (The spillway is used to maintain the maximum elevation of the water in the reservoir.) The spillway of the 2.0 million gallon (mg) Kawela reservoir has an elevation of 228 feet above mean sea level. The reservoir has sufficient capacity to accommodate the maximum daily flow and the fire flow required for the resort by City and State regulations and guidelines.

The existing Resort water system is currently served by the BWS Wailee Wells (State Nos. 4101-07 and 4101-08). The two wells are located west of the Resort's mauka agricultural lands at elevations of 5,000 and 4,200 feet respectively (see Figure 3-3). The two wells have authorized uses of 340,000 and 410,000 gallons per day respectively.

These wells are part of the Waialua-Kawela system, which can also receive water from the Waialua and Haleiʻwa wells (State Well Nos. 3405-01 to 04 respectively). The Wailee Wells provide water for the BWS Service Area that extends from Pupukea to the Resort and withdraw water from the Kawailoa Aquifer. The regional system has a combined capacity of approximately six (6) million gallons per day.

Water from the Wailee Wells is conveyed to the Kawela Reservoir by a 16-inch water main located within the Kamehameha Highway right-of-way and a 20-inch water main along the access road to the reservoir.

A 12-inch diameter water line extends *makai* under Kuilima Drive from the 16-inch main under Kamehameha Highway. The 12-inch line provides the existing Turtle Bay Hotel, the golf course, and the Kuilima Estates with drinking water. Portions of the 12-inch line are situated within the SEIS Lands.

The existing system was designed for integration into the resort's expanded system that will include new distribution lines to be installed along circulation roads as part of the Proposed Action.

The existing water demand for the hotel, golf clubhouse, and Kuilima Estates is estimated to be 345,000 gallons per day. The regional BWS system can easily meet this demand.

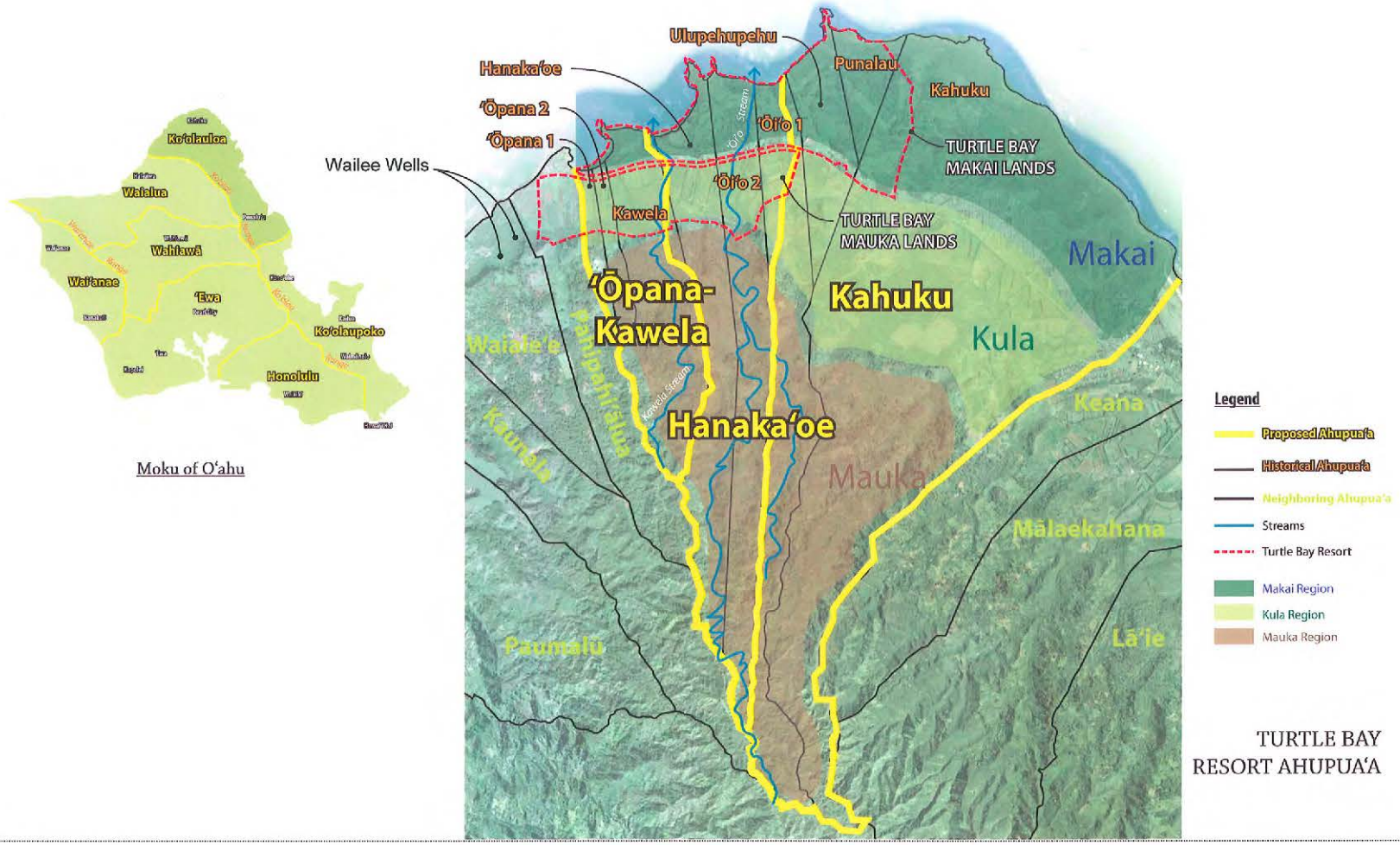
B.7.c. [2] PROPOSED SYSTEM

The proposed water demand estimates and the proposed design of the system are derived from the City and County of Honolulu's BWS Water System Standards. Calculation of the projected domestic water demands for the Proposed Action are based on the presumption that the Resort receives water service from the BWS except for golf course irrigation which will be served by the resort's non-potable system described in the next section. The resort's non-potable water system is and will continue to be completely independent of the resort's potable (drinkable) water system. (As discussed in the following section, non-potable water demand at the resort is served by non-potable wells owned by TBR and supplemented by reclaimed water from the Kuilima Wastewater Treatment Plant.)

Future water demand created by the Proposed Action will be supplied by new wells that have already been developed by the Resort and will be dedicated to the BWS. Called the ʻŌpana Wells, they are located mauka of the SEIS Lands at an elevation between 125 and 131 feet. Two of the three ʻŌpana Wells are identified as State Nos. 4100-04 and 4100-05 and are located on property identified as TMK 5-7-002:009. They have a combined allowable capacity of 890,000 gpd of average daily demand[1]. A third ʻŌpana Well has been drilled and cased. It has an estimated capacity of 450,000 gpd of average daily demand. Collectively, the three ʻŌpana Wells have a capacity of up to 1,340,000 gpd. The wells were constructed in 1991 but were not dedicated to the BWS at that time. The pumps were re-tested in 2006. A building permit application tocomplete renovations to the existing facility, including the refurbishment of the pumps, piping and controls was submitted in July, 2006 and issued in December, 2008. The

[1] Each of the three wells has a capacity of 700 gpm or 1 million gallons per day. However, BWS standards limit the amount of water that a developer can receive as a credit from the BWS for their development, so although the first two wells can produce a combined maximum of two million gallons per day, the Resort is allocated a capacity of 890,000 gallons per day for the two.

Figure 3-3: Wailee Wells



construction is now complete and final testing is ongoing. In consideration of TBR's anticipated dedication of the ʻŌpana Wells to the City and County BWS by late 2012 or early 2013, the BWS has agreed to allocate a sufficient amount of potable water for the Proposed Action.

Once the ʻŌpana Wells are dedicated to the BWS, the current in-place regional water system can support development of up to seventy-five (75) percent of the Proposed Action. As the average daily water demand approaches 890,000 gallons per day as the result of the phased development, the third ʻŌpana Well will need to be added to the system. The Developer has the ability to unilaterally complete development of the third ʻŌpana Well to meet all potable demand for the Proposed Action. Although the existing Kawela Reservoir site has sufficient room for a second reservoir, the Proposed Action does not include the construction of a second reservoir. The existing Kawela Reservoir has the capacity to provide the estimated 24-hour maximum daily water demand for the Proposed Action, in accordance with BWS criteria. Water from the ʻŌpana Wells will be conveyed to the Kawela Reservoir via a 20-inch water line.

Water service for the Proposed Action is planned to be divided into two parts; east and west. See Figure 3-4**.** For the western area of the Proposed Action, a new 12-inch water line will be incorporated into the construction of Kaihalulu Drive, the primary connector road included in the Proposed Action. As is the case with the existing system, the new water line is planned to be connected to the existing 16-inch water main under Kamehameha Highway. The existing 12-inch line under Kuilima Drive is planned to remain in place and is planned to connect to the new 12-inch line. For the eastern area of the Proposed Action, a new 12-inch water line is planned to be incorporated into the widening of Marconi Road. This line is planned to also connect to the 16-inch main under Kamehameha Highway.

B.7. d. Irrigation Water

B.7.d. [1] EXISTING SYSTEM

Non-potable irrigation water at the resort is supplied by two (2) non-potable wells that have been approved by the State Water Commission. One is located *mauka* and adjacent to Kamehameha Highway on resort-owned property directly south of the Gathering Place in the Proposed Action. Well #4100-01 provides an average of approximately 200,000 gallons per day (gpd) over the course of a year primarily as a source to to irrigate the Fazio Golf Course. The other is located *makai* to Kamehameha Highway on resort owned SEIS lands to the south of the middle of Hole #5 on the Palmer Course. Well #4158-14 provides an average of approximately 130,000 gpd over the course of a year.

B.7.d. [2] PROPOSED SYSTEM

Future demand for irrigation water will be met with water from these or other existing non-potable wells (located *mauka* of Punahoʻolapa Marsh as depicted on Figure 3-1, supplemented by treated effluent from the WWTP where allowable. The golf course irrigation system will be maintained independent from the potable system, and use of non-potable water for resort landscaping will be considered where appropriate.

B.7. e. Wastewater Collection and Treatment

B.7.e. [1] EXISTING SYSTEM

The SEIS Lands are vacant and are not presently served by the Resort's existing wastewater collection and treatment system. The wastewater collection system required for the Proposed Action will consist of an expansion of the existing system. The existing treatment plant has the capacity to serve the requirements of the Proposed Action.

The existing wastewater collection and treatment system consists of privately owned gravity sewers designed to collect peak flows from the Turtle Bay Hotel, Kuilima Estates and other resort facilities. Wastewater from the existing resort facilities is treated at wastewater treatment plant (WWTP) situated on the mauka side of Kamehameha Highway (see Figure 3-1). The WWTP is owned and operated by Turtle Bay Wastewater Treatment, a privately owned utility providing a service to the resort in much the same manner as other public utilities such as the Board of Water Supply's municipal water system and the Hawaiian Electric Company's electrical service. To that end, while the SEIS addresses the demand for public utility services such as the WWTP, the actual operation of the WWTP is not included within the scope of the SEIS because the plant is not located within SEIS Lands. The WWTP was built in 1994 to replace the original oxidation ponds within the SEIS Lands that treated the wastewater from the resort. The WWTP has an ultimate average design capacity of 1.32 million gallons per day (mgd) and is rated for ultimate peak flows of 4.24 mgd. Presently, the facility treats around 0.31 mgd as flows will vary between 290,000 gpd to 320,000 gpd. Based on records from the existing WWTP and the WWPS, the average existing wastewater flow at the resort is approximately 310,000 gallons per day (gpd), which is equivalent to 215 gallons per minute (gpm).

Because the ground elevation of the WWTP is about 26 feet above mean sea level, an elevation approximately 18 feet higher than the existing resort facilities on the makai side of the highway, the wastewater has to be pumped from the resort uphill to the treatment plant. To accomplish this, wastewater generated from the existing resort facilities is conveyed through underground pipelines to the Kuilima Wastewater Pump Station (WWPS), located near the existing Golf Clubhouse parking lot (see Figure 3-5). It is then pumped uphill from the WWPS to the WWTP via a 16-inch diameter force main that crosses under Kamehameha Highway as shown in Figure 3-5. The WWPS consists of one centrifugal pump plus one standby, with a design flow of 1,200 gpm. Based on the calculated existing peak flow of the resort (583 gpm), the existing WWPS has an excess pumping capacity of 617 gpm.

Treatment of wastewater at the WWTP generates two products for disposal; treated wastewater (effluent) and solids. The solids are trucked from the WWTP to the Honouliuli Municipal Landfill by a private service contracted by the plant owner.

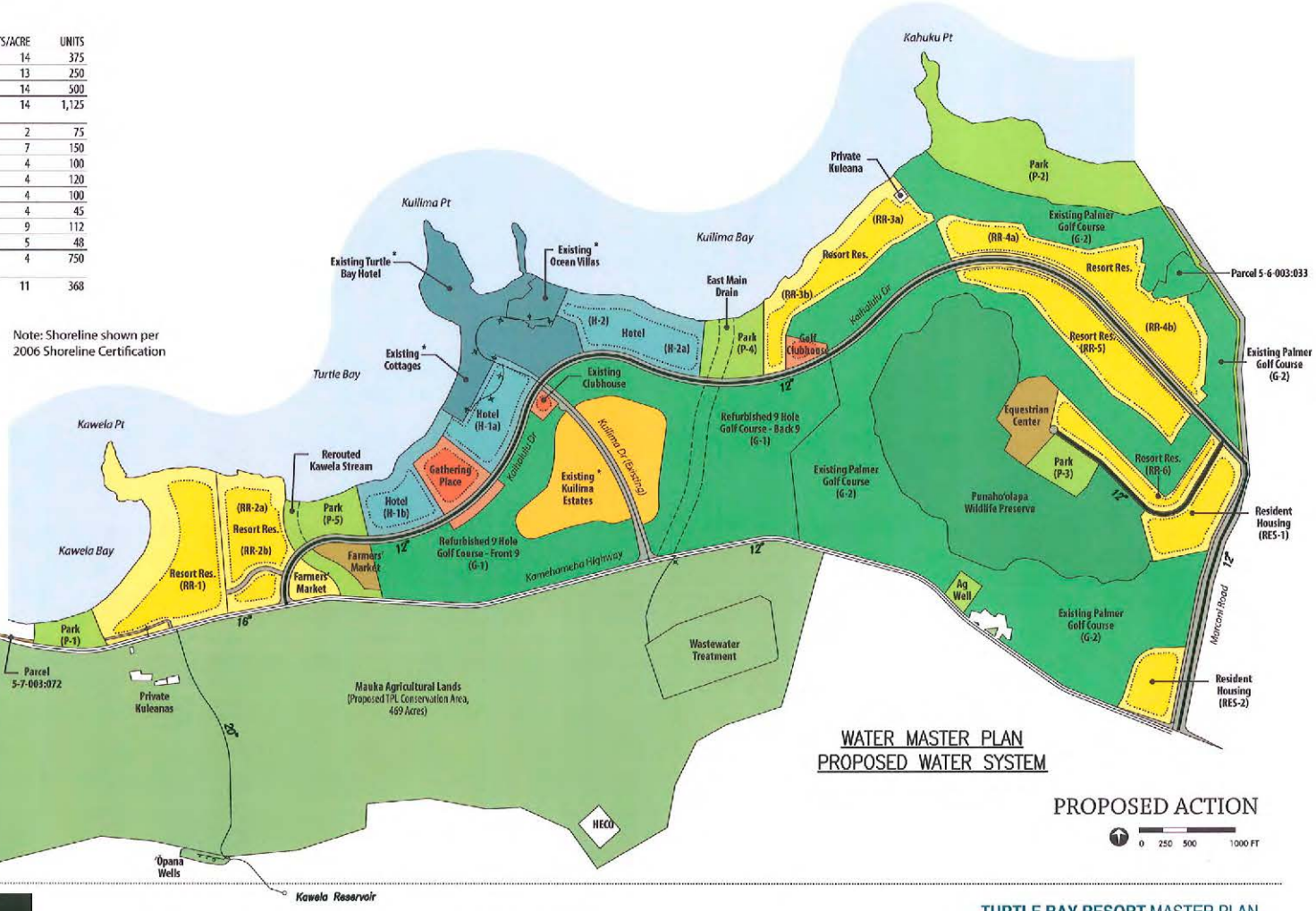
The wastewater is oxidized, disinfected, and filtered at the plant and then returned to the resort by gravity flow through a 12-inch diameter discharge pipe. The treated effluent is stored in the Palmer Golf Course Storage Ponds where it is blended with non-potable water and used to irrigate the Palmer Golf Course.

Figure 3-4: Water Master Plan, Proposed Water System

Proposed Action

AREA	ACRES	UNITS/ACRE	UNITS
Hotel (H-1a, 1b)	25.9	14	375
Hotel (H-2, 2a)	19.0	13	250
Existing Turtle Bay Hotel	34.5	14	500
TOTAL HOTEL	79.4	14	1,125
Resort Residential (RR-1)	39.1	2	75
Resort Residential (RR-2a, 2b)	20.3	7	150
Resort Residential (RR-3a, 3b)	24.8	4	100
Resort Residential (RR-4a, 4b)	33.4	4	120
Resort Residential (RR-5)	25.6	4	100
Resort Residential (RR-6)	11.2	4	45
Resident Housing (RES-1)	12.4	9	112
Resident Housing (RES-2)	8.8	5	48
TOTAL RESIDENTIAL	175.6	4	750
Existing Kuilima Estates	33.1	11	368
Gathering Place (Piko)	9.6		
Existing Clubhouse	1.2		
New Clubhouse	2.3		
TOTAL OTHER	13.1		
Golf Course (G-1)	123.1		
Golf Course (G-2)	191.5		
Punahoolapa Wildlife Preserve	100.0		
Park (P-1)	4.8		
Park (P-2)	38.0		
Park (P-3) - Bird Sanctuary	6.0		
Park (P-4)	9.4		
Park (P-5)	11.3		
Equestrian Center	8.8		
Farmers' Market (east)	3.4		
Farmers' Market (west)	4.1		
Parcel 5-6-003:033	3.8		
AG Well (Lot 524)	2.0		
TOTAL OPEN SPACE	506.2		
Kuilima Drive (Existing)	4.5		
P-1 Access Road	0.4		
RR-1/2 Access Road	0.7		
Equestrian Road	2.6		
Marconi Road Expansion	11.3		
Kaihalulu Drive	24.8		
TOTAL ROADWAYS	44.3		
Parcel 5-7-003:072	0.2		
TOTAL SITE	**851.9**		

Note: Shoreline shown per 2006 Shoreline Certification



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* Not in SEIS Area

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Based on the level of treatment provided at the WWTP, the reclaimed water is classified by the State Department of Health (DOH) as R2 effluent, which has a partially restricted use, according to the department's Guidelines for the Treatment and Use of Recycled Water". The median fecal coliform bacteria densities of the treated effluent are not allowed to exceed 23 per 100 milliliters. The treated effluent has an approximate turbidity of 45 nephlometric turbidity units (NTU).

B.7.e. [2] PROPOSED SYSTEM

The proposed gravity sewer system will likely be constructed with Polyvinyl Chloride (PVC) pipe. The expanded wastewater collection system will consist of new underground collection lines that direct wastewater to transmission lines, which will in turn convey the wastewater to five new wastewater pump stations situated at strategic points along Kaihalulu Drive as depicted in Figure 3-5 same figure as above. The five new pump stations will direct the wastewater via new force mains to the Kuilima WWPS which will use the existing force main to deliver the wastewater to the WWTP for treatment.

B.7. f. Solid Waste Collection and Disposal & Recycling

B.7.f. [1] EXISTING SYSTEM

Solid waste generated by existing activities at the Resort, the Kuilima Estates, and private operations (restaurants), is collected by Honolulu Disposal, a private contractor, under separate contracts. Ultimately, the waste is transported to either H-Power at Campbell Industrial Park or the Waimānalo Gulch Landfill.

On-site recycling is performed in a number of ways. The Hotel utilizes bins for sorting of glass, plastic, and paper, and operates its own cardboard compactor/baling machine. On-site green waste generated from the Hotel and golf course maintenance is mulched and re-used on-site. Privately owned restaurants manage their own recycling of glass. Kuilima Estates has independent arrangements for recycling, and green waste recycling/disposal.

The total volume of solid waste presently generated at the resort (exclusive of Kuilima Estates) is estimated to be approximately 1,689 tons per year, or on average just over 4.5 tons per day.

B.7.f. [2] PROPOSED SYSTEM

The Proposed Action will increase the number of hotel and residential units, expand the commercial square footage, and provide new public park facilities. Solid waste collection and disposal will continue to mirror current operations, utilizing private waste hauling contractors for collection and disposal at the two City waste handling facilities.

B.7. g. Electrical and Telecommunication Services

B.7.g. [1] EXISTING SYSTEM

Electricity is provided to the Resort by Hawaiian Electric Company (HECO). Communications are provided by Hawaiian Telcom and Oceanic time Warner Cable. An existing electrical substation, called the Kuilima Substation, is located *mauka* of the resort (about a half mile

Figure 3-5: Sewer Master Plan, Proposed System

Proposed Action

AREA	ACRES	UNITS/ACRE	UNITS
Hotel (H-1a, 1b)	25.9	14	375
Hotel (H-2, 2a)	19.0	13	250
Existing Turtle Bay Hotel	34.5	14	500
TOTAL HOTEL	79.4	14	1,125
Resort Residential (RR-1)	39.1	2	75
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Resort Residential (RR-3a, 3b)	24.8	4	100
Resort Residential (RR-4a, 4b)	33.4	4	120
Resort Residential (RR-5)	25.6	4	100
Resort Residential (RR-6)	11.2	4	45
Resident Housing (RES-1)	12.4	9	112
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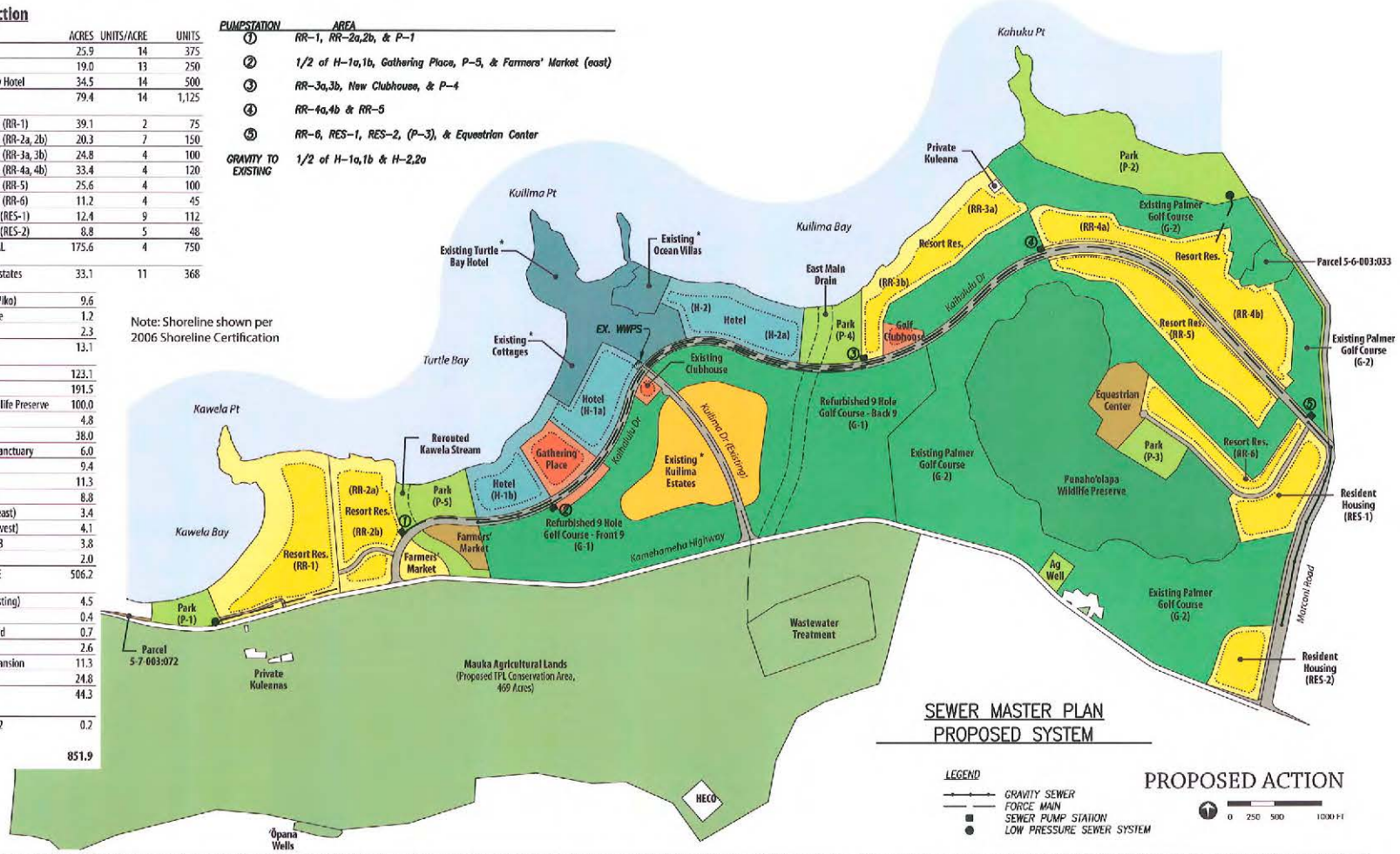
TOTAL RESIDENTIAL	175.6	4	750
Existing Kuilima Estates	33.1	11	368
Gathering Place (Piko)	9.6		
Existing Clubhouse	1.2		
New Clubhouse	2.3		
TOTAL OTHER	13.1		
Golf Course (G-1)	123.1		
Golf Course (G-2)	191.5		
Punahoolapa Wildlife Preserve	100.0		
Park (P-1)	4.8		
Park (P-2)	38.0		
Park (P-3) - Bird Sanctuary	6.0		
Park (P-4)	9.4		
Park (P-5)	11.3		
Equestrian Center	8.8		
Farmers' Market (east)	3.4		
Farmers' Market (west)	4.1		
Parcel 5-6-003:033	3.8		
AG Well (Lot 524)	2.0		
TOTAL OPEN SPACE	506.2		
Kuilima Drive (Existing)	4.5		
P-1 Access Road	0.4		
RR-1/2 Access Road	0.7		
Equestrian Road	2.6		
Marconi Road Expansion	11.3		
Kaihalulu Drive	24.8		
TOTAL ROADWAYS	44.3		
Parcel 5-7-003:072	0.2		
TOTAL SITE	**851.9**		

PUMPSTATION	AREA
①	RR-1, RR-2a,2b, & P-1
②	1/2 of H-1a,1b, Gathering Place, P-5, & Farmers' Market (east)
③	RR-3a,3b, New Clubhouse, & P-4
④	RR-4a,4b & RR-5
⑤	RR-6, RES-1, RES-2, (P-3), & Equestrian Center
GRAVITY TO EXISTING	1/2 of H-1a,1b & H-2,2a

Note: Shoreline shown per 2006 Shoreline Certification



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* Not in SEIS Area

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south of the intersection of Kuilima Drive and Kamehameha Highway) and receives electrical energy from an overhead 40 KW transmission line. Electricity is provided to the resort via overhead and underground transmission lines, presently energized at 11.5 kV, which are owned and maintained by HECO. The electrical components serving the resort represent a portion of the electrical grid maintained by HECO for the island of Oʻahu. To energize this grid, HECO generates electricity from several power plants located in Honolulu, Pearl City, Campbell Industrial Park in Ewa, and Kahe Point on the leeward coast. Additional power is provided by renewable resources including the City's H-Power waste-to-energy facility at Campbell Industrial Park and the wind turbine generators at Kahuku maintained by First Wind.

HECO's current island-wide generation capacity is approximately 1,669 MW. The present peak coincident demand for electricity on Oʻahu is approximately 1,327 MW.

Hawaiian Telcom (HTCO) is the local area telephone provider and presently serves the Resort from their Lāʻie Central Office. HTCO shares the wood polies along Kamehameha Highway to support cables from the Central Office, and has installed underground facilities along Kuilima Drive.

Oceanic Time Warner Cable (Oceanic) is the local CATV provider, and has an agreement with HTCO for use of the wood poles along Kamehameha Highway to link transmission cable from their Sunset Office to the resort. Oceanic has underground facilities along Kuilima Drive and two power supplies at the Turtle Bay Hotel to serve the resort.

B.7.g. [2] PROPOSED SYSTEM

Hawaiian Electric Company will need to install two new distribution feeders from the Kuilima Substation and will require additional duct line to extend the feeders to serve the SEIS Lands. In addition, the company intends to upgrade the substation by adding a second transformer.

Both HTCO and Oceanic will require easements on-site to accommodate new equipment, and must extend their trunking facilities from Kamehameha Highway along the new resort access road, Kaihalulu Drive, to serve the SEIS Lands.

Although the existing resort (the Turtle Bay Hotel and appurtenant recreational facilities, and Kuilima Estates East and Kuilima Estates West) is not part of the Proposed Action, for purposes of evaluation it is necessary to understand how much electrical energy the resort consumes. The electrical usage of the present facilities is estimated to be approximately 1,450,412 kilowatt-hours (KWH) per month.

B. 8. Views

With the exception of community housing parcel Res-2, which abuts Kamehameha Highway at the southeastern corner of the resort property, and development parcels RR-1 and RR-2 at Kawela Bay, none of the remaining development parcels in the Proposed Action are visible from the highway.

The existing hotel is a prominent feature on Kahuku Point. Portions of the Palmer and Fazio golf courses are visible from the shoreline. Much of the remaining SEIS Lands are obscured from shoreline views by dense groves of ironwood trees.

B. 9. Construction and Funding Source

The proposed project is estimated to cost $769.9 million, which includes approximately $148.5 million for new infrastructure. The project is planned to be entirely privately funded. No public investment will be required.

B. 10. Use of Public Funds or Lands

The Proposed Action will require no public funds to be implemented. No public lands will be developed.

B. 11. Phasing and Timing

The estimated absorption table below reflects a reasonable estimate by TRB's expert market assessment consultant based on historical market data and their current interpretation. As market fluid market conditions change, the phasing and future absorption will also change and the reader should be aware that this only forecast.

Construction of the hotel and residential units comprising the Proposed Action is currently planned to be phased over eleven (11) years, with groundbreaking in approximately 2015 dependent on receipt of final bulk subdivision, other approvals and market conditions, as summarized in the Table below. Because the two hotels are planned to consist of a series of smaller structures, rather than single towers, they may be developed in increments based upon anticipated market absorption rates.

The development of the hotel and residential units is planned to be preceded and accompanied by the construction of requisite infrastructure. Because the new roadways will constitute the principal routes for subterranean pipelines (water, utilizes, and wastewater collection/ transmission) and will also contain culverts for drainage, they constitute the principal component of the infrastructure phasing plan. Infrastructure phasing contemplates the option to install required utility lines prior to construction of roads where it makes feasible sense.

Implementation of the infrastructure phasing plan proposes to start with the construction of the intersection of Kaihalulu Drive (formerly known as Alpha Road) and Kamehameha Highway near Kawela Bay. Kaihalulu Drive will extend from Kamehameha Highway to the East Main Drain, providing access to Hotel site H-2. Roadway runoff will be directed to the golf course water features or channelized routing through the landscape. This segment of Kaihalulu Drive will also contain the culvert structures for the future widening of the West Main Drain. The construction of this portion of Kaihalulu Drive will coincide with the re-contouring of the Fazio Golf Course and the improvement of runoff flow to the Kuilima Drain and through the existing breaks in the sand dunes.

The second segment of Kaihalulu Drive from the East Main Drain to Marconi Road will be constructed to support the Golf Course Clubhouse, Resort Residential RR-3 to RR-6, the Equestrian Center, and Community Housing CH-1. Roadway runoff also will be directed to the golf course water features or channelized routing through the landscape. This segment of Kaihalulu Drive will also contain the culvert structures for the future widening of the East Main Drain. The Golf Course Clubhouse and the recountouring of the Fazio and Palmer Golf Courses to improve the flow of runoff will be constructed concurrently and precede the construction of the second phase of Kaihalulu Drive.

The Intersection of Marconi Road and Kamehameha Highway will likely be required to develop the Community Housing CH-2 site.

The West Main Drain will be widened to support the development on the western portion of the property. The East Main Drain and Punahoʻolapa Ditch will be widened to support the development on the east side of the property. In the interim, the re-contouring of the golf courses will improve the flow of runoff to the existing drains and the breaks in the sand dunes. The increase in runoff volume due to the proposed developments will be controlled by the re-contouring of the Fazio and Palmer Golf Courses.

The development phasing plan forecasts Hotel site H-1, Resort Residential RR-1, RR-2, RR-5 and RR-6 and Community Housing CH-1 and Ch-2 as the first sites to be developed. Resort Residential RR-1 and RR-2 are located west of the West Main Drain and are planned to be constructed prior to the restoration of the Kawela Stream alignment to the West Main Drain. The sheet flows from Kamehameha Highway onto the RR-1 and RR-2 sites is planned to be diverted by grassed swales to the existing west main drain or Kawela Stream. The site runoff is planned to be directed to the West Main Drain, the Fazio Golf Course, or directed by sheet flow to the ocean according to Best Management Practices (*BMPs*). Runoff directed to the ocean is planned to pass through the shoreline setback area.

Hotel site H-1 is planned to be developed along with the RR-1 and RR-2 sites. The runoff from the H-1 site is planned to be directed to the West Main Drain or directed by sheet flow to the ocean with *BMPs*. Runoff directed to the ocean is planned to pass through the shoreline setback area. The site runoff from Resort Residential RR-5 and RR-6 and Community Housing CH-1 and 2 is planned to also be developed along with RR-1 and RR-2 and runoff is planned to be directed to Palmer Golf Course.

Hotel site H-2 is planned to be developed after Hotel site H-1. The site runoff is planned to be directed to the Fazio Golf Course or directed by sheet flow to the ocean with *BMPs*. Runoff directed to the ocean is planned to pass through the shoreline setback area.

Resort Residential site RR-3 is planned to be developed after sites RR- 5 and RR-6. The site runoff is planned to be directed to the Palmer Golf Course or directed by sheet flow to the ocean with *BMP*s. Runoff directed to the ocean is planned to pass the shoreline setback area. The construction of the East Main Drain improvements is planned to precede the development of RR-3.

Table 3-1: Proposed Action Phasing Plan

Parcel	Market Product	Average Sq, Footage	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
Resort Residential (RR-1)	Luxury	2,750	21	11	11	11	11	10						**75**
Resort Residential (RR-2a)	Townhome	2,200	20	10	10	10								**50**
Resort Residential (RR-3a)	Luxury	2,600						2	12	12	12	12		**50**
Resort Residential (RR-4a)	Mid Luxury	1,600				8	12	12	12	1				**45**
Resort Residential (RR-5)	Mid	1,000	26	14	15	15	15	15						**100**
Resort Residential (RR-6)	Mid Luxury	1,700	20	11	11	3								**45**
Resort Residential (RR-4b)	Mid	1,300							15	15	15	15	15	**75**
Resort Residential (RR-3b)	Townhome	1,400					10	10	10	10	10			**50**
Resort Residential (RR-2b)	Condominium	1,300	44	28	28									**100**
Resident Housing (RES-1)	Early Single Family	1,200	26	13	13	13	13	13	13	8				**112**
Resident Housing (RES-2)	Condominium	1,000	18	12	6	6	6							**48**
Total			**175**	**99**	**94**	**66**	**67**	**62**	**62**	**46**	**37**	**37**	**15**	**750**
Hotel (H-2)	Timeshare	1,200							35	35	35	35	35	**175**
Hotel (H-2a)	Condo Hotel	1,100									9	36	30	**75**
Hotel (H-1a)	Timeshare	1,200	30	30	30	30	30	25						**175**
Hotel (H-1b)	Condo Hotel	1,100				34	35	35	35	35	26			**200**
Total Hospitality			**30**	**30**	**30**	**64**	**65**	**60**	**70**	**70**	**70**	**71**	**65**	**625**
Grand Total			**205**	**129**	**124**	**130**	**132**	**122**	**132**	**116**	**107**	**98**	**80**	**1,375**

Resort Residential site RR-4 is planned to be developed along with site RR-3. Runoff from the site is planned to be directed to the Palmer Golf Course.

The exact points of storm water discharge is planned to be determined by the individual hotel, resort residential, and community housing developments. The options available is planned to include discharge to the golf courses as noted above or by sheet flow to the ocean. Ocean discharges is planned to be subject to *BMPs* such as vegetated swales, infiltration, of physical treatment through the use of inlet filters or structural measures.

B. 12. Necessary Approvals

The SEIS lands are contained within the State Urban District. No adjustments to the State Land Use district are anticipated.

The SEIS Lands were zoned for resort development in 1986. At the time this Supplemental EIS is being prepared it has not been determined by the City and County of Honolulu if the Proposed Action will necessitate the processing of a Change of Zoning application to adjust existing zoning boundaries, to accommodate the Proposed Action, or if the changes can be addressed by an administrative Zoning Boundary Adjustment.

If a Change of Zone is determined to be necessary, the process is estimated to take approximately eight months from the date the application is accepted for processing. A Zoning Boundary Adjustment can typically be processed in approximately 45 calendar days. TBR anticipates submitting the appropriate applications once the environmental review process has been completed.

The Resort is operating under an existing Special Management Area Use Permit granted by the Honolulu City Council in 1986 pursuant to Resolution No. 86-308. The Proposed Action may require a minor modification to the existing SMA Use Permit to address the fact that the resort's original master plan is being revised.

Implementation of the Proposed Action will also require a National Pollution Discharge Elimination System (NDPES) permit approval from the State Department of Health for construction disturbing in excess of one acre, and grading and building permits from the City and County of Honolulu's Building Department.

The proposed realignment of Kawela Stream will require a Stream Channel Alteration, a Section 404 permit from the U.S. Army Corps of Engineers, and a Section 401 Water Quality Certification. Additional restoration activities at Punahoʻolapa Marsh will require a 404 permit and 401 certification.

A Joint Development Agreement may be required by the City and County of Honolulu. This approval is typically executed through a Conditional Use Permit.

CHAPTER FOUR:

ALTERNATIVES

For the purposes of master planning, a full range of alternatives to the Proposed Action has been considered. These alternatives are presented below. The merits of each alternative are evaluated utilizing the Resort development objectives presented in Chapter Two of this document to determine which alternatives are reasonable; that is to say, which are best suited to fulfill the development objectives. The anticipated impacts of the resulting Reasonable Alternatives are then compared to the Proposed Action. The alternatives addressed in the SEIS are intended to provide a more robust and comprehensive evaluation than that which was presented in the 1985 EIS.

The 1985 EIS disclosed an expansion plan that was eventually approved to allow a total of 4,000 resort units at Turtle Bay (the existing hotel plus 3,500 additional units, including 2,500 hotel units and 1,000 resort-residential units). The 1985 EIS presented five alternatives to the 3,500-unit expansion plan: No Action; No Further Development; Alternative Site; More Development Than Proposed; and Less Development Than Proposed. Under the 1985 EIS's No Action Alternative, entitlements for the 3,500-unit expansion proposal would not be granted and the owner would have likely sold the fee-simple properties for development allowable under the then-existing zoning designations. The No Further Development Alternative went a step further than the No Action Alternative by contemplating the eventual downzoning of all undeveloped portions of the resort property. The Alternative Site Alternative briefly evaluated the merits of relocating resort development at Turtle Bay to Lāʻie, Makaha or West Beach (now known as Ko ʻOlina). The More Development Alternative was based upon a development plan for the resort that was considered in 1979 that would have allowed a total of 4,700 hotel units (six new hotels), 1,700 resort condominium units, 50 resort-residential units, 425 residential units, and 100,000 square feet of commercial development.

A. Alternate Site Plans and Uses

As discussed above, site planning for the undeveloped portions of the SEIS Lands is constrained by a combination of existing land uses and zoning requirements that surround them. Punahoʻolapa Marsh is a permanent feature that cannot be moved.

The existing Turtle Bay Hotel cannot be physically moved. Notwithstanding the cost, the structure could be demolished and rebuilt elsewhere on the property but this is not considered to be a reasonable or feasible alternative: the hotel structure was renovated in 2001-2, and again more recently, and the structure will likely remain viable for many decades. Eventually, when it is determined that the structure has reached the end of its useful lifecycle, it may undergo another significant rehabilitation and renovation.

Similarly, the combined 368-unit complex (including two resident manager units) of Kuilima Estates East and West cannot be moved, but individual structures will likely be renovated over

time, subject to a 75% approval of the owners' association. Kuilima Estates East and West was formerly a leasehold project, but the Resort owner has sold the lease fee to the various condominium owners and the two developments are now essentially independent of the Resort.

The routing of Marconi Road can be altered at significant cost and impact. However, the routing of Kuilima Drive is relatively fixed because it bisects Kuilima Estates and any shift in its route would require the demolition of existing residential structures. The routing of the East and West Main Drains can be altered at significant cost and impact. The rerouting of the drainage ways and Marconi Road may provide greater flexibility in site planning for the entire property, but it is not likely that they will contribute substantively to the character of the resort.

More developable land can be created by reducing one of the existing 18-hole golf courses to nine holes or by closing one or both of them. However, it is unlikely that both courses would be closed because of the value of golf as a recreational and open-space amenity to the hotel and the Kuilima Estates. Utilizing land made available by closing a golf course to accommodate hotel development further inland from the shoreline is not considered to be a reasonable alternative because it would undermine the success of the resort from a competitive point of view. Proximity to the shoreline is a vital component of a successful hotel property in Hawai'i: it is what visitors desire. If hotels were moved a quarter to a half mile inland, they would struggle to command occupancy and room rates sufficient to cover the costs of resort operations. To achieve higher room rates, the structures would likely have to be built tall enough for visitors to see the ocean over the treetops. However, as the Resort has an overall height limit of 90 feet, only the top stories of an inland hotel would command views of the ocean and horizon, and therefore, the number of 'premium' rooms would constitute only a fraction of the total rooms, rendering this option financially infeasible.

TBR has considered the above constraints in its development of the alternatives presented in the SEIS. The alternatives constitute what TBR believes to be a synthesis of the available permutations for potentially feasible site planning on the property.

Alternative lands uses such as industrial and high density residential are not considered to be reasonable alternatives because they are not allowed under the existing zoning of the property. Industrial land use activities would be incompatible with the character of the property and the surrounding region. As discussed above, the development of the property as a high-density residential area would be contrary to the Oahu General Plan and the Ko'olau Loa Sustainable Communities Plan. Restoration of the property to its former agricultural use or to a preservation use limited to open space are both contrary to the O'ahu General Plan and the Ko'olau Loa Sustainable Communities Plan which, together with the State Land Use Commission, established the property as a visitor destination several decades ago. The visitor industry constitutes O'ahu's primary source of revenue and there appears to be no desire on the part of lawmakers to take actions that would significantly reduce visitor expenditures on O'ahu.

A. 1. Height Alternatives

The allowable height of structures at the Resort was established in the 1980s by the zoning classifications granted for the property and the accompanying Unilateral Agreement. The maximum allowable building height is 90 feet, a limit that cannot be exceeded without a variance granted by the City and County of Honolulu. Building to 90 feet, or seeking a variance to exceed it, is not considered to be appropriate by TBR and has been rejected as a reasonable alternative. Buildings exceeding five or six stories in height are considered by TBR to be inconsistent with the rural character of the property.

A. 2. Alternate Locations

At approximately 840 acres, the size of the Resort exceeds that of Waikīkī and is similar in size to Ko ʻOlina. There is no vacant location zoned for resort development within the State of Hawaiʻi of a comparable size. Thus, the proposed resort expansion cannot be replicated elsewhere unless coastal property zoned for another use were reclassified to accommodate resort development. However, such an action would be contrary to the Oahu General Plan, which limits the location of resort properties to Waikīkī, Ko ʻOlina, Turtle Bay, and a modest sized hotel at Lāʻie, and is, therefore, infeasible and unreasonable. The process of amending the General Plan to allow a new resort destination area on Oʻahu, followed by the process of rezoning the property to a classifications suitable for resort development would likely take well in excess of five years. Several more years would be likely required to secure approvals for and to construct the infrastructure necessary to support a destination resort. When the time needed for construction, based on market absorption, is added to that, the actual implementation of an alternative location could over 20 years or more into the future; a period well beyond the development horizon for Turtle Bay.

A. 3. Alternate Implementation Strategies

As described in Chapter Three, implementation of the Proposed Action is planned to span over an 11-year period, beginning in 2015 and ending in 2025. The phasing schedule is based on the anticipated rate of market demand for the hotel, resort-residential, and community housing units. The actual rate of market absorption may vary in response to market forces that cannot be predicted at this time. Alternative implementation strategies involve either bringing more units to market in a shorter time frame or a longer time frame.

A.3. a. Accelerated Implementation Strategies

The construction of new units in a shorter time frame would result in a reduction of the time period associated with construction impacts. However, if there is no market for constructed units, they will remain vacant; representing added maintenance and upkeep costs for the developer. This alternative is rejected.

A.3. b. Delaying Implementation

Extending implementation of the Proposed Action to a period longer than 11 years will lengthen the construction period and its associated impacts, and for that reason, a longer development period is rejected.

A.3. c. No Action Alternative

Under Hawai'i's environmental assessment law, an environmental assessment for a Proposed Action must be prepared at the "earliest practicable time", pursuant to Chapter 343-5b, Hawaii Revised Statutes. In most cases, compliance with Chapter 343 is triggered by a proposed activity that requires some form of development approval. In these instances, the evaluation of alternatives to the Proposed Action typically includes assessing the impacts of no action (a No Action alternative); meaning what would the impacts upon the environment be if no action were taken. Inclusion of a No Action alternative in an alternatives analysis assists decision-makers in evaluating the extent of a Proposed Action's impacts by providing a baseline against which impacts can be measured.

However, the Resort expansion project is a unique case that may very well be unprecedented. An environmental impact statement was prepared and approved in 1985 for the proposed expansion of the resort to include 3,500 new resort units. The State Land Use Commission, the Honolulu City Council, and the Mayor of Honolulu subsequently granted all land use approvals for the resort expansion and thereby establishing private property values on this basis. These approvals significantly affected the valuation of the property proposed for resort expansion. Land that was previously zoned for agricultural use was subsequently designated for resort development.

As discussed earlier in this document, due mostly to macro-economic conditions involving economic upheaval in domestic and foreign markets, implementation of the approved resort expansion pursuant to the entitlements previously granted was delayed by approximately two decades. But when circumstances eventually changed and the Resort's owners prepared to move forward with the Resort expansion, the Hawaii Supreme Court determined that the 1985 EIS was no longer valid and needed to be supplemented with new information and analyses.

In view of these existing approvals, doing nothing with the entitled land is determined to be unreasonable and infeasible. Doing nothing with the property fails to achieve not only the resort's objectives, but also fails to fulfill the policies of the State of Hawai'i and the City and County of Honolulu as expressed in the land use permits and approvals already granted for the expansion of the Resort. The long awaited new employment opportunities for the region would not be provided and both the State and the City would be deprived of a source of significant new tax revenue. The community would be deprived of new public parks. New affordable housing opportunities would not be provided in a district where they are needed.

The property owners are focused on responsibly achieving a reasonable return on their investment and are not land speculators. Zoning was in place when they invested. The major land use approvals have already been granted for the proposed resort expansion. It is unreasonable for the property owners to forego the sizeable investment they made when they purchased the resort in 2010. The preparation of the SEIS is evidence of their intention. Once the SEIS process has been completed, TBR intends to move forward with the Resort expansion, albeit with a modified plan intended to reduce adverse impacts. For this reason, a No Action alternative is rejected as unreasonable and is excluded from further consideration.

B. Alternate Development Plans

As discussed earlier in the SEIS, the Comprehensive Plan presents TBR's vision for the Turtle Bay Lands that include both the SEIS Lands and the Other Lands. The Proposed Action presented in the SEIS is limited to the SEIS Lands. If any activities or development on the Other Lands trigger the need for an environmental assessment pursuant to Chapter 343 HRS as amended, those assessments will be prepared separately pursuant to the requirements of Chapter 343, if triggered.

The Proposed Action is presented in Chapter Three. Following are description of three development plan alternatives for the SEIS Lands that are determined to be reasonable alternatives. The three alternatives constitute land use plans of varying density. Because the subject property constitutes a mature resort area, it contains several relatively fixed elements: the existing hotel; the Kuilima Estates condominiums; the entrance road, Kuilima Drive; two golf courses (Fazio and Palmer); and the 100-acre Punahoʻolapa marsh. Moreover, the existing entitlements require several additional elements: numerous parks; a spine road extending laterally along the length of the property; an affordable housing component; and a shoreline setback area extending approximately 100 feet inland from the certified shoreline. The presence of these fixed and required elements makes the three alternative land use plans below appear at first glance to be rather similar. However, they are not. They vary widely in the density and distribution of land uses.

B. 1. Full Build Out Alternative

If TBR were to proceed with development of the SEIS Lands maximizing development to the extent allowable under existing land use entitlements and approvals, a total of five new hotels containing a maximum of 2,500 units along with 1,000 new residential units would be allowed. This maximized development scenario is presented here as the Full Build Out Alternative and was the subject of the 1985 EIS where it was presented as the proposed action. Figure 4-1 depicts the Full Build Out Alternative. Table 4-1 summarizes the components of the Full Build Out Alternative.

Under this alternative, development would be set back approximately 100 feet from the certified shoreline, except for Kawela Bay where development over 50 feet in height would be setback a minimum of 300 feet. Building heights would be limited to 90 feet for hotel, commercial, and residential structures with more restrictive height limits in the coastal area. In effect, the coastal area of the SEIS Lands would be comprised of almost continuous hotel development from Kawela Bay to nearly Kahuku Point.

Full build out of the Resort would include a five-acre shopping village situated in close proximity to the existing hotel and a 3.4 acre commercial area at the intersection of the resort's new access road with Kamehameha Highway. Both existing golf courses would be retained and four new parks would be provided; one at each end of the resort, one adjacent to the East Main Drain and one adjacent to the marsh. The existing equestrian center would be relocated to a property adjacent to the intersection of Marconi Road and Kamehameha Highway. Ninety units of affordable housing would be provided adjacent to Marconi Road along the eastern property boundary of the resort.

Table 4-1: Full Build-Out Alternative

Land Use	Area (in acres)	Density (units/acre)	Total Units
Hotel:			
Hotel (H-1)	29.7	19	551
Hotel (H-2)	24.5	16	383
Hotel (H-3)	37.0	14	530
Hotel (H-4)	10.5	59	621
Hotel (H-5)	21.7	19	415
Existing Hotel	*32.8*	*15*	*500*
Subtotal	**156.2**	**19**	**3,000**
Residential:			
Resort Residential (R-1a & b)	33.5	13	420
Resort Residential (R-2)	25.6	10	255
Resort Residential (R-3)	22.0	8	175
Resort Residential (R-4)	6.7	9	60
Resident Housing (RES-1)	5.5	16	90
Subtotal	**93.3**	**11**	**1,000**
Kuilima Estates	*33.1*	*11*	*368*
Commercial:			
Shopping Village	5.0		
Lot 118 (at highway)	3.4		
Beach Club	2.8		
Existing Golf Clubhouse	*1.8*		
New Golf Clubhouse	7.6		
Subtotal	20.6		
Open Space/Recreation:			
Golf Course (G-1)	143.8		
Golf Course (G-2)	189.3		
Punahoolapa Marsh Preserve	*100.0*		
Park (P-1)	4.8		
Park (P-2)	38.0		
Park (P-3) Bird Sanctuary	6.0		
Park (P-4)	2.0		
Equestrian Center	8.8		
Former Kuleana Lot	3.8		
Ag Well (Lot 524)	*2.0*		
Subtotal	**498.5**		
Roadways:			
Kuilima Drive	*4.5*		
Kaihalulu Drive	33.8		
P-1 Access Road	0.4		
Marconi Road Expansion	11.3		
Subtotal	50.0		
Parcel 5-7-003:072	0.2		
TOTAL SITE	**851.9**		

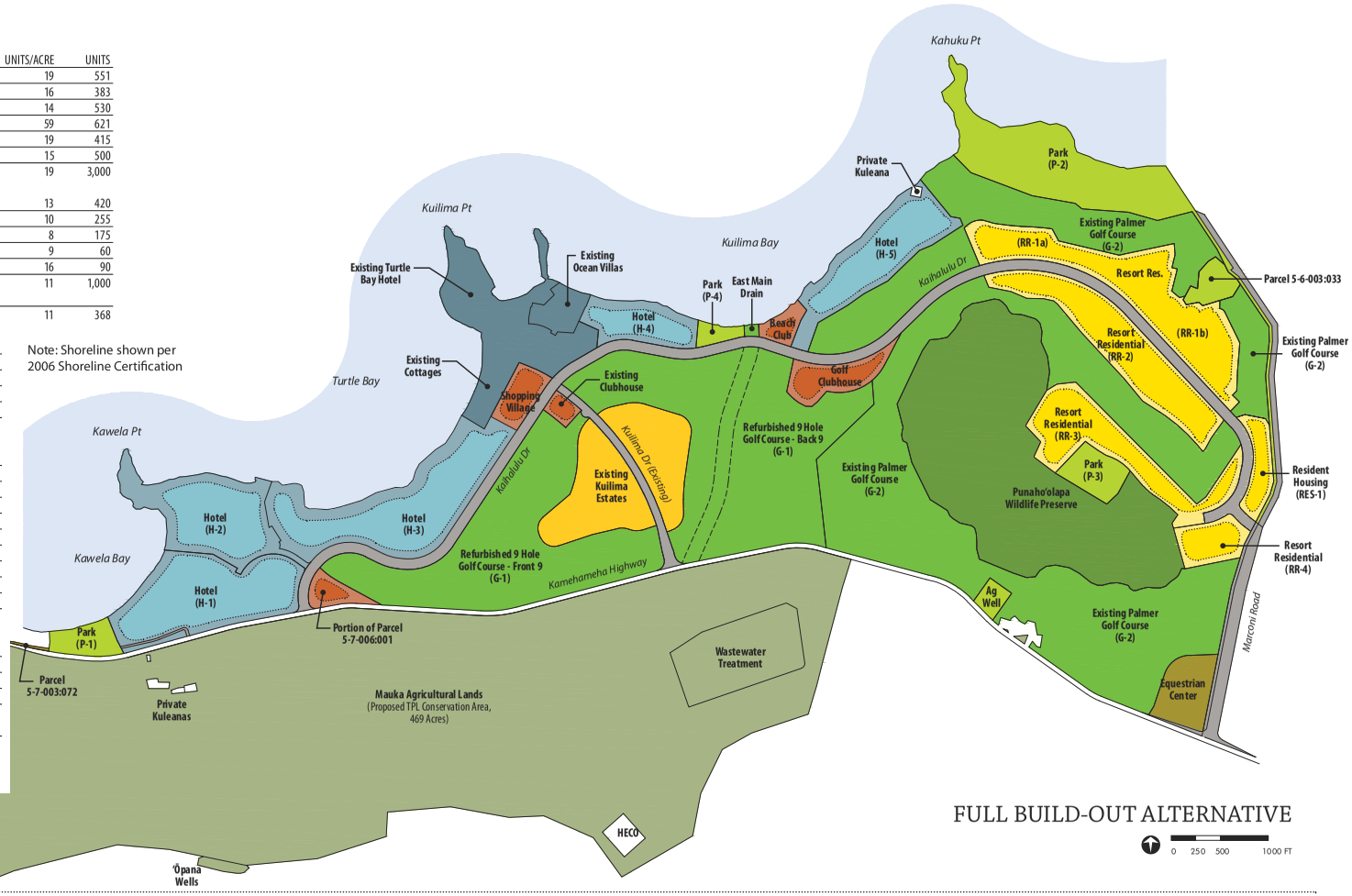
NOTE: *Italics* denote existing land uses.

Figure 4-1: Full Build-Out Alternative

Full Build-Out

AREA	ACRES	UNITS/ACRE	UNITS
Hotel (H-1)	29.7	19	551
Hotel (H-2)	24.5	16	383
Hotel (H-3)	37.0	14	530
Hotel (H-4)	10.5	59	621
Hotel (H-5)	21.7	19	415
Existing Turtle Bay Hotel	32.8	15	500
TOTAL HOTEL	156.2	19	3,000
Resort Residential (RR-1a, 1b)	33.5	13	420
Resort Residential (RR-2)	25.6	10	255
Resort Residential (RR-3)	22.0	8	175
Resort Residential (RR-4)	6.7	9	60
Resident Housing (RES-1)	5.5	16	90
TOTAL RESIDENTIAL	93.3	11	1,000
Existing Kuilima Estates	33.1	11	368
Shopping Village	5.0		
Portion of Parcel 5-7-006:001	3.4		
Beach Club	2.8		
Existing Clubhouse	1.8		
New Clubhouse	7.6		
TOTAL OTHER	20.6		
Golf Course (G-1)	143.8		
Golf Course (G-2)	189.3		
Punahoolapa Wildlife Preserve	100.0		
Park (P-1)	4.8		
Park (P-2)	38.0		
Park (P-3) - Bird Sanctuary	6.0		
Park (P-4)	2.0		
Equestrian Center	8.8		
Parcel 5-6-033:033	3.8		
AG Well (Lot 524)	2.0		
TOTAL OPEN SPACE	498.5		
Kuilima Drive (Existing)	4.5		
P-1 Access Road	0.4		
Marconi Road Expansion	11.3		
Kaihalulu Drive	33.8		
TOTAL ROADWAYS	50.0		
Parcel 5-7-003:072	0.2		
TOTAL SITE	**851.9**		

Note: Shoreline shown per 2006 Shoreline Certification



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Based upon the proprietary market analysis conducted for the resort owners, it is estimated that current and anticipated market conditions would require 39 years for the market to absorb the available new resort and residential units. Assuming construction of a Full Build-Out Alternative was to begin in 2015, it is estimated based on anticipated market absorption rates that the final units would be constructed in 2053.

B. 2. Resort Residential Only Alternative

Based upon ongoing dialogue with community stakeholders, TBR recognizes that a vocally active minority, while offering no constructive alternative, opposes any new hotel development at the Resort. TBR has, therefore, developed this Resort-Residential-Only alternative as a means of exploring the implications of no additional hotels. (i.e. How could the property be used if no additional hotels were built?) TBR has made a substantial investment in the property over time. In order to recoup that investment, the only viable option would be to develop a residential community surrounding the existing hotel throughout the developable resort residential sites. It would be possible to limit such residential development to a scale and density consistent with the rural character of the region and in keeping with the resort character of the property.

It should be noted here that a higher density residential subdivision consisting of lot sizes ranging from 5,000 to 7,500 square feet was rejected from further consideration because it would likely be found to be inconsistent with the population guidelines of Oahu General Plan and the existing Koʻolau Loa Sustainable Communities Plan. A higher density residential alternative is similar to the No Action Alternative presented in the 1985 EIS. It was rejected at that time and it is rejected here.

As a land use, Resort Residential typically constitutes low-density development consisting of one to four single-family luxury homes per acre. House sizes would typically range from 2,500 to over 5,000 square feet in area. Individual homes would be marketed as second homes and vacation residences for several million dollars each. Resort Residential homes might also include a range of concierge services offered by the existing hotel staff including full kitchen staff and maid/butler service. Residential yards and amenities are typically maintained as common-area grounds by resort maintenance staff. Resort Residential homes are often vacant over 50% of the year because they are legally used as short-term transient rentals or vacation units focused on holidays or peak periods.

A conceptual land use plan for the Resort Residential Alternative is presented as Figure 4-2 and a summary of its components is presented below in Table 4-2. Please note that the references in the table to Hotel refer to the hotel parcels identified in the Full Build Out Alternative and represent a means of identifying parcels of land. The Resort Residential Alternative would include the existing hotel but no new hotel development. Rather, resort residential homes would be built on the various hotel parcels.

Under this alternative, development would be set back approximately 100 feet from the certified shoreline, except for Kawela Bay where development over 50 feet in height would be setback

Figure 4-2: Resort Residential Alternative

Resort Residential

AREA	ACRES	UNITS/ACRE	UNITS
Existing Turtle Bay Hotel	32.8	15	500
TOTAL HOTEL	32.8	15	500
Resort Residential (RR-1)	29.7	2	60
Resort Residential (RR-2a, 2b)	24.5	2	50
Resort Residential (RR-3a, 3b)	37.0	4	155
Resort Residential (RR-4a, 4b)	10.5	6	60
Resort Residential(RR-5)	21.7	2	40
Resort Residential (RR-6)	33.5	1	35
Resort Residential (RR-7)	25.6	1	25
Resort Residential (RR-8)	22.0	1	25
Resident Housing (RES-1)	5.5	8	46
Resort Residential (RR-9)	6.7	1	4
TOTAL RESIDENTIAL	216.7	2	500
Existing Kuilima Estates	33.1	11	368
Shopping Village	5.0		
Beach Club	2.8		
Portion of Parcel 5-7-006:001	3.4		
Existing Clubhouse	1.8		
New Clubhouse	7.6		
TOTAL OTHER	20.6		
Golf Course (G-1)	143.8		
Golf Course (G-2)	189.3		
Punahoolapa Wildlife Preserve	100.0		
Park (P-1)	4.8		
Park (P-2)	38.0		
Park (P-3) - Bird Sanctuary	6.0		
Park (P-4)	2.0		
Equestrian Center	8.8		
Parcel 5-6-003:033	3.8		
AG Well (Lot524)	2.0		
TOTAL OPEN SPACE	498.5		
Kuilima Drive (Existing)	4.5		
P-1 Access Road	0.4		
Marconi Road Expansion	11.3		
Kaihalulu Drive	33.8		
TOTAL ROADWAYS	50.0		
Parcel 5-7-003:072	0.2		
TOTAL SITE	**851.9**		

Note: Shoreline shown per 2006 Shoreline Certification

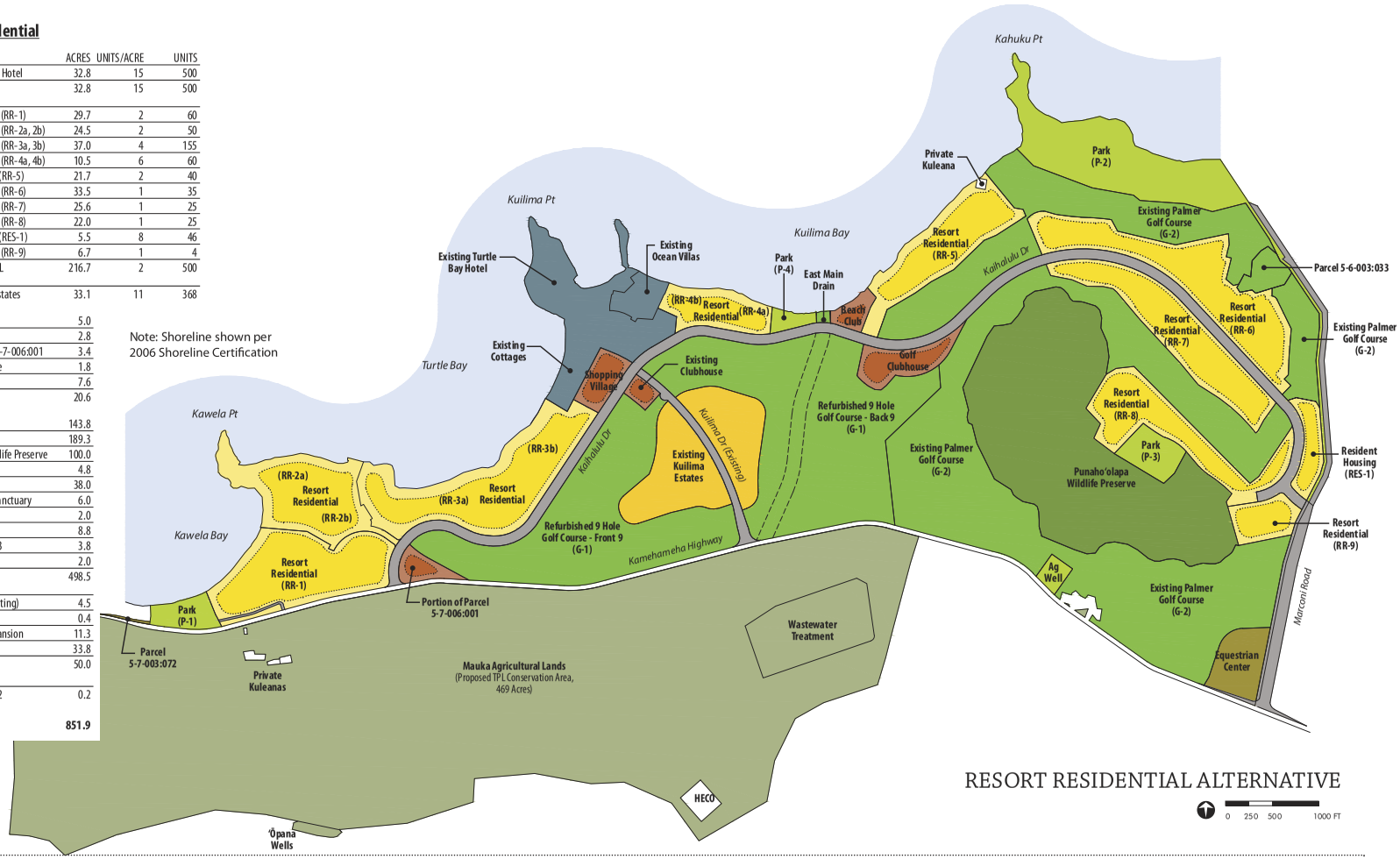

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Table 4-2: Resort Residential Alternative

Land Use	Area (in acres)	Density (units/acre)	Total Units
Existing Hotel	*32.8*	*15*	*500*
Resort Residential:			
Hotel (RR-1)	29.7	2	60
Hotel (RR-2a & b)	24.5	2	50
Hotel (RR-3a & b)	37.0	4	155
Hotel (RR-4a & b)	10.5	6	60
Hotel (RR-5)	21.7	2	40
Resort Residential (RR-6)	33.5	1	35
Resort Residential (RR-7)	25.6	1	25
Resort Residential (RR-8)	22.0	1	25
Resort Residential (RR-9)	6.7	1	4
Resident Housing:			
Resident Housing (RES-1)	5.5	8	46
Subtotal	**216.7**	**2**	**500**
Kuilima Estates	*33.1*	*11*	*368*
Commercial:			
Shopping Village	5.0		
Lot 118 (at highway)	3.4		
Beach Club	2.8		
Existing Golf Clubhouse	*1.8*		
New Golf Clubhouse	7.6		
Subtotal	20.6		
Open Space/Recreation:			
Golf Course (G-1)	143.8		
Golf Course (G-2)	189.3		
Punahoolapa Marsh Preserve	*100.0*		
Park (P-1)	4.8		
Park (P-2)	38.0		
Park (P-3) Bird Sanctuary	6.0		
Park (P-4)	2.0		
Equestrian Center	8.8		
Former Kuleana Lot	3.8		
Ag Well (Lot 524)	*2.0*		
Subtotal	**498.5**		
Roadways:			
Kuilima Drive	*4.5*		
Kaihalulu Drive	33.8		
P-1 Access Road	0.4		
Marconi Road Expansion	11.3		
Subtotal	38.3		
Parcel 5-7-003:072	0.2		
TOTAL SITE	**851.9**		

NOTE: *Italics* denote existing land uses.

a minimum of 300 feet. Building heights throughout the property would be limited to 90 feet as established by the prevailing zoning. However, single-family residential structures seldom exceed 25 feet in height. 46 units of affordable housing would be provided adjacent to Marconi Road along the eastern property boundary of the resort.

Because of the flood zone boundaries established in many coastal areas of the property, the first habitable floor of any residential structure must be built above the identified flood elevation. On the lands fronting Kawela Bay, for example, flood elevations range from 11 to 14 feet above mean sea level. Therefore, the requirement that habitable floor be elevation above flood elevations would likely constrain the development of single family homes in some areas. While it may be possible to elevate an entire single family home, it is not necessarily a practical, aesthetically pleasing, or cost-effective strategy. On the other hand, duplex and multi-family units can be easily elevated because the first floor can be devoted to garage space. Thus, under the Resort Residential Alternative, the distribution of single-family homes will likely be constrained or limited by flood zone designations.

The non-residential components of the Resort Residential Alternative would be similar to those included in the Full Build-Out Alternative.

Based on existing and anticipated market conditions, it is estimated that implementation of the Resort Residential Alternative would span the same time period as the Proposed Action (2015-2025).

B. 3. Conservation Partner Alternative

As has been discussed elsewhere in this document, TBR has been engaged in an extensive community dialogue about the future of the resort. TBR first raised the possibility of excluding the shoreline of Kawela Bay from any resort related development in the Environmental Assessment/Supplemental Environmental Preparation Notice published in August 2011. This alternative was designated the Kawela Conservation Alternative. In response to community feed-back on this alternative, provided to TBR by various members of the Koʻolau Loa North Shore Alliance (KNSA) after publication of the EA/SEISPN, TBR offered to develop a plan that reflected even a greater degree of conservation than that which was presented as the Kawela Conservation alternative.

The Conservation Partner concept presumes that the property owner will receive economic consideration in lieu of the foregone development rights. Accordingly, expanding the level of conservation was initiated under the premise that the amount of economic consideration necessary for the Kawela Conservation Alternative would need to be adjusted accordingly. A revised Kawela Conservation Alternative (Alternative 6A) was presented to KSNA members for discussion purposes only on November 13, 2011. It was intended to attempt to interpret the feed-back described above. Discussions ensued with respect to its appropriateness for consideration and what might it take for it to be supported by the KSNA, if not endorsed. Variables discussed at that time included building height, setbacks, affordable housing, and the number of lockout units.

Based on the foregoing, TBR has developed a Conservation Partner Alternative that attempts to interpret the informal comments discussed on November 13, 2011 and preserve the option for extensive conservation. The key elements of the Conservation Partner Alternative are the elimination of any development west of the proposed alignment of the rerouted Kawela Stream at the West Main Drain, and the elimination of all resort residential development east of the East Main Drain. To accomplish this, the Conservation Partner Alternative would require economic consideration to compensate for the reduced overall density. In other words, to preserve the coastal areas from further development, a third party in the form of a brokered conservation organization, must partner with the resort owners to provide monetary compensation for the loss of potential value that would otherwise result from the development of these properties. At the time of this writing, although the owners' intention has been made known to the KNSA, no third party has yet to step forward to continue this dialogue. In the absence of a conservation partner, the value of the coastal lands over which a conservation easement might be placed has not been determined. Nevertheless, it is an alternative worth evaluating subject to the emergence of an interested partner.

The Conservation Partner Alternative focuses hotel development in the Hanakaʻoe *ahupuaʻa* with one new hotel on either side of the existing hotel and a commercial Gathering Place situated between the west side hotel and the existing hotel. See Figure 4-3. A resort residential development area would define the eastern and western extent of development. Previously proposed resort residential development areas at Kawela Bay and at the eastern end of the resort would be replaced with undeveloped open space areas. The concentration of development within Hanakaʻoe would result in the shortening of the resort's proposed spine road, Kaihalulu Drive, which would be no longer needed to extend the length of the resort and intersect with Marconi Road. Two smaller roads would be constructed to access the Park P-1 at Kawela Bay and the west side resort residential development parcel adjacent to the realigned West Main Drain. A Farmer's Market would be developed at the intersection of Kaihalulu Drive and Kamehameha Highway.

Building heights at the two new hotels would be limited to 60 feet, which would allow four habitable floors above the non-habitable ground floor. No lock-off units would be allowed, meaning that one hotel unit equals one key. Building heights for the resort residential development area RR-1 and RR-2 would be limited to 40 feet (one habitable floor above the non-habitable ground floor). Remaining residential development would be limited to 20 feet in height. Oceanfront setbacks would be increased to 200 feet. The 160 community housing units proposed in the Preferred Alternative would be reduced to a 48-unit development at the intersection of Marconi Road and Kamehameha Highway. Table 4-3 below summarizes the components of the Conservation Partner Alternative.

Based on existing and anticipated market conditions, the Conservation Partner Alternative could be implemented in 9 years (2015-2022).

Figure 4-3: Conservation Partner Alternative

Conservation Partner

AREA	ACRES	UNITS/ACRE	UNITS
Hotel (H-1)	27.6	9	250
Hotel (H-2)	16.3	12	190
Existing Turtle Bay Hotel	31.8	16	500
TOTAL HOTEL	75.7	12	940
Resort Residential (RR-1)	13.1	3	34
Resort Residential (RR-2)	8.4	2	20
Resort Residential (RR-3)	29.1	5	132
Resort Residential (RR-4)	19.4	3	66
Resident Housing (RES-1)	8.8	5	48
TOTAL RESIDENTIAL	78.8	4	300
Existing Kuilima Estates	33.1	11	368
Gathering Place (Piko)	6.6		
Existing Clubhouse	1.1		
New Clubhouse	3.5		
Parking	2.9		
TOTAL OTHER	14.1		
Open Space	192.4		
Landscaped Open Space (G-1)	45.8		
Golf Course (G-2)	203.5		
Punahoolapa Wildlife Preserve	100.0		
Park (P-1)	4.8		
Park (P-2)	38.0		
Park (P-3) - Bird Sanctuary	7.3		
Park (P-4)	9.6		
Equestrian Center	5.9		
Farmers' Market	6.6		
Parcel 5-6-003:033	3.8		
AG Well (Lot 524)	2.0		
TOTAL OPEN SPACE	619.7		
Kuilima Drive (Existing)	4.5		
P-1 Access Road	0.4		
R1/R3 Road	1.6		
Marconi Road Expansion	11.3		
Kaihalulu Drive	12.5		
TOTAL ROADWAYS	30.3		
Parcel 5-7-003:072	0.2		
TOTAL SITE	**851.9**		

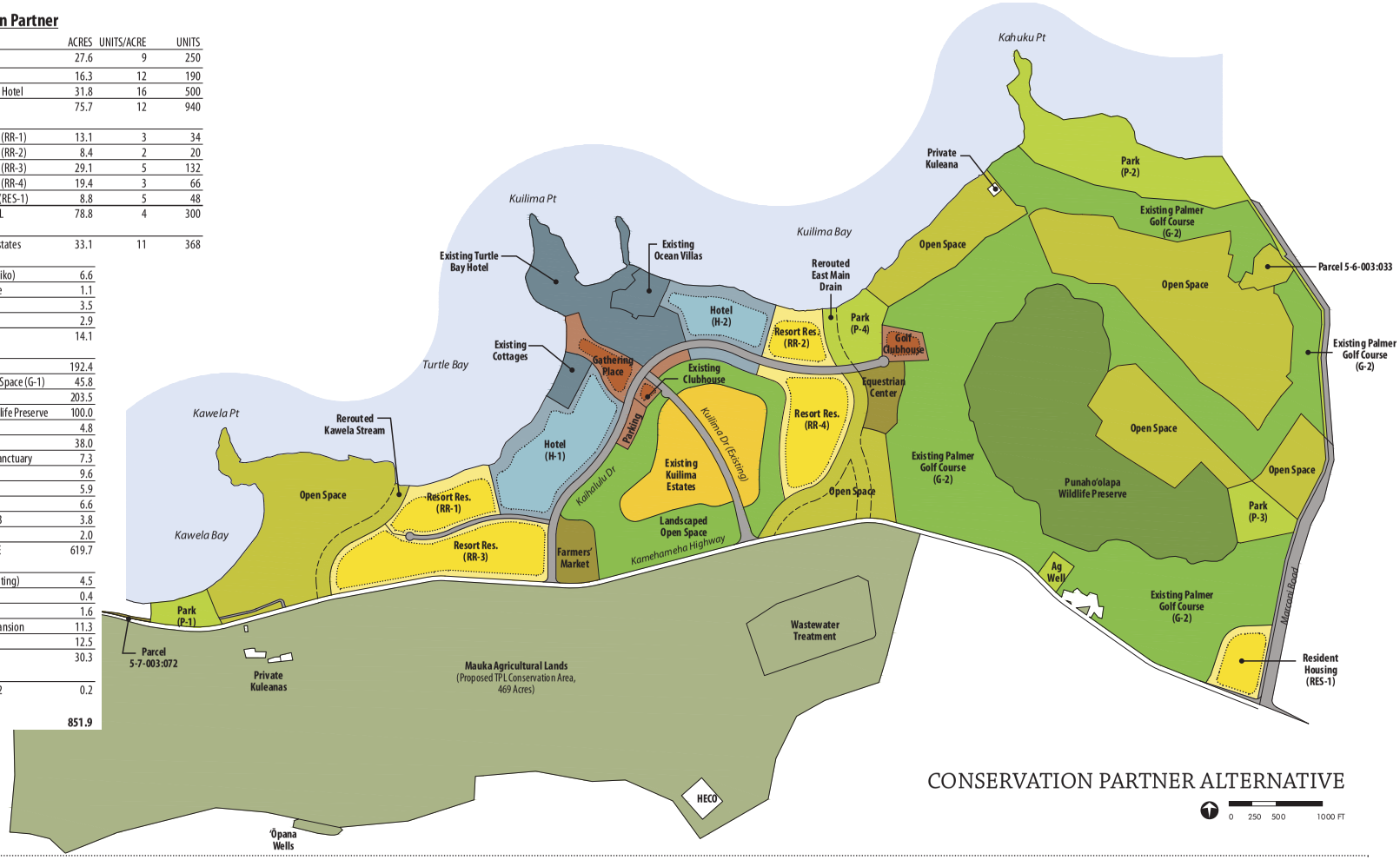

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Table 4-3: Conservation Partner Alternative

Land Use	Area (in acres)	Density (units/acre)	Total Units
Hotel:			
Hotel (H-1)	27.6	9	250
Hotel (H-2)	16.3	12	190
Existing Hotel	*31.8*	*16*	*500*
Subtotal	**75.7**	12	940
Resort Residential:			
Resort Residential (RR-1)	13.1	3	34
Resort Residential (RR-2)	8.4	2	20
Resort Residential (RR-3)	29.1	5	132
Resort Residential (RR-4)	19.4	3	66
Resident Housing:			
Resident Housing (RES-1)	8.8	5	48
Subtotal	**78.8**	**4**	**300**
Kuilima Estates	*33.1*	*11*	*368*
Commercial:			
Gathering Place	6.6		
Existing Golf Clubhouse	*1.1*		
New Golf Clubhouse	3.5		
Parking	2.9		
Subtotal	**14.1**		
Open Space	196.2		
Landscaped Open Space (G-1)	45.8		
Golf Course (G-2)	203.5		
Punahoolapa Marsh Preserve	100.0		
Park (P-1)	4.8		
Park (P-2)	38.0		
Park (P-3) Bird Sanctuary	7.3		
Park (P-4)	9.6		
Equestrian Center	5.9		
Farmers Market	6.6		
Ag Well (Lot 524)	*2.0*		
Subtotal	**619.7**		
Roadways:			
Kuilima Drive	4.5		
RR1/RR3 Road	1.6		
P-1 Access Road	0.4		
Marconi Road Expansion	11.3		
Kaihalulu Drive	10.6		
Subtotal	**30.3**		
Parcel 5-7-003:072	0.2		
TOTAL SITE	**851.9**		

C. Comparative Evaluation of Reasonable Alternatives

An evaluation of alternatives can be based on both quantitative and qualitative assessments. From the perspective of a landowner, the most desirable alternative might be the one that generates the greatest revenue (quantitative). Or, it might be the one that contributes the most to fulfilling the dreams and expectations of the landowner (qualitative). From the perspective of parties that may be opposed to a project, the most desirable alternative might be the one that contributes the most to preserving the status quo, or even reversing it in the instance where the status quo is deemed to be unacceptable (qualitative). Or, it might be the alternative that provides the most of a desirable outcome or the least of an undesirable outcome (quantitative). Obviously, evaluating alternatives from either of these perspectives is quite subjective.

To overcome this challenge, the state agency responsible for overseeing the environmental assessment process, the OEQC, has determined that alternatives should be evaluated with respect to the extent to which they are able to satisfy the objectives guiding the applicant (or land owner's) preferred course of action.

C. 1. Qualitative Comparison

As set forth in Section 11-200-17F, HAR: "The draft EIS shall describe in a separate and distinct section alternatives which could attain the objectives of the action, regardless of cost, in sufficient detail to explain why they were rejected…In each case, the analysis shall be sufficiently detailed to allow the comparative evaluation of the environmental benefits, costs, and risks of the proposed action and ***each reasonable alternative.***"

Following are the objectives presented in Chapter Two.

I. *Manage design, development, construction, and operations sustainably in a manner that embodies the spirit of long-established traditional ahupuaʻa system of planning and proactive resource management*

II. *Integrate the Resort into the fabric and daily activities of the local community.*

III. *Create a balance of economic, social and cultural vitality while maintaining the rural character of the Resort's coastal area by focusing critical development mass within the ahupuaʻa of Hanakaʻoe (around the existing hotel).*

IV. *Operate the Resort as a place that will be equally welcoming to residents from neighboring communities as to visitors from afar.*

V. *Provide enhanced access to the shoreline for residents, visitors and residents from nearby communities, and cultural practitioners including fishermen and gatherers, by the provision of additional parks, shoreline access points and a shoreline trail interconnecting them.*

VI. *Enhance and protect the environment with specific attention to Punahoʻolapa Marsh, Kawela Bay, and the Agricultural Lands.*

VII. *Ensure the long-term preservation of the Agricultural Lands through the implementation of a conservation easement on the Agricultural Lands.*

VIII. *Assist with local housing needs by providing additional housing units affordable to members of the local community beyond what is presently required.*

Using these objectives as the criteria for evaluating the alternatives, Table 4-4 presents an evaluation of the alternatives based upon their individual ability to implement the identified objectives of the Proposed Action.

Table 4-4: Comparitive Evaluation of Alternatives (Qualitative)

Alternative	Ob. I	Ob. II	Ob. III	Ob. IV	Ob. V	Ob. VI	Ob. VII	Ob. VIII	sum
1=actively supports, 0=conforms, -1=inconsistent									
Proposed Action	1	1	1	1	1	1	1	1	**8**
Full Build Out	1	1	-1	1	1	1	-1	-1	**2**
Resort Res Only	-1	-1	-1	0	1	-1	-1	-1	**-5**
Conserv. Partner	1	1	1	1	1	1	1	-1	**6**

Of the three reasonable alternatives considered, the Conservation Partner Alternative scores nearly as high as the Proposed Action, yet, it falls short of fulfilling one of the key objectives of the Proposed Action, specifically in the area of providing housing units affordable to the local community beyond what is required by law. This is largely due to the fact that the reduction in density, beyond that which is proposed in the Proposed Action, renders the development project economically infeasible. As discussed in Section B.3 above, some form of economic consideration to compensate for the loss of density would be required to implement the Conservation Partner Alternative. Given the amount of land designated for conservation the compensation would likely be tens or even hundreds of millions of dollars.

The Full Build-Out Alternative fulfills some of the Proposed Action's objectives except for the distribution of density along the entire shoreline as opposed to concentrating it in the Hanakaʻoe *ahupuaʻa* and the provision of housing that is affordable to the local community in excess of what is required. While this alternative would provide construction employment over a longer period of time, the associated construction impacts would also be extended well beyond the horizon for the Proposed Action. The increased resort population would likely contribute at least twice the traffic impacts as those anticipated for the Proposed Action.

The Resort Residential Only Alternative is the least desirable because it does virtually nothing to increase environmental and cultural sensitivities or provide housing that is affordable to the community beyond what is required by law.

C. 2. Comparison of Environmental Effects

The environmental affects of each of the proposed alternatives are summarized in the following table.

Table 4-5: Comparison of Environmental Effects Among Alternatives

I = Identifiable Impact; SA = Significant Adverse; N = None or Not Significant; SB = Significant Beneficial

Environmental Effect	Proposed Action	Full Build-Out	Resort Residential	Conservation Partner
Topography	N	Same	Same	Less
Soils	I	Same	Same	Less
Vegetation	I	More	Same	Less
Fauna	N	More	Same	Less
Avifauna	SA	Same	Same	Same
Groundwater	I	Same	Same	Same
Drainage	SB	Same	Same	Same
Marine Water Quality	SB	Same	Same	Same
Marine Biota	I	Same	Same	Less
Sea Turtles	I	More	Same	Same
Hawaiian Monk Seals	I	More	Same	Same
Views	I	More	Less	Less
Air Quality	N	More	Less	Same
Traffic	SA	More	Less	Less
Noise	I	More	Less	Less
Archaeological Sites	SA	Same	Same	Less
Cultural Resources	SA	Same	Same	Less
Agricultural Resources	N	Same	Same	Same
Population Growth	I	More	Less	Same
Wastewater	N	More	Less	Same
Solid Waste	I	More	Less	Same
Water Use	N	More	Less	Same

Given the general character of development among the alternatives, when compared to the Proposed Action, the physical area disturbed by the Full Build-Out would be generally greater than the Proposed Action because the density would be higher and the expanded shoreline setbacks proposed in the Proposed Action would not be provided. The physical area impacted by the Resort Residential alternative would be about the same as the Proposed Action, but the physical area impacted by the Conservation Partner Alternative would be less because the foot print of development would be greatly reduced.

In terms of activity on the property, the Full Build-Out Alternative would generate more activity because its daily population would be higher than the Proposed Action. Without hotels, the physical activity associated with the Resort Residential Alternative would be less than the Proposed Action because its daily population would be smaller. The physical activity associated with the Conservation Partner Alternative would be less than the Proposed Action, but greater than the Resort Residential Alternative.

Using a simple scoring system, where Same = 0, More = 1, and Less equals -1, when compared to the Proposed Action, the environmental effects of the alternatives result in a score of +12 for the Full Build-Out Alternative, -8 for the Resort Residential Alternative, and -10 for the Conservation Partner Alternative. Of the three alternatives, the Conservation Partner Alternative would have the least relative environmental effects.

C. 3. Quantitative Comparison

The following discussion is summarized from the socio-economic impact analysis presented in Appendix F. The effects of the Proposed Action and each development alternative are quantified both over the period through 2025, and over the period leading to full occupancy for each alternative. (Full occupancy dates range from 2022 for the Conservation Partner alternative, to 2053 for the Full Build-Out alternative.)

To compare operations and fiscal effects of the Development Alternatives, calculations are shown for development through 2025 – i.e., Full Absorption for the Proposed Action and the Resort Residential Alternative, and shortly after Full Absorption for the Conservation Partner Alternative -- and for the actual year of Full Absorption. Table 4-6 compares the construction schedules for the Proposed Action and the three alternatives to 2025. It shows that while the Full-Build Out alternative will over time involve far more hotel and resort residential units than the Proposed Action, fewer units would be built by 2025.

Table 4-6: Construction Plans, Development Alternatives

	Action and Alternatives			
	Proposed Action	**Full Build-out**	**Resort Residential**	**Conservation Partner**
Through 2025				
Hotel units	625	592	0	440
Residential Units				
Resort Residential	590	468	454	252
Community Residential	160	90	46	48
Build-out year	*2024*	*2052*	*2024*	*2021*

NOTE: When completed, the Full Build-Out Alternative would include 2,500 hotel units, 910 resort residential units, and 90 community residential units. Development schedule estimated by TBR.

C.3. a. Construction Spending, Employment, and Wages

In Table 4-7, construction spending, employment and wages are shown for the entire construction period for each of the development alternatives. The annual average on-site construction workforce provides a point of comparison among the alternatives. While the Full Build-Out Alternative, when finished, involves far more construction than the other alternatives, the Proposed Action brings the highest average annual construction workforce, simply because the larger Full Build-Out project could only be built over a very long time.

Table 4-7: Construction-Related Employment and Wages, Proposed Action and Alternatives

	Proposed Action	Full Build-Out	Resort Residential	Conservation Partner
Construction Spending (million, 2011 $s)				
Infrastructure	$148.5	$215.1	$120.0	$87.8
Buildings	$324.4	$1,138.6	$4.5	$167.3
Single Family	$297.0	$16.2	$304.1	$115.1
Total	$769.9	$1,369.9	$428.5	$370.2
Direct Construction Workforce				
Infrastructure	564	636	456	334
Buildings	1,363	4,782	19	702
Single Family	1,336	73	1,368	518
Total	3,263	5,491	1,843	1,554
On-site Const. workers	2,611	4,393	1,474	1,243
Construction period (yrs.)	11	39	11	8
Average annual on-site FTE	237	113	134	155
Indirect and Induced Jobs	5,482	9,225	3,096	2,611
Wages (million, 2011 $s)				
Direct	$225.3	$379.1	$127.3	$107.3
Indirect and Induced	$247.7	$416.8	$267.2	$118.0
Total	$473.0	$795.9	$394.4	$225.3

NOTE: The values shown are rounded, so totals may differ slightly from the sum of the individual values in the table.
SOURCES: See Tables 4-2, 5-1 in the socio-economic impact analysis.

The next two tables compare the long-term workforces associated with the development alternatives.

Table 4-8: On-Site Employment and Wage Impacts, Proposed Action and Alternatives

	Proposed Action	Full Build-Out	Resort Residential	Conservation Partner
As of 2025				
Operations-Related Workers				
Direct Workers	753	530	48	469
Indirect + Induced Workers	785	559	43	494
Total	1,539	1,089	91	963
Wages (Million 2011 $s)				
Direct Workers	$23.8	$16.8	$1.6	$14.8
Indirect and Induced Workers	$35.5	$25.2	$1.9	$18.5
Total	$59.2	$42.1	$3.5	$33.3
After Full Absorption				
Estimated Absorption	*2025*	*2053*	*2025*	*2022*
Operations-Related Workers				
Direct Workers	753	2,240	48	469
Indirect + Induced Workers	785	2,359	43	494
Total	1,539	4,598	91	963
Wages (Million 2011 $s)				
Direct Workers	$23.8	$71.1	$1.6	$14.8
Indirect and Induced Workers	$35.5	$106.6	$1.9	$18.5
Total	$59.2	$177.6	$3.5	$33.3

NOTE: The values shown are rounded, so totals may differ slightly from the sum of the individual values in the table.
SOURCES: See Tables 4-3, 5-1, socio-economic impact analysis.

Both 2025 and full-occupancy estimates are provided. As of 2025, the Proposed Action would bring the largest operations workforce – but the Full Build-Out would involve far more workers, both on-site and off-, as its visitor numbers and spending grow. The Resort Residential Alternative stands out as generating only modest numbers of new jobs. Moreover, the Resort Residential Alternative would support very few off-site jobs through visitor spending.

Table 4-9: Off-Site Employment and Wage Impacts Associated with Visitor Spending, Proposed Action and Alternatives

	Off-site Employment from Visitor Spending			
	Proposed Action	Full Build-Out	Resort Residential	Conservation Partner
As of 2025				
Visitors Staying in New Units				
Total	2,206	2,202	483	1,477
Adjusted total, spending	1,862	1,793	242	1,376
Spending, Non-lodging				
Per person per day	$104.73	$89.92	$132.24	$119.01
Annual (Million $s)	$71.2	$49.7	$11.7	$59.8
Jobs from Visitor Spending				
Total (Direct and Indirect)	765	534	125	643
minus On-site (DII)	322	261	91	240
Off-site (DI)	443	273	34	402
Regional Share (40%)	177	109	14	161
	-			
Wages, Off-site (Million $s)	$18.4	$11.3	$1.4	$16.7
Regional Share (40%)	$7.4	$4.5	$0.6	$6.7
After Full Absorption	***2025***	***2053***	***2025***	***2022***
Visitors Staying in New Units				
Total	2,206	5,968	483	1,477
Adjusted total, spending	1,862	5,669	242	1,376
Spending, Non-lodging				
Per person per day	$104.73	$89.92	$132.24	$119.01
Annual (Million $s)	$71.2	$189.3	$11.7	$59.8
Jobs from Visitor Spending				
Total (Direct and Indirect)	765	2,035	125	643
minus On-site (DII)	322	1,103	91	240
Off-site (DI)	443	933	34	402
Regional Share (40%)	177	373	14	161
Wages, Off-site (Million $s)	$18.4	$38.7	$1.4	$16.7
Regional Share (40%)	$7.4	$15.5	$0.6	$6.7

Notes: See Table 4-4 in the socio-economic impact analysis for methodology. Non-lodging visitor spending estimated for the Proposed Action and alternatives as follows:

	Prop. Action	Full Build	Res. Res.	Consv. Part.
Relation to average spending	99%	85%	125%	113%
Per-Person per day, non-lodging Spending	$104.73	$89.92	$132.24	$119.01

Please note: The regional share estimate was developed by Belt Collins Hawaii LLC on the basis of visitor spending patterns. The values shown are rounded, so totals may differ slightly from the sum of the individual values in the table.

Table 4-10: New On-Site Population, Proposed Action and Alternatives

	Existing Resort (No Action Alt.)	New Daytime Population with			
		Proposed Action	Full Build-out	Resort Residential	Conservation Partner
As of 2025					
Hotel , Ocean Villa guests	638	1,139	1,291	-	957
Resort Residential (including Kuilima Estates)					
FT Residents	167	41	52	43	24
PT residents, visitors	146	516	334	362	151
Community Residential		479	269	138	144
Day Visitors	96	180	190	161	173
Operations workforce	439	561	530	34	350
Construction workforce	-	-	127	-	-
Subtotal	1,485	2,916	2,795	737	1,798
Total at Resort (Combined)	1,485	4,401	4,280	2,223	3,284
Existing share of Combined Total	100%	34%	35%	67%	45%
After Absorption					
Year		*2025*	*2053*	*2025*	*2022*
Hotel , Ocean Villa guests	638	1,139	5,370	-	957
Resort Residential					
FT Residents	167	41	94	43	24
PT residents, visitors	146	516	599	362	151
Community Residential		479	269	138	144
Day Visitors	96	180	323	161	173
Operations workforce	439	561	2,240	34	350
Construction workforce	-	-	-	-	-
Subtotal	1,485	2,916	8,894	737	1,798
Total at Resort (Combined)	1,485	4,401	10,380	2,223	3,284
Existing share of Combined Total	100%	34%	14%	67%	45%

NOTES: Weekday state holiday midday population estimated. Only construction workers involved in new construction (rather than renovations) are included. The values shown are rounded, so totals may differ slightly from the sum of the individual values in the table.
SOURCES: See Table 4-6, socio-economic impact analysis.

C.3. b. Population

By 2025, the development alternatives would result in quite distinct on-site populations. At that time, the Full Build-Out Alternative would support a population much like that of the Proposed Action: the difference between the two emerges as Full Build-Out construction continues until 2052, as shown in Table 4-10. The Resort Residential Alternative would bring the smallest new

population. With this alternative, the existing resort's population would account for two-thirds of the people on-site. Finally, the Conservation Partner Alternative would bring a smaller on-site population than the Proposed Action. However, that alternative concentrates the population in the central section of the property, so the density would be similar in that area.

Table 4-11 applies to the development alternatives the assumptions developed to estimate the regional population for the Proposed Action. Again, the Resort Residential Alternative stands out as generating smaller visitor and employee populations.

The Full Build-Out Alternative regional population would continue to grow with further development until after 2050. While the regional population associated with that alternative after build-out can be calculated, its share of the regional population cannot, since no regional projections extend so far into the future.

Table 4-11: Regional Population Associated with Proposed Action and Development Alternatives, 2025

	Action and Alternatives			
all figures are persons, year 2025	**Proposed Action**	**Full Build-out**	**Resort Residential**	**Conservation Partner**
Resident Population Groups (Islandwide)				
A. TBR Resort Recreation Residents	55	70	43	24
B. TBR Community Housing Residents	638	359	138	144
C. Direct Operations Workforce Households	1,613	1,135	102	1,004
Indirect and Induced Operations				
D. Workforce Households (islandwide)	896	1,196	92	1,058
E. Off-Site Workforce Households	505	584	74	862
Total (assuming unduplicated counts)	3,707	3,344	448	3,090
Potential New Regional Resident Population				
A. 100% of group	55	70	43	24
B. 30% of group	192	108	41	43
C. 20% of group	323	227	20	201
D. 20% of group	179	239	18	212
E. 40% of group	202	234	30	345
Total	951	877	152	824
Share of Projected Regional Pop. Increase	36.7%	33.9%	5.9%	31.8%
Regional New De Facto Population Change				
Regional Resident Population	951	877	152	824
New TBR Visitor and Part-time Population	2,206	2,202	483	1,477
Total	3,157	3,079	635	2,301

NOTES: The values shown are rounded, so totals may differ slightly from the sum of the individual values in the table. On completion (as of 2053), the Full Build-Out Alternative would involve a Potential New Regional Resident Population of 3,000. The Regional De Facto Population Change associated with that alternative would climb to 8,968.
SOURCES: See Tables 4-7, 5-4, socio-economic impact analysis

C.3. c. Fiscal Effects

Tables 4-12 through 4-14 estimate government revenues due to construction, sales and operations, and property values with development. They show significant revenue flows for both the State of Hawai'i and the City and County of Honolulu with development.

The average cost analysis used to analyze the Proposed Action can be applied for all the development alternatives. Table 4-15 shows the net revenue (i.e., amount of revenues in excess of costs). The ratio of revenues to costs by 2025 is positive for all development alternatives. As of that point, the net revenues for the City and County of Honolulu are largest with the Proposed Action. Over time, the additional development in the Full Build-Out Alternative would make the return from that alternative the highest for both levels of government.

Table 4-12: Government Revenues Associated with Construction, Proposed Action and Alternatives

	Cumulative, through Build-out			
All figures are Millions of 2011 $s	**Proposed Action**	**Full Build-out**	**Resort Residential**	**Conservation Partner**
Construction cost (1)	$769.9	$1,369.9	$428.5	$370.2
Construction-related Wages (2)	$473.0	$795.9	$394.4	$225.3
Excise Taxes To State (3)				
On Construction	$31.2	$53.5	$17.4	$15.0
On Spending by Workforce (4)	$12.0	$20.2	$10.0	$5.7
Excise Taxes to City and County				
On Construction	$3.5	$5.9	$1.9	$1.7
On Spending by Workforce (4)	$1.3	$2.2	$1.1	$0.6
Income Taxes				
Corporate (5)	$1.3	$2.2	$0.7	$0.6
Personal (6)	$28.8	$48.5	$24.0	$13.7
Total Revenues from Construction Spending				
State of Hawaii	$73.3	$124.5	$52.1	$35.1
City and County of Honolulu	$4.8	$8.2	$3.0	$2.3

NOTE: The values shown are rounded, so totals may differ slightly from the sum of the individual values in the table.
SOURCES: See Table 4-8, socio-economic impact analysis.

Table 4-13: Government Revenues Associated with Visitor Spending, Proposed Action and Alternatives

All figures are Millions of 2011 $s	Proposed Action	Cumulative Full Build-out	Resort Residential	Conservation Partner
Through 2025				
Conveyance Taxes	$5.1	$2.4	$9.7	$1.9
Taxes on Visitor Accommodations				
Transient Accommodations Tax (Hotel Condominiums and Visitors in Resort Residential Units)	$32.9	$18.1	$23.2	$26.3
Transient Occupancy Tax (Time Shares)	$16.3	$3.7	$0.0	$6.6
Taxes on Cash Flows from Visitor Spending				
Excise Taxes				
On Lodging (Visitors only)	$16.0	$8.8	$11.3	$12.8
On Other Visitor Spending	$17.7	$11.6	$6.0	$21.5
On On- and Off-Site Workers' Spending	$11.7	$7.3	$1.6	$11.9
Excise Tax Total	$45.5	$27.7	$19.0	$46.2
State of Hawai'i Share	*$40.9*	*$25.0*	*$17.1*	*$41.6*
City and County of Honolulu Share	*$4.5*	*$2.8*	*$1.9*	*$4.6*
Income Taxes				
On- and Off-Site Workers	$25.3	$15.9	$3.5	$41.8
State of Hawai'i Total	$120.6	$65.0	$56.1	$164.6
City and County of Honolulu Total	$4.5	$2.8	$1.1	$7.5
Through Full Absorption *Year:*	***2025***	***2053***	***2025***	***2022***
Conveyance Taxes	$5.1	$7.1	$9.7	$1.9
Taxes on Visitor Accommodations				
Transient Accommodations Tax (Hotel Condominiums and Visitors in Resort Residential Units)	$32.9	$193.3	$13.2	$17.3
Transient Occupancy Tax (Time Shares)	$16.3	$41.6	$0.0	$3.9
Taxes on Cash Flows from Visitor Spending				
Excise Taxes				
On Lodging (Visitors only)	$16.0	$94.0	$6.4	$8.4
On Other Visitor Spending	$17.7	$173.0	$3.4	$13.5
On On- and Off-Site Workers' Spending	$11.7	$121.8	$0.9	$7.4
Excise Tax Total	$45.5	$388.8	$10.7	$29.3
State of Hawai'i Share	*$40.9*	*$349.9*	*$9.7*	*$26.4*
City and County of Honolulu Share	*$4.5*	*$38.9*	*$1.1*	*$2.9*
Income Taxes				
On- and Off-Site Workers	$25.3	$263.2	$2.0	$16.1
State of Hawai'i Total	$120.6	$855.1	$34.5	$65.5
City and County of Honolulu Total	$4.5	$38.9	$1.1	$2.9

Notes: All taxes estimated from current rates (excise at 4.5%; TAT at 9.25%; TOT at 7.25% of half o maintenance fee for period of occupancy; conveyance taxes at escalating rates depending on cost and whether buyer is a Hawai`i resident) and historic ratios between earnings or revenues and taxes. Excise tax on workers' income estimated for taxable disposal income. Property sales values and maintenance fees estimated by Belt Collins Hawaii LLC are based on information from TBR and review of comparable projects. The values shown are rounded, so totals may differ slightly from the sum of the individual values in the table.
SOURCES: See Table 4-9, socio-economic impact analysis.

Table 4-14: Increased Property Tax Revenues for the City and County of Honolulu, Proposed Action and Alternatives

All $ figures are Millions of 2011 $s	Proposed Action	Cumulative Full Build-out	Cumulative Resort Residential	Cumulative Conservation Partner
Through 2025				
Land Redeveloped (acres)				
Cumulative	221	74	217	123
Value of Redevelopment (Mill $s)				
Residential Construction	$441.0	$146.8	$304.1	$115.1
Residential Land	$586.8	$136.7	$918.7	$281.5
Hotel Construction	$175.9	207.2		$162.8
Hotel/Resort Land	$202.7	$125.7	$0.0	$198.7
Cumulative Property Taxes				
Residential	$26.0	$7.6	$31.3	$12.7
Hotel, Resort	$24.3	$20.3	$0.0	$35.4
Total Collections	$50.3	$27.9	$31.3	$48.1
Through Full Absorption *Year:*	***2025***	***2053***	***2025***	***2023***
Land Redeveloped (acres)				
Cumulative	221	217	217	123
Value of Redevelopment (Mill $s)				
Residential Construction	$441.0	$291.5	$304.1	$115.1
Residential Land	$586.8	$291.0	$918.7	$281.5
Hotel Construction	$175.9	$863.3		162.75
Hotel/Resort Land	$202.7	$547.5	$0.0	$198.7
Cumulative Property Taxes				
Residential	$26.0	$51.4	$31.3	$8.5
Hotel, Resort	$24.3	$359.9	$0.0	$22.0
Total Collections	$50.3	$411.3	$31.3	$30.5

NOTES: Land development totals take into account new hotel and residential parcels. Commercial development, changes from golf course use to open space, and increased commercial land values are not considered. The values shown are rounded, so totals may differ slightly from the sum of the individual values in the table.
SOURCES: See Table 4-10, socio-economic impact analysis.

Table 4-15: Revenue-Cost Summary, Proposed Action and Alternatives, through 2025

All $ figures are Millions of 2011 $s		Cumulative			
		Proposed Action	Full Build-out	Resort Residential	Conservation Partner
Through 2025					
State of Hawai'i					
Revenues (Mill. $s)		$193.9	$108.3	$108.2	$199.6
Average cost, Visitors	$2,171				
Cumulative Census, Visitor-years at Resort		12,729	13,517	3,989	6,664
Visitor-Related Costs (Mill. $s)		$27.6	$29.3	$8.7	$14.5
Average cost, Residents	$6,830				
Full-time Resort Residents at Resort		416	557	372	210
Resident-Related Costs (Mill. $s)		$2.8	$3.8	$2.5	$1.4
Total Costs		$30.5	$33.1	$11.2	$15.9
Net Revenues > Costs		$163.4	$75.1	$97.0	$183.7
Revenue/Cost Ratio		6.4	3.3	9.7	12.6
City and County of Honolulu					
Revenues (Mill. $s)		$59.7	$69.6	$35.4	$35.7
Average cost, Visitors	$1,060				
Cumulative Census, Visitor-years at Resort		12,729	13,517	9,352	6,664
Visitor-Related Costs (Mill. $s)		$13.5	$14.3	$9.9	$7.1
Average cost, Residents	$1,485				
Full-time Resort Residents at Resort		416	557	372	210
Resident-Related Costs (Mill. $s)		$0.6	$0.8	$0.6	$0.3
Total Costs		$14.1	$15.2	$10.5	$7.4
Net Revenues > Costs		$45.6	$54.4	$24.9	$28.3
Revenue/Cost Ratio		4.2	4.6	3.4	4.8

NOTE: See Tables 4-12 and 4-13, socio-economic impact analysis, for average cost analyses. Revenue calculations bring together information from Tables 5-7 through 5-9, socio-economic impact analysis. The values shown are rounded, so totals may differ slightly from the sum of the individual values in the table.

C.3. d. Housing

Housing impacts differ among the alternatives because they involve fewer Community Housing units than the Proposed Action, and because the alternatives vary in the number of workers (and hence workers' households) they support in the region. Both the Proposed Action and the Resort Residential Alternative involve a larger increase in housing supply than in demand. The Full Build-Out Alternative might generate more demand than housing for residents. The Conservation Partner Alternative would clearly involve more demand for resident housing than the supply of Community Housing provided.

When construction of the Full Build-Out Alternative is complete around 2053, demand for housing from operations-related workforce households is estimated as 234 to 469 additional units, resulting in a net excess of demand over the supply provided by the resort expansion of 144 to 379 housing units in the KNS region.

C.3. e. Public Safety

Following the ratios and projections used in the socio-economic impact analysis, new public safety services demand associated with the Full Build-Out Alternative could come to about 4.8 police patrol positions and 3.3 fire control positions by 2025; the total public service demand would climb to 14.0 police positions and 9.6 fire positions at completion.

The eventual new population with the Full Build-Out might well justify acquisition of new equipment such as an additional fire truck. It might justify construction of additional space for public safety operations, if perhaps not a new facility.

The Proposed Action and the other development alternatives could justify modest increases in public safety personnel and equipment, but not new facility construction. The Resort Residential Alternative could, based on current staffing ratios, justify 1.0 additional police patrol positions and 0.7 fire control positions. The Conservation Partner Alternative could justify an additional 3.6 police positions and 2.5 fire positions.

The cost of new fire control and police services has already been estimated through the average cost analysis (in Table 4-14 above).

As noted for the Proposed Action, redevelopment of the resort would bring increased patrols by resort security. New roadways, park facilities and landscaping would remove large areas of brush from the SEIS Lands. New construction would be to current fire codes, reducing the risk of fire and increasing access to the entire resort. All of these factors would tend to reduce the effects of development on public safety services.

C.3. f. Education

The high estimate of potential new school enrollment associated with the other development alternatives is lower than with the Proposed Action, because the Proposed Action includes a larger commitment to Community Housing. Table 3-16 shows that the development alternatives would generate less demand for spaces in the public schools than the Proposed Action as of 2025.

For the Full Build-Out Alternative, construction and increases in operations jobs would continue until about 2053. By that time, total potential regional project-related new school enrollment would be in the range from 98 to 210 students. That range is much larger than those in Table 4-16. Based on the high estimate, project-related enrollments could reach up to 4.4% of the 2011 total regional DOE enrollment. If that enrollment increase occurred on a regional level within a year or two, the DOE might need to take steps to assure that all students can be housed and taught effectively. However, the increase projected here would occur over forty years. In that time, other changes in standards, practices, and demography would intervene, so it is simply not clear whether the eventual project-related growth with the Full Build-Out Alternative (i.e., the growth anticipated under existing permits) would present a small challenge to the regional DOE schools or a large one.

Table 4-16: Potential New Public School Enrollment, Proposed Action and Development Alternatives, to 2025

	Action and Alternatives			
	Proposed Action	**Full Build-out**	**Resort Residential**	**Conservation Partner**
New Community Housing	160	90	46	48
New Households Formed by Workers				
Low Estimate	83	57	6	57
High Estimate	167	115	11	113
Potential New K-12 Enrollment				
Low Estimate	49	32	7	27
High Estimate	123	77	21	61

NOTES: See Table 4-15, socio-economic impact analysis, for multipliers used to estimate school impacts, and Table 5-11 for housing estimates. See text of the socio-economic impact analysis for discussion of potential enrollment after completion of the Full Build-Out Alternative.

Based on current enrollment levels, demand for new preschool places in the region would be modest by 2025 (See Table 4-17). By full absorption of the Full Build-Out Alternative, regional demand could climb to about 16 to 34 places.

With more resort employment and renewed state support, enrollments could climb. As noted earlier, these calculations are based on current demand for preschools in the KNS region, and could underestimate demand in more prosperous conditions.

C.3. g. Health

The new population associated with the Full Build-Out Alternative by 2025 could create demand for as many as 8.3 acute care beds and 0.9 Emergency Medical staff positions. The demand for medical services and facilities would be smaller with the Resort Residential Alternative or the Conservation Partner Alternative than with the Proposed Action. After construction of the Full Build-Out Alternative finishes by 2053, demand for health care services for the new population at the resort could climb to 24.2 beds and 2.7 Emergency Medical staff positions.

Table 4-17: Potential New Preschool Enrollment, Proposed Action and Development Alternatives, to 2025

	Action and Alternatives			
	Proposed Action	**Full Build-out**	**Resort Residential**	**Conservation Partner**
New Community Housing	160	90	46	48
New Households Formed by Workers				
Low Estimate	83	57	6	57
High Estimate	167	115	11	113
Potential New Preschool Enrollment				
Low Estimate	8	5	1	4
High Estimate	20	13	4	10

NOTES: See Table 4-16, socio-economic impact analysis, for multipliers used to estimate preschool impacts, and Table 5-11 for housing estimates. See text of socio-economic impact analysis for discussion of potential enrollment after completion of the Full Build-Out Alternative.

The eventual demand associated with the Full Build-Out would be large in a region with limited health care facilities. It could make expansion of local health care facilities necessary. However, that demand would be realized over a period of many decades, so the impact of that demand cannot be clearly assessed at this time.

C.3. h. Recreation

Under the Full Build-Out Alternative, much the same recreation facilities would exist as with the Proposed Action. Resort visitor demand for golf tee times would be even greater. The potential effects on other courses noted for the Proposed Action would also arise, and would probably be even greater.

In order to reposition the resort as an exclusive, upscale site for the Resort Residential Alternative or the Conservation Partner Alternative, the golf course operator could limit rounds on one course or both, and could offer preferential access to residents of the new resort homes. Consequently, access by hotel guests, nearby residents and golf tours would be limited and could become more expensive.

Since the Conservation Partner Alternative reduces golf at Turtle Bay to the Palmer Course alone, golf access would be even more limited than under the other alternative scenarios.

The Full Build-Out and Resort Residential Alternatives both include a beach club on Kuilima Bay. This would provide a separate venue for resort residents to enjoy beach and ocean activities. With the beach club serving part-time residents, the higher onsite population of the Full Build-Out Alternative might help reduce resource conflicts among residents, resort residents and visitors.

The Conservation Partner Alternative could increase access to Kawela Bay and would likely increase public knowledge of the area, while minimizing adjacent development. The resort and the Partner agency would need to anticipate a major increase in usage of the bay and its park.

As with the Proposed Action, the new park development under the various Development Alternatives could help visitors to spread out along the North Shore. However, the Full Build-Out Alternative includes a much larger on-site visitor population. In this case, the beneficial effect of park development for the region could be offset by the increased visitor numbers.

C.3. i. Potable Water Use

The following table presents a summary of the water demand generated by the Proposed Action and the Alternatives.

Table 4-18: Comparison of Potable Water Use

Activity	Estimated Water Demand (gpd)	Percent Increase over Existing Use
Existing Resort	345,000	
Proposed Action*	1,201,100	+248%
Full Build-Out Alternative*	1,787,200	+418%
Resort Residential Alternative*	690,500	+100%
Conservation Partner Alternative*	756,400	+119%

*Includes existing uses

Of the three alternatives, Resort Residential would require the least amount of additional drinkable water (about twice as much as the resort presently uses). The Proposed Action would require approximately four times as much water, while the Full Build-Out Alternative would require five times the amount presently utilized at the resort. The Proposed Action and the Conservation Partner Alternative fall within that range, with the former on the high side and the latter on low side.

C.3. j. Wastewater Demand

Table 4-19 compares wastewater demand among the Proposed Action and alternatives.

Table 4-19: Comparison of Wastewater Generation

Activity	Estimated Wastewater Generation (gpd)	Percent Increase over Existing Use
Existing Resort	301,000	
Proposed Action*	598,406	+98%
Full Build-Out Alternative*	885,766	+194%
Resort Residential Alternative*	395,210	+31%
Conservation Partner Alternative*	405,366	+35%

*Includes existing uses

The Full Build-Out Alternative would nearly double the volume of wastewater compared to the Proposed Action, and triple the volume generated by the existing facilities. Both the Resort Residential Alternative and Conservation Partner Alternative would increase wastewater generation by about a third over existing demand. However, as discussed in Chapter Three, the existing wastewater treatment plant has sufficient capacity for wastewater generated by the Proposed Action or any of the alternatives.

C.3. k. Summary

Table 4-20 presents a comparative summary of the Proposed Action and the Alternatives. All information is projected from 2014 through the year 2025, unless otherwise stated.

Table 4-20: Comparitive Quantitative Summary of Proposed Action and Alternatives

	Proposed Action	Full Build-Out Alternative	Resort Residential Alternative	Conservation Partner Alternative
Total Construction Spending	$770 million	$1,370 million	$429 million	$370 million
Total Direct Construction Workforce	3,263	5,491	1,843	1,554
Total Indirect/Induced Jobs	5,482	9,225	3,096	2,611
On-Site Jobs at Build Out	1,539	4,598	91	963
Total Daytime Population	4,401	10,380	2,223	3,284
Total Statewide Tax Related Construction Revenue	$73 million	$125 million	$52 million	$35 million
Total County Tax Related Construction Revenue	$5 million	$8 million	$3 million	$2 million
Total Statewide Visitor Spending	$121 million	$855 million	$35 million	$66 million
Total County Visitor Spending	$5 million	$39 million	$1 million	$3 million
Total Real Property Tax Revenue	$50 million	$411 million	$31 million	$31 million
New Community Housing	160 units	90 units	46 units	48 units
Total Potable Water Use	1.2 mgd	1.78 mgd	691,000 gpd	756 gpd
Total Wastewater Generated	598,000 gpd	886,000 gpd	395,000 gpd	405,000 gpd

CHAPTER FIVE:

PROBABLE IMPACTS OF THE PROPOSED ACTION

A. Impacts to the Natural Environment

Following is a discussion of the Proposed Action's anticipated impacts on the SEIS Lands, the near shore area, and the surrounding region to the extent required by law. The Proposed Action constitutes the activities to be undertaken by TBR, its successors, and assignees to implement the Comprehensive Plan as it relates to the SEIS Lands. Specific measures that may be needed to mitigate significant adverse impacts are identified wherever appropriate. Where appropriate, the impacts of the Proposed Action are compared to the impacts associated with the three alternatives considered in the SEIS.

A. 1. Topography

A.1. a. Impacts

Implementation of the Proposed Action will not result in any significant adverse impact to the existing topography of the SEIS Lands. The proposed development will be situated, at the minimum, from 150 to 300 feet inland of the certified shoreline, well inland of the existing dune system that abuts the shoreline. Inland of the dune system, the land is relatively flat with very little variation in grade. A combination of filling and/or elevating of structures in the flood hazard district will be required for the Proposed Action dwelling structures in accordance with regulatory requirements, as well as for the Full Build-Out alternative and the Resort Residential alternative, if implemented. No filling or elevating of structures in the flood hazard district is anticipated for the Conservation Partner alternative.

Some berm construction may be required for purposes of sound attenuation in very limited locations (see discussion in Section B2 below).

A.1. b. Recommended Mitigation Measures

The alteration to the topography will follow regulatory requirements and the fill materials will be contoured and landscaped to provide the appearance of natural landforms. Mitigation for fill placement is discussed under Soils below.

A. 2. Soils

A.2. a. Impacts

Clearing, grading, and grubbing activities during construction will disturb the soil retention values of the existing vegetation. Soil erosion can occur if graded and grubbed areas are exposed to flooding or strong winds. The movement of heavy construction equipment over exposed areas can also lead to soil erosion in the form of fugitive dust. Soil erosion caused by flooding can negatively impact near shore areas through the introduction of silt, increased turbidity, and soil-borne nutrients.

A.2. b. Recommended Mitigation Measures

To ensure that the navigable waters of the United States, including streams and coastal areas, are not impacted by soil erosion, all project-related construction activities will comply with the City and County of Honolulu's rules and regulations for the control of grading, grubbing, stockpiling, soil erosion, and sedimentation, including the Rules Relating to Soil Erosion Standards (April 1999); and the applicable provisions of the State Department of Health's Water Quality Standards (Chapter 11-54, HAR), and Water Pollution Control requirements (Chapter 11-55, HAR). An application for a National Pollutant Discharge Elimination System (NPDES) permit will be submitted to the DOH for review and approval prior to construction. Grading, excavation, and erosion control plans will be prepared and submitted to the City's Department of Planning and Permitting for review and approval. Best Management Practices (BMPs) will be employed, as specified in approved grading, excavation, erosion control, and construction plans. BMPs may include limiting site grading, the phasing of construction activities, use of temporary berms, use of silt fencing and screens, thorough watering of graded areas during non-active construction periods, and the utilization of temporary water sprinkling in active construction zones.

A. 3. Terrestrial Vegetation

A.3. a. Impacts

Some existing vegetation will be removed in targeted development areas. The overall site coverage of vegetation within the SEIS Lands will be reduced proportionate to the extent of new development footprints. This is not considered to be a significant adverse impact because the proposed development areas do not impact sensitive plant species, account for less than 35% of the total land area makai of Kamehameha Highway and are located well inland from the most sensitive plant areas (the coastal strand).

No species of plant listed as threatened or endangered under state or federal statutes was recorded during either the March or September 2011 surveys of the SEIS lands, and none are expected to occur on this already highly disturbed site. Only endemic species or subspecies are likely to be listed as threatened or endangered in the future, and only one endemic species (ʻakoko recorded in the strand environment) was identified in the floral inventory surveys. There are a number of Hawaiian *ʻakoko* species either listed or considered species of concern (USFWS, 2011), but not *E. degeneri,* the species detected during the surveys. However, *E. degeneri* and *ʻohelo kai* (Lycium *sandwicense)* are uncommon species on Oʻahu due to limitations of this type of habitat (these species only occur in strand environments).

A.3. b. Recommended Mitigation Measures

Areas not impacted by new building footprints, roadways, sidewalks or parking areas, will be andscaped to minimize soil erosion. Future developments on the SEIS lands will continue utilizing appropriate native species in landscaping. As recommended in the consulting biologist's report (Appendix D), thinning of ironwood trees where these are invasive to either wetland or strand plant communities will be implemented as a potentially valuable conservation activity. Efforts will continue or be increased to limit access (but particularly by All-Terrain and other mechanical vehicles) to coastal strand areas where the plant community is predominantly native.

A. 4. Terrestrial Fauna and Avifauna

A.4. a. Impacts

Some terrestrial fauna existing on site will be temporarily displaced by construction activity in areas that abut habitat. However, as the project area's terrestrial fauna consists entirely of domestic and invasive species, the impact is not considered to be significant and no mitigation measures are proposed.

Potential impacts in construction areas that abut wetland habitat may include effects to listed water bird species that have been and may be further attracted to the wetland features. These run the gamut from temporary disturbance of individual birds that may be attracted to the area as potential modifications of the ditch around Punahoʻolapa Marsh are constructed, to direct physical harm of individual birds. The use of certain herbicides, insecticides and fertilizers used in landscape and golf course maintenance can also pose threats to water birds, as can the unintentional migration of petroleum, oils, lubricants, cleaning agents and the like into water features. Golf course operations have the potential to result in physical harm to listed water bird species that may use resources on the active golf course. However, recent surveys in March and September of 2011 did not document any direct adverse impacts of the golf course operations to water bird species. As golf is an ongoing activity on the site, and the Proposed Action contemplates a reduction in golf operations, it is unlikely that any expansion of the Resort facilities will result in any increased threats to water birds by the golf operations.

Following build out, and operation of the proposed improvements to the Resort, nesting water birds could potentially be disturbed by human activity causing abandonment of the nest, broken eggs, trampled chicks, and increased predation of eggs and chicks when adults potentially flee human disturbance and leave their nests and young unguarded. An operating resort will by its very nature attract certain human commensal species such as cats and rats, which also pose threats to these avian species, especially to young birds and eggs. As the site is already operated as a resort it is unlikely that the proposed expansion of the facilities will attract any predators that are not already using resources on the property.

The principal potential impact that further modification of this site poses to protected seabirds is the increased threat that birds will be downed after becoming disoriented by lights associated with the project during the nesting season. The two main areas that outdoor lighting could pose a threat to these nocturnally flying seabirds is if, 1) during construction, if it is deemed expedient, or necessary to conduct nighttime construction activities, 2) following build-out, the potential use of streetlights or other exterior lighting during the seabird nesting season.

Although no bats have been identified on the SEIS Lands, the principal potential impact that development generally poses to bats is during the clearing and grubbing phases of construction as vegetation is removed. The removal of vegetation within a project site may temporarily displace individual bats if present, which may use the vegetation as a roosting location. As bats use multiple roosts within their home territories, the potential disturbance resulting from the removal of the vegetation is likely to be minimal. During the pupping season, females carrying

their pups may be less able to rapidly vacate a roost site as the vegetation is cleared. Additionally, adult female bats sometimes leave their pups in the roost tree while they forage. Very small pups may be unable to flee a tree that is being felled. But, as stated above, because no bats are anticipated to be present, construction activities will not result in impacts to this species.

A.4. b. Recommended Mitigation Measures

If nighttime construction activity or equipment maintenance is proposed during the construction phases of the project, all associated lights will be shielded, and when large flood/work lights are used, they will be placed on poles that are high enough to allow the lights to be pointed directly at the ground. Streetlights or exterior facility lighting installed in conjunction with the project will be shielded to reduce the potential for interactions of nocturnally flying seabirds with external lights and man-made structures. Night sky protection is further addressed in Appendix A.

Although the use of pesticides and fertilizers associated with golf course operations constitute a potential adverse impact, in practice the operation of the Fazio and Palmer Golf Courses over the past 20 or more years has not resulted in any known adverse impacts to water birds. To ensure that no adverse impacts occur in the future, the golf courses will continue to be managed in a manner that minimizes the potential for accidental release of chemicals and/or petrochemicals into the environment.

The planned restoration of Punahoʻolapa Marsh will provide an educational and outreach opportunity to improve understanding of the marsh's sensitive environment for Resort guests, visitors, employees, and the surrounding community. An information and education program focused on the history of the marsh and the native flora and fauna will be implemented.

As no bats are present on the SEIS Lands, no measures to mitigate impacts are warranted.

A. 5. Groundwater Resources

A.5. a. Impacts

It is not anticipated that the Proposed Action will result in a significant adverse impact upon groundwater resources. Continuous near shore water quality monitoring at the Resort since the mid-1980s demonstrates that the practice of using non-potable water combined with treated effluent from the Resort's wastewater treatment plant to irrigate the Palmer Golf Course has not resulted in identifiable impacts to near shore water quality. The use of treated effluent and non-potable water for irrigation is beneficial to the environment because it reduces demand for the use of potable water for irrigation purposes. Nutrients in the effluent also reduce the need for fertilizers on the golf course.

Irrigation of a typical golf course requires approximately a million gallons per day. As discussed in Chapter Two, water from a non-potable well located within the Resort property combined with treated effluent from the WWTP are the sources for irrigation water used on the Palmer

Golf Course. Non-potable well #4158-14 provides an average estimated volume of 200,000 gallons per day over the course of a year, with higher volumes during the summer and much lower volumes during the winter. Other areas of the Resort are irrigated with potable water.

Under the Proposed Action, although the total number of golf holes will be reduced from 36 to 27, the irrigation requirements of those 27 holes will still exceed the volume of treated effluent that will be available from the WWTP.

Continuous near shore water quality monitoring also demonstrates that there have been no significant adverse impacts as the result of the use of pesticides and fertilizers on the Resort property.

A.5. b. Recommended Mitigation Measures

To enable treated effluent to be used for the irrigation of the Fazio Golf Course or common areas near dwelling units, TBR will recommend to the owners of the WWTP that improvements be implemented at the plant to improve the quality of the treated effluent used for irrigation from R2 to R1 quality.

To ensure that the water quality in near shore areas is not undermined by pesticide or fertilizer use, Resort personnel will continue to store, handle and use these chemicals in accordance with established Best Management Practices.

A. 6. Surface Water and Drainage

A.6. a. Impacts

The existing golf courses were designed to be two independent natural bio-swale drainage infrastructure components accommodating storm runoff (the East Main Drain and West Main Drain drainage subsystems of the Resort). The golf course fairways are shaped to provide channelized routing through the golf course landscaping leading runoff to the golf course water features, the East and West Main Drains or the coast. Runoff to the golf course water features provides supplemental make-up water to sustain the created wetlands, with the wetlands being one of the Resort's BMP's to address long term near shore water quality concerns relative to ocean discharges. The golf course water features and channelized routing through the landscape serve as natural bio-swale BMP's prior to ocean discharge as sheet flow or through the East and West Main Drains.

A hydrologic analysis was performed to assess the change in runoff quantities from the Proposed Action's anticipated discharge during a major rain event to each golf course or subsystem, pursuant to a previously approved Drainage Master Plan. The Proposed Action will continue to rely upon the golf courses as the principal means of addressing drainage and storm water runoff.

A.6. b. Recommended Mitigation Measures

The East Main Drain, West Main Drain and the Fazio and Palmer Golf Courses serve as the primary drainage facilities to handle the Resort's storm runoff as proposed in the Drainage Master Plan approved by the City.

A.6.b. [1] FAZIO AND PALMER GOLF GOURSES

Planned upgrades to the Fazio Golf Course include the re-contouring of the fairways to widen the West Main Drain and improve the flow of runoff through the existing breaks in the sand dunes and sheet flow areas, while still maintaining the storm water detention and water quality features of the course. Construction of the proposed Resort Residential (RR-3) adjacent to the East Main Drain may include re-contouring of the development to improve the flow of runoff through the existing breaks in the sand dunes and sheet flow areas.

Besides the Fazio Golf Course, portions of the Palmer Golf Course are also being evaluated for further re-design to enhance the drainage system. The proposed Community Housing (CH-2) development could benefit from the re-contouring of the golf course between Kamehameha Highway and the lagoons in the Palmer Golf Course to reduce the Ho`olapa Stream Floodway. Grassed lined channels can be incorporated into the re-design because the Resort will be responsible for the maintenance of the channel. It is possible for the East and West Main Drains and the Punaho'olapa Ditch to meander through the golf course, flowing through irregular channels with golf course features, slowing and further filtering runoff on its way towards the ocean.

As an enhancement to the regional drainage system, the east portion of the Fazio Golf Course and the entire Palmer Golf Course can accommodate the increase in runoff from the proposed developments through retention. The increase in runoff is calculated as the difference between the pre-development and post development runoff for the 24-hour 100-year storm. The increased runoff volume from the proposed developments on the east side of Kuilima Drive, which includes the Golf Course Clubhouse, the new Hotel Site (H-2, H2a) and Resort Residential and Community Housing sites (RR-3 to 6 and CH-1 and CH-2), served by the East Main Drain is approximately 79.4 ac-ft. The Fazio Golf Course and Palmer Golf Course provide a total of 179.29 ac-ft of runoff volume east of Kuilima Drive at an elevation of 6 feet msl. Punaho'olapa Marsh provides 96.8 ac-ft of runoff volume at elevation 6 feet msl, for a total of 276.09 ac-ft. of runoff volume, that receive runoff from offsite properties that flow across Kamehameha Highway and the Palmer Golf Course into the marsh.

As an enhancement to the regional drainage system, the west portion of the Fazio Golf Course can accommodate the increase in runoff through retention from the proposed developments on the west side of Kuilima Drive, Resort Residential sites (RR-1 and RR-2a, 2b), Hotel Site (H-1a, 1b) and the Farmer's Market (east and west) and Gathering Place. The increased runoff volume west of Kuilima Drive, which includes Kawela Stream, West Main Drain, and West Kuilima Drain, is approximately 39.8 ac-ft. of runoff volume. The existing Fazio Golf Course provides 69.09 ac-ft west of runoff volume of Kuilima Drive at an elevation of 8 feet above mean sea level.

The City is updating its Storm Drainage Standards as required by its NPDES Permit. As specified by the City,

> ***"…Within six (6) months of the effective date of this permit, the Permittee shall submit to State of Hawaii Department of Health (DOH) for review and acceptance, a plan for requiring LID in the standards to the Maximum Extent Practicable (MEP). LID refers to storm water management practices which seek to mimic natural processes and protect water quality via infiltration, evapotranspiration or reuse of storm water runoff at the site where it was generated. The standards shall be applicable to all construction projects disturbing at least one (1) acre and smaller projects (e.g., retail gas stations, restaurants, auto repair shops, parking lots) that have the potential to discharge pollutants to the City Municipal Separate Storm Sewer System (MS4). The plan for the implementation of LID provisions in the City's standards shall include at a minimum the following:***
>
> - ***Criteria for requiring implementation.***
> - ***Investigation into the development of quantitative criteria for a specific design storm to be managed by LID techniques. Examples of design storm requirements include: 24-hour, 85% storm through infiltration; on-site management of the first inch of rainfall within a 24-hour period; retention of the 100-year, 2-hour storm; or on-site management of the 24-hour, 95% storm."***

For the Proposed Action the individual developments will be required to retain the Water Quality Design Storm, the 1-inch storm, within the Fazio or Palmer Golf Courses or on-site, for disposal by infiltration, evapotranspiration or harvesting/reuse.

Drain lines from developments within the Resort will discharge into the golf courses for flood and filter control and or be directed by sheet flow to the ocean with BMPs.

A.6.b. [2] EAST MAIN DRAIN

Upon completion of the Proposed Action, flood control will be provided by the East Main Drain that conveys off-site drainage from ʻŌʻio Stream and on-site drainage east of Kuilima Drive to the ocean. The design flow of the proposed East Main Drain Channel is 4,404 cfs up to the confluence with the Punahoʻolapa ditch, where the flow increases to 6,191 cfs from the confluence to the ocean. The existing grass channel and culverts are proposed to be replaced by a new grassed lined channel with a bottom width of 140 feet with 3:1 side slopes up to the confluence with the Punahoʻolapa Marsh ditch, when the bottom width increases to 160 feet wide. The Punahoʻolapa Marsh Ditch will be replaced with a new grassed lined channel with a bottom width of 120 feet with 2:1 side slopes. The East Main Drain and Punahoʻolapa Ditch will be slightly bermed to separate the faster moving offsite flows in the channel and maintain low velocities in the golf course which is also used as water quality feature. At the coastline, the channel will be lined with rip-rap and extend to the ocean up to a depth of 3 feet below mean sea

level, replacing the four existing 72 inch culverts, which will be removed.

The DOT is presently designing a highway safety project that includes a new bridge on Oio Stream that will discharge into the East Main Drain. The proposed bridge will have a 35-foot clear span and 8 foot opening height with provisions for an expansion to 73-foot span (the second span is 38 feet) in the future. The expansion to the 73-foot span will accommodate the previous Plate 6 flow of 5,636 cfs.

Kaihalulu Drive will cross the East Main Drain below the confluence with Punahoʻolapa Ditch. A system of 4 – 32 feet x 10 feet Con-span culverts was analyzed to convey the storm runoff under Kaihalulu Drive. The East Main Drain flows through the Fazio and Palmer Golf Courses which are maintained by the Resort, and there is little possibility of debris being carried to the Kaihalulu Drive crossing.

The proposed new Community Housing Sites (CH-1 and CH-2), new Golf Course Clubhouse, and Resort Residential Sites (RR-3a, 3b, RR-4a, 4b, RR-5 and RR-6) will drain into the existing golf course water features which can provide detention as one of the Resort's BMPs to address long-term water quality concerns relative to ocean discharges. Runoff from Resort Residential Site (RR-3) and Hotel Site (H-2, 2a) may be directed by sheet flow to the ocean with BMPs.

A.6.b. [3] WEST MAIN DRAIN

The original drainage master plan proposed to restore the original Kawela Stream alignment back to the West Main Drain. The existing grassed lined West Main Drain channel will be enhanced by a new grassed lined channel with a 120 foot bottom width and 3:1 side slopes which expands to a 140 foot bottom width to accommodate the Kaihalulu Drive Crossing. The West Main Drain will be slightly bermed to separate the faster moving offsite flows in the channel and maintain low velocities in the golf course, and will also function as a water quality feature. At the coastline, the channel will be lined with rip-rap and extend to the ocean up to a depth of 3 feet below mean sea level, replacing the existing 48-inch drains near the coastline, which will be removed. There will be a smaller channel with a 50 foot bottom width and 3:1 side slopes running from the proposed Kawela Stream Diversion to the west side of Kuilima Drive to capture sheet flow off of Kamehameha Highway.

Kaihalulu Drive crosses the West Main Drain between Resort Residential Site (RR-2, 2a) and the Farmer's Market (west) and Farmer's Market (east) and Park (P-5). A system of 5 – 24 feet x 5 feet Con-span culverts was analyzed. A system of arch pipes can be used to convey the storm runoff under Kaihalulu Drive as long as the arch pipes have similar hydraulics. The West Main Drain flows through the Fazio Golf Course which is well maintained by the Resort, and there is little possibility of debris being carried to the Kaihalulu Drive crossing.

The Resort will work with the DOT on the planning and design of a new bridge to coincide with any drainage improvements in the area. In the interim, the Fazio Golf Course is graded to receive the sheet flow off of Kamehameha Highway and convey this runoff to the West Main Drain. The DOT is presently planning to improve the existing Kawela Stream culvert without the diversion.

The proposed Resort Residential Sites (RR-1 and RR-2a, 2b) will drain into the West Main Drain. The Farmer's Market (west), Farmer's Market (east), Gathering Place and Hotel Site (H-1) will drain into existing golf course water features which provide detention as one of the Resort's BMPs to address long-term water quality concerns relative to ocean discharges. Runoff from Resort Residential Sites (RR-1 and RR-2, 2a), Gathering Place and Hotel Site (H-1) may be directed by sheet flow to the ocean with BMPs.

Long term actions to mitigate the Proposed Action's impacts on water resources are presented in Appendix A.

A. 7. Marine Resources

A.7. a. Water Quality

A.7.a. [1] IMPACTS

Potential near shore impacts to the marine ecosystem from any shore-side development include:

- short-term construction impacts (primarily sediment from runoff or dewatering)
- nutrient enrichment or pollution of near shore waters from
    - use of fertilizers related to agriculture, horticulture, hotel grounds maintenance, or golf course management.
    - use of R2 water (treated wastewater effluent) for golf course irrigation
    - use of commercial herbicide application
- changes in ground water or surface water flow patterns

Water quality along the project shoreline has been monitored since the mid-1980s, and has been found to vary predictably with season, wave height, and the inflow from storm runoff from existing outfalls. The levels of nutrients monitored in the shoreline water samples have not appreciably changed over the data-gathering time period, indicating that the use effluent treated to the R2 level for golf course irrigation is a not a factor in near shore water quality.

During and shortly after runoff events, State water quality standards for turbidity, total nitrogen, and total phosphorus are typically exceeded in the near shore water of each bay. During prolonged periods when there is no outflow, the waters of both Turtle Bay and Kuilima Bay are usually within State water quality standards, but the waters of Kawela Bay typically do not meet these standards.

In Kawela Bay, total nitrogen and total phosphorus levels do not meet state standards. These nutrients likely inflow with the large flux of groundwater and become concentrated due to the high residence time of water in the bay. Turbidity in Kawela Bay usually does not meet State standards, particularly in the eastern portion of the bay. Turbidity is likely the result of both sediment input from Kawela Stream and phytoplankton growth associated with the inflow of nutrient rich ground water. Nitrogen is commonly high in groundwater inflow, but the high

concentration of phosphorus is unusual. Potential sources of the high groundwater phosphorus concentration include septic waste systems from homes adjacent to the eastern and western boundaries of the Resort property, fertilizers from up-slope agriculture,and possibly runoff from military activities in mauka regions that flow into this drainage system.

Along the Resort shoreline, there are three (3) primary surface outfalls to the near shore waters and several focused points of groundwater input. Balancing the distribution of flow between these outfall points will be key to minimizing adverse impacts to near shore ecosystems. Results from the marine analyses presented in Appendix B indicate that storm runoff may presently be over-allocated to Kawela Bay, and significantly under allocated to the West Main Drain into Turtle Bay.

The other potential large source of nutrients to groundwater, and thereafter to near shore coastal waters, is typically human sewage. However, the Resort relies upon a wastewater treatment plant with lagoon treatment and effluent recycled as R2-water for irrigation of the golf course. A review of the operation of this plant is beyond the scope of this report as it is not located on the SEIS Lands.

A.7.a. [2] RECOMMENDED MITIGATION MEASURES

The first stage of avoiding adverse impacts is to recognize where these potential impacts may occur, and to then design to avoid, minimize, or mitigate for unavoidable impacts. The baseline survey of marine water quality serves as both a point of reference to gage any future impacts and as a source of information for project designers to incorporate all possible means to avoid, minimize or mitigate adverse impacts.

Because the site may include sub-surface caves, any dewatering that needs to occur as part of any construction activity should carefully control effluent water and not direct it to unlined dug pits where it will likely find a direct route to the shoreline.

The application of fertilizes on hotel grounds, at private residences, and in common areas needs to be carefully regulated to ensure that excessive fertilization does not occur that could seep into underground drainage flows.

The application of fertilizers on the Palmer Golf Course needs to continue to be carefully monitored in conjunction with the use of treated effluent for irrigation. If the nutrients from the two sources exceed the needs of the turf, the excess nutrients can make their way into the groundwater and near shore waters. The application of irrigation water needs to be adjusted for rainfall conditions, with the R2 water stored when not needed.

Along the Kuilima shoreline, there are three (3) primary surface outfalls to the near shore waters and several focused points of groundwater input. Balancing the flow distribution between these outfall points will be key to minimizing adverse impacts to near shore ecosystems. Results from

the marine analyses conducted for the Proposed Action indicate that storm runoff may presently be over-allocated to Kawela Bay, and significantly under allocated to the West Main Drain in Turtle Bay. Engineering to modify these flows could have a significant positive impact upon the near shore environment. Specifically, restoring the Kawela Stream to its original alignment out-falling to the West Main Drain would have a new, large positive impact on Kawela Bay with minimal adverse impact in Turtle Bay.

Kawela Bay is one of the North Shore's natural treasures. Unfortunately, the offshore reefs that protect Kawela Bay from the forces of the ocean limit water circulation within the bay and inhibit sediment dispersion. For over a century, stream-borne sediments have been accumulating on the floor of the bay. With every heavy rain event, turbidity in Kawela Bay spikes and is slow to dissipate.

Kawela Stream enters the coastal plain mauka of the western end of the Resort. As the Kawela Stream emerges from its valley, it makes an abrupt turn to the west and parallels Kamehameha Highway until it is aligned with Kawela Bay where it again turns and enters near the center of the bay. Makai of the highway, the stream is intermittent with surface flows reaching the coast only during a few significant storm events each year. Often, especially during the winter, the stream may be flowing at upper elevations but as it approaches the coastal plain the flow percolates to groundwater and into the underground karst cave system.

However, Kahuku Plantation maps from the 1890s depict a different stream route, which suggests that the present day alignment is likely an artifact of plantation stream diversion. This possibility appears to be reinforced by a review of aerial photos. The mouth of Kawela Valley appears to be directly aligned with a large off-shore stream channel through the reef at the western end of Turtle Bay (See Figure 2-1). The project's consulting marine scientist believes this is a pre-historic channel that marks the location of the natural outfall site of Kawela Stream. Apparently, stream channel diversion was a common practice among plantation managers to augment irrigation of sugar cane fields and promote efficient drainage to improve crop growth.

The restoration of Kawela Stream to its historical channel would roughly follow the present West Main Drain. With the removal of the source of much of the sediment load entering Kawela Bay, it is anticipated that near shore water quality will improve significantly. It is also anticipated that with time, sediment on the floor of Kawela Bay will eventually flush out to sea.

The bay is roughly symmetrical with shallow shelves along the east and west edges. The middle of the bay is also relatively shallow. There are channels on both sides of the bay separating the shallow coastal (headland) shelves from the center shelve, but the western channel is much deeper and wider than the eastern channel. It is believed that these physical characteristics, coupled with the observed clockwise current in the eastern portion of the bay, are responsible for trapping Kawela Stream sediments.

The project's consulting marine scientist believes that Kawela Bay may have the most

substantiated water quality baseline in the State of Hawai'i. Beginning in 2006 until the present, four water samples have been taken within the bay on a quarterly basis for a total of 80 samples. As discussed in Appendix C, comparison of these samples with data collected from the bay between 1989 and 1994 show no significant differences in water quality over the years. This comparison is particularly interesting because the 1989 sampling began not long after the last of the residents moved away from the eastern side of the bay and the cesspools associated with their homes became unused. If those cesspools were delivering a significant load of nutrients to the bay, one would expect a decrease in nutrient concentrations over time at the east end of the bay once the residents left. But this did not happen. According to the water quality analysis conducted for the SEIS, all nutrient concentrations from the sampling station at the east end of Kawela Bay from 2006 to the present are indistinguishable from the samples taken near this same location two decades ago. There has been no long-term change in the water quality with Kawela Bay. (see Chapter 2 of the SEIS and/or Appendix E for a more detailed discussion of existing water quality)

Water quality sampling indicates that the waters of Kawela Bay do not meet State water quality standards of an open coastline. While a large quantity of nutrients are likely delivered to the bay in groundwater, the majority of the sediments and their associated nutrients enter the bay during infrequent flow events of Kawela Bay. Removal of this source of nutrients and sediments to the bay would generally improve water quality over a period of years.

If restoration of the original alignment is implemented, it would likely focus on activities outside of the SEIS Lands. As the current stream channel upslope of Kamehameha Highway approaches the highway in a southerly direction, it turns to the west in a 90 degree turn, and then parallels the highway approximately 1,500 feet before turning north again, crossing under Kamehameha Highway, and ending at Kawela Bay. The current stream channel, before turning west, is almost directly above the West Main Drain on the SEIS Lands. The excavation of a diversion channel between its 90-degree bend and Kamehameha Highway will enable the intermittent stream flow to be delivered directly to the West Main Drain. A water quality basin may also be included in the project to allow suspended solids in the stream flow to settle out before reaching the coast. These activities would be outside the scope of the SEIS because they would not occur on SEIS Lands.

While the operation of the Kuilima WWTP is beyond the scope of the Proposed Action, it is recommended that the plant operators consider implementing upgrades to improve the quality of effluent to R1.

At the new shoreline park in Kawela Bay, special consideration should be given to the public restroom facilities as any groundwater generated by this system will enter the bay at a point with minimal circulation, dilution, or offshore transport. For this reason, the wastewater collection system included in the Proposed Action will be extended to new park comfort stations.

A.7. b. Marine Biota

A.7.b. [1] IMPACTS ON FISH

Improving access and paths to the shoreline will likely lead to an increase in fishing pressure and an equal increase in illegal or destructive fishing practices, but at the same time provides improved access for monitoring and policing. Expansion of Resort facilities typically leads to increased storm water runoff into near shore waters due to an increase in roof areas and paved areas, and increased nutrient loading as the result of additional use of fertilizers on common areas that were formally unmanaged.

A.7.b. [2] RECOMMENDED MITIGATION MEASURES

The creation of Advisory Councils for each *ahupuaʻa* in accordance with the Cultural and Natural Resources Management Plan (see Appendix K) and *Tomorrow's Ahupua'a* (Appendix A) will provide a mechanism for collaborative decision-making to address the long-term preservation of coastal fisheries along the Resort coastline.

The Resort's Unilateral Agreement requires that best efforts be made to promote the creation of a Marine Life Conservation District at Kawela. But to do so will require broad-based input from the community.

In addition to providing educational material about stewardship, it is recommended by the marine consultant that TBR work closely with State agencies charged with fisheries management and with concerned fishermen from this *ahupuaʻa* to investigate the initiation of marine protected area status for the coastline to include closed, rotational, or restricted fishing areas, seasons, or other methods of stewardship.

The potential for increased ground water nutrient input should be addressed through appropriate vegetation management planning (integrated fertilizer and pest management plans), and may also include extension activities directed at farm operators located up-slope of the development. Development of a nutrient budget and continued tracking of fertilizer applications over time are keystones to good long term management. Controlling sediment influx from winter storms through upslope detention (desilting) basins and appropriate vegetation of bare exposed slopes could greatly reduce the adverse impact of these winter storms to the nearshore ecosystem.

A.7.b. [3] IMPACTS ON TURTLES

Improving access to the shoreline will lead to a greater probability of interactions between people and sea turtles that are on the Federal endangered species list. Any human interaction that causes an endangered species to alter its behavior may be considered as a "take" by Federal agencies. While this regulatory position may seem extreme, NOAA recognizes that minimal interaction with turtles and seals are not likely to result in permanent harm (at least not for the seals or turtles) and it is primarily concerned with overt interactions and conflicts with fishing gear.

Fibropapillomatosis (FP), a disease among the Hawai'i green turtle population, appears to have peaked about a decade ago (Chaloupka et al. 2009), but persists in the population at varying spatial scales (Van Houtan et al. 2010). According to Van Houtan et al. (2010), FP rates in the North Shore of O'ahu have declined over time, but have not declined at the same rate in Kahuku where the disease continues to persist. Importantly, Van Houtan et al. (2010) suggest a potential relationship exists between the expression of FP and the State's land use, wastewater management practices and invasive macroalgae. Hence, care must be applied to ensure that proposed development does not increase nitrogen and other nutrient loads into the marine environment that is known to promote invasive algae grown (Smith et al. 2010).

Combined turtle mortalities related to man's activities (net and rope entanglement, gunshot, boat strike, and plastic ingestion) totals about 19% of all mortalities in the project area as discussed in Chapter Two. Man's activities, particularly involving fishing activities, are a significant factor in turtle mortalities (Nitta and Henderson 1993; Chaloupka et al. 2008).

Surveys of turtles (only in Kawela Bay) showed a 50% increase in population number, and analyses of NOAA turtle stranding data from this shoreline indicate that the turtles are larger as compared to two decades ago. Similarly the turtle survey data and NOAA database indicate that there has been an increase in the number of Hawaiian monk seals along this shoreline since 1985.

With reasonable precautions and expansion of educational outreach programs, it is unlikely that increased near shore human activity created by the anticipated development would have any measurable adverse impact on adult sea turtles along the coast. Two major causes of human-caused turtle mortality are from boat propeller impact and from gill net entanglement, neither of which activities are likely to increase as a result of the proposed development. Sea turtles are known to habituate to the presence of humans in or on the water and would not likely remove themselves from grazing habitat due to the presence of people in the water in quantities likely to result from the planned development.

Some sea turtle nesting has been reported over the years along this shoreline, and as the population continues to recover the importance of this area to nesting turtles may increase. Artificial lighting is known to disorient hatchlings. It is likely that increased lighting and beach activity during breeding season evening hours could dissuade turtles from emerging to lay eggs on these beaches. Furthermore, when turtle hatchlings emerge from their nest in the middle of the night, they orient towards the brighter sky above the ocean. Any development that may increase relative ambient lighting contributing to lighting pollution in this area should therefore adopt a lighting plan that shields direct light away from the beach and uses longer wavelength (yellow) lights that are not attractive to hatchling turtles.

A.7.b. [4] RECOMMENDED MITIGATION MEASURES

While increases in large marine animals in the region is beneficial to the species, because the turtles are on the Federal Endangered Species List, it is important that visitors and residents treat these species in accordance with Federal guidelines.

To mitigate the impact of greater potential interactions between humans and turtles, a public education program that advises beach goers of their stewardship responsibility towards these creatures is recommended.

To avoid exacerbating the incidence of FP in sea turtles, the careful management of the use of fertilizers on the Resort's golf courses and open space common areas is recommended to ensure that the Resort does not contribute to excessive nitrogen levels in near shore waters.

Federal wildlife managers have expressed concern that lighting from the expanded Turtle Bay Development may disorient juvenile turtles, and fledgling seabirds. Consideration will be given to a development-wide lighting design that minimizes light impact towards the beaches and ocean. The increased shoreline setbacks included in the Proposed Action may also help to reduce night-lighting impacts. The issue of night sky protection is further addressed in Appendix A.

A.7.b. [5] IMPACTS ON MONK SEALS

Around the main Hawaiian Islands, the human activities of greatest concern to NOAA Monk seal researchers are the potential for entanglement in fishing gear, impact from boats, or predation by fishermen who may view the seals as direct competitors for fish resources. None of these sources of mortality are likely to increase as a result of the Proposed Action because the majority of anticipated clientele are not likely to engage in these activities. However indirect impacts including increased interactions with fishermen, surfers, kayakers, and other ocean recreational uses can be anticipated as a result of improved access to the public and increases in shoreline population. And at the same time, there will be better access and viewing by stewardship organizations, Resort security, and other interested parties of the coastal areas where interactions occur. There have been known incidences elsewhere of beach users purposefully or unintentionally harassing seals that have hauled out on the shoreline.

A.7.b. [6] RECOMMENDED MITIGATION MEASURES

The potential impacts to Hawaiian Monk seals resulting from increase human activities along the Resort coastline may be minimized through public and community wide education programs to inform recreational enthusiasts and near shore users of their presence. To that end, the Cultural and Natural Resource Management Plan presented in Appendix K recommends the creation of an Advisory Council for each of the three ahupuaʻa containing portions of the SEIS Lands. The proposed Councils will provide a mechanism for collaborative decision-making regarding the long-term protection of Hawaiian monk seals.

Resort management presently encourages volunteers to monitor seals and to work with security on cordoning off safe zones for seals that have hauled out on the beach to prevent beach users from intentionally or unintentionally harassing them. This program will be continued. Unlike existing conditions with large areas of unmonitored coastline, implementation of the Proposed Action will make it easier to monitor the coastline. Resort security personal, site management will also be trained with the proper protocols for protecting Hawaiian monk seals and will actively participate in the education of beach users to the extent practicable.

A. 8. Views

A. 8. a. Impacts

Implementation of the Proposed Action will alter views of the Resort property from Kamehameha Highway and from the coastline.

As evidenced in Figure 5-1, new landscape vegetation will be densest along the Kamehameha Highway corridor to maximum privacy for the low density residential properties. The rooftops of residential structures closest to Kamehameha Highway at Kawela Bay may be visible but it is likely that most of the structures themselves will be screened from view by landscape vegetation. The rooftops of low to medium density hotel structures will not likely be visible from the highway because of their relatively low building height and their distance from the highway. This is best demonstrated by the rending of the anticipated view from the intersection of the new proposed Resort entrance, Kaihalulu Drive, with Kamehameha Highway west of Kuilima Drive (see Figure 5-2). However, with the creation of the new intersection, motorists on Kamehameha Highway will likely be able to briefly glimpse the existing hotel in the distance as they pass by in the west to east direction.

Figure 5-1: Proposed View: Kawela

From the shoreline, voluntarily expanded setback areas from 150' to 300' between proposed resort residential developments and the coastline will likely be landscaped with turf and a mixture of native plants and ornamental plants, creating much more open views of the Resort property than presently exist. However, the presence of the sand berms along the shoreline and

Figure 5-2: Proposed View: Entry

the slope of the beach (depending on the time of year) will likely limit interior views from the beach area to some degree.

Figure 5-3 depicts views of the SEIS Lands on the eastern side of the Resort property. The proposed hotel development site, H-2, will be the most visually prominent site in this region. However, its relatively low profile and distance from the shoreline will result in visual impacts considerably less than those of the existing Turtle Bay Hotel. Views from the remainder of the shoreline will be similar to those along the western side of the Resort. Figure 5-4 presents a rendering of a typical view of proposed resort residential development from the coastline.

A.8. b. Recommended Mitigation Measures

The existing Unilateral Agreement, as well as the design guidelines for the Resort including voluntary reductions in height limits, provides prescriptive measures to mitigate visual impacts of the proposed Resort expansion project. As evidenced in the various artistic renderings, the Proposed Action preserves the low-density rural character of the property with smaller low-rise buildings, as opposed to taller towers typically associated with hotel structures, and by increasing open space and view corridors,

A. 9. Air Quality

The Air Quality Impact Study presented in Appendix J concludes that the Proposed Action will impact air quality during the short term as the result of construction activities and over the longer term due to increases in traffic resulting from the project and increased energy use.

Figure 5-3: Proposed View: Kahuku

Figure 5-4: Proposed View: Typical Residential

A.9. a. Short Term Impacts

Short-term direct and indirect impacts on air quality could potentially occur due to project construction. For a project of this nature, there are two potential types of air pollution emissions that could directly result in short-term air quality impacts during project construction: (1) fugitive dust from vehicle movement and soil excavation; and (2) exhaust emissions from on-site construction equipment. Indirectly, there also could be short-term impacts from slow-moving construction equipment traveling to and from the project site, from a temporary increase in local traffic caused by commuting construction workers, and from the disruption of normal traffic flow caused by lane closures of adjacent roadways.

A.9.a. [1] FUGITIVE DUST EMISSIONS

Fugitive dust emissions may arise from the grading and dirt-moving activities associated with site clearing and preparation work. The emission rate for fugitive dust emissions from construction activities is difficult to estimate accurately. This is because of its elusive nature of emission and because the potential for its generation varies greatly depending upon the type of soil at the construction site, the amount and type of dirt-disturbing activity taking place, the moisture content of exposed soil in work areas, and the wind speed. The EPA has provided a rough estimate for uncontrolled fugitive dust emissions from construction activity of 1.2 tons per acre per month under conditions of "medium" activity, moderate soil silt content (30%), and precipitation/evaporation (P/E) index of 50. (U.S. EPA: 1995) Uncontrolled fugitive dust emissions at the project site would likely be somewhere near that level, depending on the amount of rainfall that occurs. In any case, Air Pollution Control Regulations of the State of Hawai`i (Section 11-60, HAR) prohibit visible emissions of fugitive dust from construction activities at the property line. Thus, an effective dust control plan for the project construction phase is essential.

A.9.a. [2] CONSTRUCTION EQUIPMENT EXHAUST EMISSIONS

On-site mobile and stationary construction equipment also will emit air pollutants from engine exhausts. The largest of this equipment is usually diesel-powered. Nitrogen oxides emissions from diesel engines can be relatively high compared to gasoline-powered equipment, but the annual standard for nitrogen dioxide is not likely to be violated by short-term construction equipment emissions. Also, the new short-term (1-hour) standard for nitrogen dioxide is based on a three-year average; thus it is unlikely that relatively short-term construction emissions would exceed the standard. Carbon monoxide emissions from diesel engines are low and should be relatively insignificant compared to vehicular emissions on nearby roadways.

A.9.a. [3] SLOW-MOVING CONSTRUCTION EQUIPMENT

Project construction activities could occasionally obstruct the normal flow of traffic at times to such an extent that overall vehicular emissions in the project area will temporarily increase.

A.9. b. Longer Term Impacts

After construction is completed, use of the proposed facilities will result in increased motor vehicle traffic in the project area, potentially causing long-term impacts on ambient air quality. Motor vehicles with gasoline-powered engines are significant sources of carbon monoxide. They also emit nitrogen oxides and other contaminates.

Federal air pollution control regulations require that new motor vehicles be equipped with emission control devices that reduce emissions significantly compared to a few years ago. In 1990, the President signed into law the Clean Air Act Amendments. This legislation required further emission reductions, which have been phased in since 1994. Additional restrictions were signed into law during the Clinton administration, and these began to take effect during the past decade. The added restrictions on emissions from new motor vehicles will lower average emissions each year as more older vehicles leave the state's roadways. It is estimated that carbon monoxide emissions, for example, will go down by an average of about 20 percent per vehicle during the next 10 years due to the replacement of older vehicles with newer models.

A.9.b. [1] TRAFFIC: PREDICTED WORST-CASE 1-HOUR CONCENTRATIONS

Table 5-1 summarizes the final results of the modeling study in the form of the estimated worst-case 1-hour morning and afternoon ambient carbon monoxide concentrations. These results can be compared directly to the state and the national AAQS. Estimated worst-case carbon monoxide concentrations are presented in the table for six scenarios: year 2012 with existing traffic, year 2025 without the project, year 2025 with the Proposed Action, year 2025 with the project Full Build-Out Alternative, year 2025 with the project Conservation Partner Alternative and year 2025 with the project Resort Residential Alternative. The locations of these estimated worst-case 1-hour concentrations all occurred at or very near the indicated intersections.

Table 5-1: Estimated Worst-Case 1-Hour Carbon Monoxide Concentrations Along Roadways Near Turtle Bay Resort Expansion Project (parts per million)

Roadway Intersection	Year/Scenario								
	2012/Present			2025/Without Project			2025/Proposed Action		
	AM	PM	Sat.	AM	PM	Sat.	AM	PM	Sat.
Kamehameha Highway at Kuilima Drive	1.7	1.3	1.7	1.6	1.4	1.8	2.4	1.9	2.1
Kamehameha Highway at Marconi Road	1.3	1.0	1.0	1.3	1.0	1.1	2.1	1.6	2.2
Kamehameha Highway at Kaihalulu Drive	-	-	-	-	-	-	2.6	1.6	2.0

Roadway Intersection	Year/Scenario								
	2025/Full Build-Out			2025/Conservation Partner			2025/Resort Residential		
	AM	PM	Sat.	AM	PM	Sat.	AM	PM	Sat.
Kamehameha Highway at Kuilima Drive	2.9	2.1	2.2	2.2	1.7	2.0	2.2	1.6	2.0
Kamehameha Highway at Marconi Road	2.7	2.0	2.2	1.9	1.3	1.7	1.9	1.3	1.7
Kamehameha Highway at Kaihalulu Drive	3.1	2.6	2.4	2.4	1.5	2.0	2.0	1.4	1.8

As indicated in the above table, the highest estimated 1-hour concentration within the project vicinity for the present (2012) case was 1.7 ppm. This was projected to occur during both the weekday morning peak traffic hour and the Saturday peak traffic period near the intersection of Kamehameha Highway and Kuilima Drive. Concentrations at other locations and times studied were 1.3 ppm or lower. All predicted worst-case 1-hour concentrations for the 2012 scenario were well below both the national AAQS of 35 ppm and the state standard of 9 ppm.

In the year 2025 without the Proposed Action, the highest worst-case 1-hour concentration was predicted to occur during the Saturday peak traffic hour at the intersection of Kamehameha Highway and Kuilima Drive. A value of 1.8 ppm was predicted to occur at this location and time. Peak-hour worst-case values at the other locations and times studied for the 2025 without project scenario ranged between 1.0 and 1.6 ppm. Compared to the existing case, concentrations generally remained about the same, and all projected worst-case concentrations for this scenario remained well within the state and national standards.

In the year 2025, the Full Build-Out alternative was predicted to result in the highest worst-case 1-hour concentration. This was predicted to occur during the weekday morning at the intersection of Kamehameha Highway and Kuilima Drive with a value of 3.1 ppm. Other concentrations for this alternative ranged between 2.0 and 2.9 ppm. The Proposed Action and other project alternatives generally resulted in slightly lower concentrations, but the difference amongst them was relatively small. Although the predicted concentrations with any development increased compared to the without project scenario, the values remained well within the federal standard (35 ppm) and state standard (9 ppm).

A.9.b. [2] TRAFFIC: PREDICTED WORST-CASE 8-HOUR CONCENTRATIONS

Worst-case 8-hour carbon monoxide concentrations were estimated by multiplying the worst-case 1-hour values by a persistence factor of 0.5. This accounts for two factors: (1) traffic volumes averaged over eight hours are lower than peak 1-hour values, and (2) meteorological conditions are more variable (and hence more favorable for dispersion) over an 8-hour period than they are for a single hour.

The resulting estimated worst-case 8-hour concentrations are indicated in Table 5-2. For the 2012 scenario, the estimated worst-case 8-hour carbon monoxide concentrations for the two locations studied were 0.6 ppm at the Kamehameha Highway/Marconi Road intersection and 0.8 ppm at the Kamehameha Highway/Kuilima Drive intersection. The estimated worst-case concentrations for the existing case were within both the state standard of 4.4 ppm and the national limit of 9 ppm.

For the year 2025 without project scenario, worst-case concentrations ranged between 0.6 and 0.9 ppm, with the highest concentration occurring at Kamehameha Highway and Kuilima Drive. All predicted concentrations were within the standards.

For the year 2025 with the Proposed Action or the alternatives, worst-case concentrations were predicted to increase somewhat compared to the without project case. At the three intersections studied, predicted worst-case concentrations ranged from 1.0 to 1.6 ppm with the highest concentration occurring at the intersection of Kamehameha Highway and Kaihalulu Drive in the Full Build-Out Alternative. All predicted 8-hour concentrations for the Proposed Action and alternatives were within both the national and the state standards.

Table 5-2: Estimated Worst-Case 8-Hour Carbon Monoxide Concentrations Along Roadways Near Turtle Bay Resort Expansion Project (parts per million)

Roadway Intersection	Year/Scenario		
	2012/Present	2025/Without Project	2025/Proposed Action
Kamehameha Highway at Kuilima Drive	0.8	0.9	1.2
Kamehameha Highway at Marconi Road	0.6	0.6	1.1
Kamehameha Highway at Kaihalulu Drive	-	-	1.3

Roadway Intersection	Year/Scenario		
	2025/Full Build-Out	2025/Conservation Partner	2025/Resort Residential
Kamehameha Highway at Kuilima Drive	1.4	1.1	1.1
Kamehameha Highway at Marconi Road	1.4	1.0	1.0
Kamehameha Highway at Kaihalulu Drive	1.6	1.2	1.0

A.9.b. [3] POWER GENERATION: INDIRECT EMISSIONS

The Proposed Action will cause indirect air pollution emissions from power generating facilities as a consequence of electrical power usage. The estimated annual electrical demands of the Proposed Action and alternatives are shown in Table 5-3. The highest electrical demand, 107 million kilowatt-hours per year, would occur with the Full Build-Out Alternative, while the Resort Residential Alternative would have the least at 31 million kilowatt-hours per year. Electrical power for the development will most probably be provided mainly by oil-fired generating facilities located on O'ahu, but some of the power could also come from sources burning other fuels, such as H-Power and the AES coal-fired power plant at Campbell Industrial Park, or from renewable energy resources that are currently being developed. In order to meet the electrical power needs of the Proposed Action, power-generating facilities may be required to burn more fuel and hence more air pollution may be emitted at these facilities.

Table 5-3: Estimated Annual Electrical Demand for Turtle Bay Resort Expansion Project

Project	Estimated Annual Electrical Demand (million kilowatt-hours)
Proposed Action	70
Full Build-Out Alternative	107
Conservation Partner Alternative	46
Resort Residential Alternative	31

Source: Personal communication via email from Cheryl Palesh, Belt Collins Hawaii LLC, to Barry D. Neal, B.D. Neal & Associates, Turtle Bay Resort Monthly Electrical Demand Estimates, August 22, 2012.

Table 5-4 below presents estimates of the indirect air pollution emissions that would result from the Proposed Action's electrical demand assuming all power is provided by burning more fuel oil at Oʻahu's power plants. These values can be compared to the island-wide emission estimates for 1993 given in Table 2-27. The Full Build-Out Alternative would have the highest emissions, while the Resort Residential Alternative would have the least.

The Proposed Action or alternatives would result in relatively small indirect emissions from project electrical demand: they amount to less than 0.1 percent of the present air pollution emissions occurring on Oʻahu.

Table 5-4: Estimated Indirect Air Pollution Emissions From Turtle Bay Resort Expansion Project Electrical Demand[a]

Air Pollutant	Emission Rate (tons/year)			
	Proposed Action	Full Build-Out	Conservation Partner	Resort Residential
Particulate	2	3	1	1
Sulfur Dioxide	24	36	16	11
Carbon Monoxide	2	3	1	1
Volatile Organics	1	1	<1	<1
Nitrogen Oxides	10	16	7	4

[a] Based on U.S. EPA emission factors for utility boilers [3]. Assumes electrical demand indicated in Table 5.3 and low-sulfur oil used to generate power.

A.9.b. [4] SOLID WASTE DISPOSAL AT H-POWER FACILITY

Solid waste generated by the Proposed Action or alternatives is not expected to exceed the amounts indicated in Table 5-5 below. As indicated in the table, the estimated amounts assume 70 percent recycling/reuse diversion. Most project refuse will likely be hauled away and burned at the H-Power facility at Campbell Industrial Park to generate electricity. Burning of the

waste to generate electricity will result in emissions of particulate, carbon monoxide and other contaminants, but these will be offset to some extent by reducing the amount of fuel oil that may be required to generate electricity for the project.

Table 5-5: Estimated Annual Soild Waste Disposal Demand for Turtle Bay Resort Expansion Project

Project	Estimated Annual Solid Waste Disposal Demand (tons)[a]
Proposed Action	2,626
Full Build-Out Alternative	3,686
Conservation Partner Alternative	1,173
Resort Residential Alternative	1,106

[a] Assumes 70 percent recycling/reuse diversion.
Source: Personal communication via email from Lee Sichter, Lee Sichter LLC, to Barry D. Neal, B.D. Neal & Associates, Turtle Bay Resort Annual Solid Waste Disposal Demand Estimates, August 14, 2012.

Table 5-6 below presents emission estimates assuming all project solid waste is burned at H-Power. These values can be compared to the island-wide emission estimates for 1993 presented in Table 2-28 in Chapter Two. The estimated potential indirect emissions from project solid waste disposal demand amount to less than 0.1 percent of the present air pollution emissions occurring on O'ahu. The emissions from the Proposed Action or alternatives are relatively small. The Full Build-Out Alternative would result in the most emissions and the Resort Residential Alternative the least.

Table 5-6: Estimated Indirect Air Pollution Emissions from Turtle Bay Resort Expansion Project Solid Waste Disposal[a]

Air Pollutant	Emission Rate (tons/year)			
	Proposed Action	Full Build-Out	Conservation Partner	Resort Residential
Particulate	0.2	0.2	0.1	0.1
Sulfur Dioxide	0.6	0.8	0.2	0.2
Carbon Monoxide	2.5	3.5	1.1	1.1
Nitrogen Oxides	6.6	9.2	2.9	2.8
Lead	0.3	0.4	0.1	0.1

[a] Assumes solid waste disposal demands indicated in Table 3-5 and that solid waste is burned in a refuse-derived fuel-fired power plant equipped with spray dryer and fabric filter. Emission rates based on U.S. EPA emission factors for refuse-derived fuel-fired combustors.

A.9. c. Recommended Mitigation Measures

With regard to short-term impacts, adequate fugitive dust control can usually be accomplished by the establishment of a frequent watering program to keep bare-dirt surfaces in construction areas from becoming significant sources of dust, and by the use of windscreens (dust fences).

In dust-prone or dust-sensitive areas, other control measures such as limiting the area that can be disturbed at any given time, applying chemical soil stabilizers, mulching and/or using windscreens may be necessary. Control regulations further stipulate that open-bodied trucks be covered at all times when in motion if they are transporting materials that could be blown away. Haul trucks tracking dirt onto paved streets from unpaved areas is often a significant source of dust in construction areas. Some means to alleviate this problem, such as road cleaning or tire washing, may be appropriate. Paving of parking areas and/or establishment of landscaping as early in the construction schedule as possible can also lower the potential for fugitive dust emissions. Monitoring dust at the project property line could be considered to quantify and document the effectiveness of dust control measures.

The only means to alleviate the problem of slow moving construction equipment on public roadways will be to attempt to keep roadways open during peak traffic hours and to move heavy construction equipment and workers to and from construction areas during periods of low traffic volume. Thus, most potential short-term air quality impacts from project construction can be mitigated.

Over the long term, because the air quality impacts resulting from traffic generated by the Proposed Action are predicted to fall within the standards established at the federal and state levels of government, no significant adverse impacts on air quality are anticipated and no mitigation measures are warranted.

With regard to the indirect air quality impacts resulting from energy consumption, conservation resulting from the employment of energy-saving technology and protocols will help to reduce impacts (see discussion in Appendix A).

Concerning the indirect air quality impacts resulting from the disposal of solid waste created by the Proposed Action, recycling and reuse programs instituted by the Resort will help to reduce identified impacts (see discussion in Appendix A).

B. Impacts on the Human Environment

B. 1. Traffic

B.1. a. Analysis of Future Conditions

The following discussion summarizes the findings and conclusions of the Traffic Impact Analysis Report (TIAR) prepared for the SEIS and included as Appendix I. The TIAR focuses on the forecast of future traffic conditions on Kamehameha Highway with and without the Proposed Action and the three Alternatives in the year 2025. Although construction associated with the Full Build-Out Alternative would extend all the way to 2053, for purposes of comparison, it and the other alternatives were all assumed to conclude construction by 2025 so that their impacts can be compared to the Proposed Action, which is projected to complete construction in that year.

There are three principal issues that must be addressed in a traffic forecast: how might ambient traffic without the Proposed Action change over the fourteen year period from 2011 to 2025 (Future Without); what volumes of traffic will the Proposed Action and the Alternatives generate (Trip Generation); and what is the origin/destination of that traffic (Trip Distribution). Following is a brief discussion of these three issues.

Forecasting Future Traffic Conditions Without the Proposed Action: Fortunately, individual traffic engineers do not have to construct their own original computer models to forecast future conditions. The Oʻahu Metropolitan Planning Organization, a state agency, periodically publishes a long-range planning document that includes sophisticated computer modeling of future traffic conditions that is used by the State Department of Transportation and the County planning departments. The current iteration of that document is called the *Oʻahu Regional Transportation Plan 2035* (ORTP).

For the purposes of the SEIS traffic analysis, the Year 2025 traffic forecasts without the Proposed Action were derived by interpolating the Year 2035 ORTP model forecasts and the Base Year 2011 DOT data for weekday traffic, assuming a straight line growth pattern, in consultation and in coordination with the State DOT staff. (Weekend traffic was not analyzed in the ORTP.) Three locations on Kamehameha Highway were selected for the regional assessment: northeast of Joseph P. Leong Highway in Haleʻiwa; west of Kuilima Drive in Kahuku; and northwest of Kaheliki Highway in Kahaluʻu.

It should be noted that the traffic forecasts take into account new development that has been approved for other areas of the study area from Haleʻiwa to Kahaluʻu and is anticipated for development in the period from 2011 to 2025. While discussions concerning the proposed Envision Lāʻie development suggest that the project could result in up to 1,200 new residential units in the Lāʻie area, the project has not yet applied for or been granted any land use approvals. Thus, it is unknown if the project will move forward, how many units may eventually be constructed, and when they would begin contributing to regional traffic. For these reasons, the Envision Lāʻie project was <u>not</u> included in regional traffic forecasts for the Resort. If the Envision Lāʻie project does move forward, it will be obligated to prepare a traffic impact analysis report to address the potential impacts it may have upon regional traffic conditions.

Between the Years 2011 and 2035, the ORTP forecasts indicate little growth (7%) in Haleʻiwa traffic volume and more moderate growth (30-35%) in the Kahuku and Kahaluʻu areas. <u>It is important to note, however, that the ORTP forecasts assumed a total of 1,184 units at the Resort, about 300 more units than currently exist.</u> Therefore, use of the ORTP forecasts to establish future traffic conditions without the Proposed Action can be considered to be <u>conservative</u> in that the forecast <u>over-estimates</u> the future traffic on the North Shore and in Windward Oʻahu without the Proposed Action. The ORTP forecasts an average annual growth rate in traffic of 0.29% at Haleʻiwa, 1.23% at Kahuku, and 1.45% at Kahaluʻu.

Traffic Generated by the Proposed Action and the Alternatives: With regard to estimates of the traffic that the Proposed Action and the Alternatives may generate (called Trip Generation in traffic engineering terms), the traffic consultant worked closely with staff of the State DOT to arrive at a methodology what was acceptable for planning purposes.

Trip Generation estimates were developed using two guides: standardized trip generation rates for various land uses developed by the Institute of Transportation Engineers (ITE); and real-world trip generation rates derived from a week-long survey of motorists conducted at the Resort in early November 2011.

The TIAR in Appendix I presents the detailed explanation of the trip generation survey and the ITE trip generation rates that were addressed together by the project's traffic consultant and the staff of the State DOT to determine a mutually agreeable set of trip generation rates that would be applied to the various land uses included in the Proposed Action and the Alternatives, including resort hotel, time-share hotel, resort residential development, shopping center, multi-family housing, farmers market, and recreational uses. Highlights of key assumptions agreed to in collaboration with the State DOT include an increase in estimated hotel occupancy rates to an average of 90% for weekday and 95% for weekend rates when average rates are more near 80% and 90% respectively; and with respect to assumptions for resort residential units, an increase to base assumptions developed from week-long survey and ITE rates by 10% to be conservative.

Trip Distribution: In addition to taking traffic counts of all turning movements for vehicles entering and leaving the Resort, SMS Research conducted a complimentary week-long traffic survey during the same period of personal interviews of about 4,800 motorists as they entered and exited the Resort and the Kuilima Estates. The purpose of this portion of the survey was to determine the origins and destinations of the vehicles arriving at and departing the Resort. The survey report, including its methodology and results, is presented as Appendix M to the SEIS.

The survey determined that about 43% of the traffic entering and exiting the Resort during the study period had origins or destinations outside the study area (Haleʻiwa to Kahaluʻu), meaning that these vehicles either came from or were destined for Honolulu, Central Oʻahu, or Leeward Oʻahu. About 39% of the Resort traffic remained within the limits of the study area. The remaining 18% originated from or were destined for the fringes of the study area (Hale`iwa/Waialua and Kaneʻohe/Kailua/Waimānalo). This trip distribution data was then aggregated by time to determine the trip distribution relationship to the peak hours of traffic. Trip distribution data for the Turtle Bay Hotel was applied to the hotels proposed in the Proposed Action and the Alternatives. Trip distribution data for the Kuilima Estates was applied to the resort-residential development included in the Proposed Action and the Alternatives plus 10% to be conservative. The trip distribution of traffic generated by other land uses in the Proposed Action and the Alternatives were based upon existing peak hour traffic patterns.

Following is a discussion of the TIAR findings concerning the future without the Proposed Action. It will be followed by a discussion of forecasts for the Proposed Action and the Alternatives.

B.1.a. [1] YEAR 2025 AM PEAK HOUR TRAFFIC WITHOUT THE PROPOSED ACTION

The Kuilima Drive and Marconi Road intersections with Kamehameha Highway are forecast to operate at satisfactory levels of service. In the vicinity of the Resort, Kamehameha Highway is forecast to operate at LOS (Level of Service) "C", with a v/c (volume to capacity) ratio of 0.22, or about 0.04 points (about 22%) higher than the existing conditions in 2011 discussed in Chapter Two of the SEIS.

The intersection of Kamehameha Highway and Joseph P. Leong Highway in Hale`iwa also is forecast to operate at satisfactory levels of service during the 2025 AM peak hour of traffic without the Proposed Action. Kamehameha Highway is forecast to operate at LOS "D", with a v/c ratio of 0.38, which is 0.08 points higher (about 27%) than existing conditions in 2011 (a 14 year period).

In Kahalu'u, the westbound approach to Kamehameha Highway/Kahekili Highway is forecast to operate at LOS "F" during the 2025 AM peak hour of traffic without the Proposed Action. Kamehameha Highway is forecast to operate at LOS "D", with a v/c ratio of 0.51, or about 24% higher than existing conditions in 2011.

Collectively, Kamehameha Highway will continue to operate during the AM peak hour at the same level of service that exists in 2011, but traffic volumes will increase between 22-27%.

B.1.a. [2] YEAR 2025 PM PEAK HOUR TRAFFIC WITHOUT THE PROPOSED ACTION

The intersection of Kuilima Drive and Kamehameha Highway is forecast to operate at LOS "E" during the Year 2025 peak hour without the Proposed Action. The Marconi Road intersection with Kamehameha Highway is forecast to operate at satisfactory levels of service. In the vicinity of the Resort, Kamehameha Highway is forecast to operate at LOS "D", with a v/c ratio of 0.33, or about 0.07 points (about 27%) higher than the existing conditions in 2011 discussed in Chapter Two of the SEIS.

The intersection of Kamehameha Highway and Joseph P. Leong Highway in Hale'iwa also is forecast to operate at satisfactory levels of service during the 2025 AM peak hour of traffic without the Proposed Action. Kamehameha Highway is forecast to operate at LOS "D", with a v/c ratio of 0.52, which is 0.04 points higher (about 8%) than existing conditions in 2011

In Kahalu'u, the westbound approach to Kamehameha Highway/Kahekili Highway is forecast to operate at LOS "F" during the 2025 AM peak hour of traffic without the Proposed Action. Kamehameha Highway is forecast to operate at LOS "E", with a v/c ratio of 0.60, or about 25% higher than existing conditions in 2011.

In Kahuku, the level of service on Kamehameha Highway will downgrade from LOS "C" to LOS "D" during the PM peak hour of traffic without the Proposed Action. Similarly in Kahalu'u, the level of service on Kamehameha Highway will downgrade from LOS "D" to LOS "E". In Hale'wa, Kamehameha Highway will continue to operate during the PM peak hour at the same level of service that exists in 2011, but traffic volumes will increase between 8-27%.

B.1.a. [3] YEAR 2025 WEEKEND PEAK HOUR TRAFFIC WITHOUT THE PROPOSED ACTION

During the Year 2025 weekend peak hour of traffic without the Proposed Action, the left-turn movement from Kuilima Drive onto Kamehameha Highway is forecast to operate at LOS "F". The Marconi Road intersection will operate at a satisfactory level of service, even if the Kahuku Mauka subdivision is implemented by others. Kamehameha Highway is forecast to operate at LOS "D" with a v/c ratio of 0.35, which is 0.6 points (or about 21%) higher than existing conditions in 2011.

The left-turn movement from northbound Joseph P. Leong Highway to westbound Kamehameha Highway in Hale'iwa is forecast to operate at LOS "D". The other traffic movements at the intersection are expected to operate at satisfactory levels of service. Kamehameha Highway is forecast to operate at LOS "D", with a v/c ratio of 0.57, about 0.03 points (about 6%) higher than existing conditions in 2011.

The westbound approach of Kamehameha Highway is forecast to operate at LOS "F" at the Kahekili intersection in Kahalu'u. Kamehameha Highway is forecast to operate at LOS "E", with a v/c ratio of 0.61, about 0.11 points (22%) higher than existing conditions in 2011. This has much to do with the fact that there is not an exclusive eastbound center left-hand turn lane at the intersection of Kahekili and Kamehameha Highway that should have previously been completed by the State DOT.

In Kahuku, the level of service on Kamehameha Highway will downgrade from LOS "C" to LOS "D" during the weekend peak hour of traffic without the Proposed Action. In Kahalu'u the level of service on Kamehameha Highway will downgrade from LOS "D" to LOS "E". In Hale'wa, Kamehameha Highway will continue to operate at LOS "D" during the 2025 weekend peak hour, the same LOS as in 2011, but with traffic volumes from 6-22% higher.

B.1.a. [4] TRAFFIC FACILITY IMPACTS WITH THE PROPOSED ACTION AND THE ALTERNATIVES

The Proposed Action and the Alternatives include the construction of a new primary access road within the Resort (generally parallel to the coast) that intersects with Kamehameha Highway near Kawela Bay, creating a new main entrance for the Resort and the main driveway through the Resort. Kuilima Drive will continue to serve the existing hotel and the Kuilima Estates. In the future, it is contemplated that certain lands in the area commonly referred to as Marconi Road will be conveyed to TBR, improved as part of the Proposed Action, constructed to City standards, and dedicated to the City.

In accordance with Condition No. 7 of the Unilateral Agreement (see Appendix J), the following traffic improvements are required at each of the proposed access intersections on Kamehameha Highway, for either the Proposed Action or the Alternatives:

- Widen westbound Kamehameha Highway to provide an exclusive right-turn lane;
- Widen eastbound Kamehameha Highway to provide an exclusive left-turn lane;
- Widen westbound Kamehameha Highway to provide a right-turn acceleration lane;
- Construct separate left-turn and right-turn lanes on side street approaches to Kamehameha Highway;
- Construct a shared left-turn/through lane and an exclusive right-turn lane on Marconi Road at Kamehameha Highway, if and when the future Kahuku Mauka Agricultural Lots road is constructed by others at the time of improvement;
- Construct bus turnouts in both directions on Kamehameha Highway at each intersection; and
- Signalize the intersections of Kamehameha Highway; when warranted, with protected left-turn phases on Kamehameha Highway.

The traffic impact analysis for the Proposed Action focused on five-year phases to coordinate traffic improvements with the proposed development schedule. In consultation with the staff of the State DOT, it was agreed that the Alternatives would not require phased traffic impact analysis unless one of the Alternatives becomes the preferred plan. At that time, the traffic impact analysis would be updated to reflect the phasing of the new preferred plan.

B.1.a. [5] YEAR 2025 AM PEAK HOUR TRAFFIC WITH THE PROPOSED ACTION

As will be addressed below under the mitigation section, the construction of Kaihalulu Drive and new properly designed intersections at Kawela Bay and Marconi Road are intended to mitigate the impacts of Resort development on Kamehameha Highway traffic conditions in the vicinity of the Resort by pulling a significant amount of vehicles off of Kamehameha Highway before Kuilima Drive, and thus relieving any anticipated traffic congestion on Kuilima Drive. The Kaihalulu Drive, Kuilima Drive, and Marconi Road intersections at Kamehameha Highway are expected to operate at LOS "B". The individual traffic movements at all three intersections are forecast to operate at LOS "C" or better. Kamehameha Highway is forecasted to operate at LOS "D", with a v/c ratio of 0.41 at Kahuku, a v/c ratio of 0.48 at Hale`iwa, and a v/c ratio of 0.57 at Kahaluʻu.

B.1.a. [6] YEAR 2025 PM PEAK HOUR TRAFFIC WITH THE PROPOSED ACTION

During the Year 2025 PM peak hour with the Proposed Action, the intersection of Kaihalulu Drive and Kamehameha Highway is forecast to operate at LOS "C". The left-turn movement from eastbound Kamehameha Highway is expected to operate at LOS "D". The other traffic movements at the intersection are expected to operate at satisfactory levels.

Kuilima Drive and Marconi Road intersections are forecast to operate at an overall LOS "B" at Kamehameha Highway. The individual traffic movements at these intersections are expected to operate at satisfactory levels. Kamehameha Highway is forecast to operate at LOS "D", with a v/c ratio of 0.50 at Kahuku, LOS "E" with a v/c ratio of 0.63 at Haleʻiwa, and an LOS "E" with a v/c ratio of 0.66 at Kahaluʻu.

B.1.a. [7] YEAR 2025 WEEKEND PEAK HOUR TRAFFIC WITH THE PROPOSED ACTION

During the Year 2025 weekend peak hour with the Proposed Action, Kaihalulu Drive and Kamehameha Highway are forecast to operate at overall LOS "C". The left-turn movement from eastbound Kamehameha Highway, westbound through movement, and the southbound left-turn movement are all expected to operate at LOS "D". Kuilima Drive and Marconi Road intersections are forecast to operate at an overall LOS "C" at Kamehameha Highway. The left-turn traffic movements from Kamehameha Highway are expected to operate at LOS "D". The other traffic movements at these intersections are expected to operate at satisfactory levels.

Kamehameha Highway is forecast to operate at LOS "E", with a v/c ratio of 0.63 at Kahuku, a v/c ratio of 0.72 at Haleʻiwa, and a v/c ratio of 0.71 at Kahaluʻu.

B.1.a. [8] YEAR 2025 WITH THE FULL BUILD-OUT ALTERNATIVE

The Full Build-Out Alternative will require the construction of double left-turn lanes on eastbound Kamehameha Highway at Kaihalulu Drive and Kuilima Drive. Within the Resort, Kaihalulu Drive will require four lanes; two lanes in each direction. The Kaihalulu Drive, Kuilima Drive, and Marconi Road intersections on Kamehameha Highway will operate at an overall LOS "C" or better, during the peak hours.

B.1.a. [9] YEAR 2025 WITH THE RESORT RESIDENTIAL ALTERNATIVE

The Kaihalulu Drive, Kuilima Drive, and Marconi Road intersections on Kamehameha Highway will operate at an overall LOS "C", during the peak hours.

B.1.a. [10] YEAR 2025 WITH THE CONSERVATION PARTNER ALTERNATIVE

The Kaihalulu Drive, Kuilima Drive, and Marconi Road intersections on Kamehameha Highway will operate at an overall LOS "C" or better, during the peak hours.

B.1.a. [11] REGIONAL TRAFFIC IMPACTS

The TIAR forecasts that traffic conditions at the Haleʻiwa and Kahaluʻu intersections that establish the limits of the study area will continue to operate at LOS "E" in 2025 due to current

traffic volume growth trends regardless of whether the Proposed Action or one of the three Alternatives is implemented. Table 5-7 (next page) summarizes the data that leads to this finding.

In viewing the data in the above table, it is important to keep the following fact in mind: the Year 2025 traffic forecasts for the Proposed Action include the ambient increase in traffic that would be present even without the Proposed Action or an Alternative. But even more importantly, because the Proposed Action is being constructed over a 14-year period the average annual rate of traffic growth relatively modest. For example, the average traffic volume along Kamehameha Highway during the morning peak hour will only increase by approximately 4.5% on an average annual basis. At the Joseph P. Leong intersection, the volume of morning peak hour traffic will increase by only about 1.7% on an annual average basis as the result of the Proposed Action. And at the Kahalu'u intersection, the morning peak hour increase in traffic volume will be even less; about 0.8%.

In comparing total growth, traffic generated by the Proposed Action is forecast to range from one third to half of the traffic that would have been generated by Full Build-Out of the Resort as permitted by existing entitlements.

B.1. b. Recommended Mitigation Measures

In addition to the construction of Kaihalulu Drive as a new internal Resort roadway and its intersection with Kamehameha Highway to create a new Resort entrance that will relieve forecast traffic congestion at the Kuilima Drive intersection, the roadway improvements discussed in Section B.1.a(4) above were specifically identified when the Resort property was rezoned to allow for expansion to mitigate the impacts of new development as the Full Build-Out Alternative. However, at that time, it was assumed that the Resort expansion would include 3,500 new units. Under the Proposed Action, that number has been reduced to 1,375 new units, but the same improvements are anticipated to be implemented. The provision of traffic signals and dedicated turning lanes will have positive impacts and improve traffic flow in the vicinity of the Resort. But will have less positive impacts and effect on the larger regional traffic conditions.

The Proposed Action will contribute to a significant increase of traffic volumes on Kamehameha Highway over time as built out over approximately 15 years. The current vehicle capacity of Kamehameha Highway is sufficient to handle the ambient and future development vehicle trip contributions as long as mitigation measures are planned and put in place at key intersections along the route. In addition, TBR will employ best traffic management practices to further mitigate the Proposed Action's impact on Kamehameha Highway.

To that end, TBR commissioned Fehr & Peers, a traffic management consulting firm, to prepare a Transportation Demand Management (TDM) analysis that explores methods to make vehicular traffic associated with the Resort more efficient. The findings of that study are summarized below.

Fehr & Peers reviewed the findings of the transportation survey conducted by SMS Research Inc. and the vehicle trip generation methodology prepared by TMC to understand existing conditions at the Resort and to gauge the potential success of new TDM measures.

Table 5-7: Summary of 2012 TIAR Volume / Capacity Analysis

Table 5-7 Traffic Impact Analysis Report - Key Findings Recap
Volume/Capacity Analysis - (Measures Traffic in Terms of Highway Capacity at 1.00 Max)

	Organic Growth w/ out TBR Expansion					Proposed Action Impacts vs Organic				Full Build Out vs Organic			Resort Res. vs Organic			Conservation Part. vs Organic		
	2011 Existing	Level of Service	2025 No Project	Level of Service	2025 Existing vs No Project	2025 No Project	**2025 Proposed Action**	Level of Service	**2025 PA vs No Project**	2025 Full Build Out	Level of Service	2025 FBO vs No Project	2025 Resort Residential	Level of Service	2025 Resort Resd. vs No Project	2025 Conservation Partner	Level of Service	2025 Conservation Part. vs No Project
WEEKDAY AM PEAK																		
Haleiwa 10:45 AM-11:45 AM	0.35	D	0.38	D	8.6%	0.38	0.48	D	26.3%	0.62	E	63.2%	0.43	D	13.2%	0.46	D	21.1%
Kahuku 11:00AM-12:00PM	0.18	C	0.22	C	22.2%	0.22	0.41	D	86.4%	0.59	D	168.2%	0.34	D	54.5%	0.37	D	68.2%
Kahalulu 6:45AM-7:45AM	0.41	D	0.51	D	24.4%	0.51	0.57	D	11.8%	0.61	E	19.6%	0.55	D	7.8%	0.56	D	9.8%
WEEKDAY PM PEAK																		
Haleiwa 2:45 PM-3:45 PM	0.48	D	0.52	D	8.3%	0.52	0.63	E	21.2%	0.78	E	50.0%	0.57	D	9.6%	0.60	E	15.4%
Kahuku 2:00 PM-3:00 PM	0.26	C	0.33	D	26.9%	0.33	0.5	D	51.5%	0.73	E	121.2%	0.40	D	21.2%	0.44	D	33.3%
Kahaluu 3:30 PM-4:30 PM	0.48	D	0.60	E	25.0%	0.6	0.66	E	10.0%	0.72	E	20.0%	0.64	E	6.7%	0.65	E	8.3%
WEEKEND PEAK																		
Haleiwa 11:45 AM-12:45 PM	0.53	D	0.57	D	7.5%	0.57	0.72	E	26.3%	0.90	E	57.9%	0.67	E	17.5%	0.70	E	22.8%
Kahuku 2:00 PM-3:00 PM	0.29	C	0.35	D	20.7%	0.35	0.63	E	80.0%	0.79	E	125.7%	0.54	D	54.3%	0.57	D	62.9%
Kahaluu 2:15 PM-3:15 PM	0.50	D	0.61	E	22.0%	0.61	0.71	E	16.4%	0.79	E	29.5%	0.69	E	13.1%	0.70	E	14.8%

T.I.A.R. Trip Generation forecasted traffic volumes based on expressed in terms of vehicles per hour (vph).

	Organic Growth w/ out TBR Expansion					Proposed Action Impacts vs Organic				Full Build Out vs Organic			Resort Res. vs Organic			Conservation Part. vs Organic		
	2011 Existing	Level of Service	2025 No Project	Level of Service	2025 Existing vs No Project	2025 No Project	**2025 Proposed Action**	Level of Service	**2025 PA vs No Project**	2025 Full Build Out	Level of Service	2025 FBO vs No Project	2025 Resort Residential	Level of Service	2025 Resort Resd. vs No Project	2025 Conservation Partner	Level of Service	2025 Conservation Part. vs No Project
WEEKDAY AM PEAK																		
Haleiwa 10:45 AM-11:45 AM	1,059	D	1,142	D	7.8%	1,142	1,444	D	26.4%	1,865	E	63.3%	1,306	D	14.4%	1,384	D	21.2%
Kahuku 11:00AM-12:00PM	517	C	640	C	23.8%	640	1,199	D	87.3%	1,717	D	168.3%	979	D	53.0%	1,084	D	69.4%
Kahalulu 6:45AM-7:45AM	1,178	D	1,455	D	23.5%	1,455	1,613	D	10.9%	1,735	E	19.2%	1,569	D	7.8%	1,597	D	9.8%
WEEKDAY PM PEAK																		
Haleiwa 2:45 PM-3:45 PM	1,443	D	1,548	D	7.3%	1,548	1,919	E	24.0%	2,479	E	60.1%	1,722	D	11.2%	1,842	E	19.0%
Kahuku 2:00 PM-3:00 PM	712	C	896	D	25.8%	896	1,473	D	64.4%	2,164	E	141.5%	1,166	D	30.1%	1,297	D	44.8%
Kahaluu 3:30 PM-4:30 PM	1,519	D	1,877	E	23.6%	1,877	2,072	E	10.4%	2,258	E	20.3%	2,005	E	6.8%	2,040	E	8.7%
WEEKEND PEAK																		
Haleiwa 11:45 AM-12:45 PM	1,571	D	1,667	D	6.1%	1,667	2,132	E	27.9%	2,605	E	56.3%	1,990	E	19.4%	2,067	E	24.0%
Kahuku 2:00 PM-3:00 PM	871	C	1,046	D	20.1%	1,046	1,842	E	76.1%	2,304	E	120.3%	1,591	D	52.1%	1,679	D	60.5%
Kahaluu 2:15 PM-3:15 PM	1,489	D	1,826	E	22.6%	1,826	2,139	E	17.1%	2,406	E	31.8%	2,056	E	12.6%	2,114	E	15.8%

Of the approximately 509 total employees working at the Resort at the time of the traffic surveys in 2011, the majority of the Resort employees live on the north side of Oahu and are distributed as follows: Kahuku (117), Halei'wa (100), Waialua (92), Wahiawā (50), Lā'ie (49), and Hau'ula (43). The remaining employees live in locations throughout central and southern O'ahu.

The existing uses at the Resort include 500 hotel rooms and 368 condominium units at Kuilima Estates (including two managers units). As discussed above, these uses generate a total of 298 vehicle trips during the weekday morning peak hour, 341 trips during the weekday afternoon peak hour and 390 trips during the Saturday midday peak hour based on October 2011 traffic counts at the Resort driveway conducted by TMC.

A significant portion of the trips generated by the hotel is pass-by trips and not primary trips to the Resort as evidenced by the interview survey of Resort patrons conducted by SMS Research. Pass-by trips are made by vehicles that are already traveling on Kamehameha Highway and are destined for another North Shore or Windward location; however, these vehicles make an impromptu stop at the Resort to shop, eat at a restaurant, use the restroom facilities, or to access the beach. While these trips are part of the total driveway volume, <u>they are not new trips to the adjacent highway</u> and would travel by the site even if the Resort did not exist.

The Traffic Study indicates proposed new development will increase proportionate to development and the average total number of vehicle trips to the site at the following levels assuming no substantive change in Resort vehicle trip rates:

Weekday AM peak hour:	852 *new* trips
Weekday PM peak hour;	867 *new* trips
Saturday midday peak hour:	992 *new* trips.

These volumes will approach and depart the site in both directions on Kamehameha Highway and represent a substantial increase in volume over existing conditions.

To minimize the number of existing and new trips generated by the Resort, TDM measures are planned to be implemented as each program is deemed feasible and effective. These programs described below would provide Resort users (employees, residents, part-time residents and guests) with options for mobility both within the Resort and to nearby attractions in North Shore, residential neighborhoods, commercial centers and Windward communities.

The following strategies and incentives are intended to encourage guests, employees, and community members of the Resort to walk, bicycle, use public transportation, carpool, or use other alternatives to driving alone when traveling to and from the Resort. In general, travel demand management supports enhanced mobility by using existing transportation systems, boosts economic efficiency of the current transportation infrastructure, improves air quality, saves energy, and reduces traffic congestion.

Convenience and cost are the primary factors that affect a person's choice of transportation mode. Measures that work well for some people do not work as well for others. Therefore, an effective TDM Program needs to provide multiple options and incentives that are flexible enough to allow customization to meet the varied needs of individuals. The proposed program presents an array of strategies and measures that can meet the needs of the future Resort guests, residents, and employees.

One of the most effective ways to reduce vehicle trips for Resort guests is to encourage alternatives to renting a car from the first day they arrive in Honolulu and combining trips with other guests, employees and/or residents. Several modes of transportation from Honolulu to Turtle Bay were evaluated to understand the cost implications of each travel mode choice. There is currently a perception that taking a shuttle or a taxi to the Resort is much more expensive than renting a car. However, research shows that shuttle and taxi service are currently competitive in price but may still be viewed as less convenient.

In addition to evaluating available travel alternatives, Fehr & Peers evaluated provision of additional transit or shuttle service between the airport and Turtle Bay. The two main options evaluated were service buy-ups from TheBus and contracted shuttle service. Service buy-ups would involve the Resort paying TheBus to increase and improve route (minimize stops) service to Turtle Bay. Service hours added to increase service frequency would be paid for by the Resort, but all service would be provided by TheBus. Contracted shuttle service was also considered with varying levels of service frequency including 15 minute, 30 minute, hourly, and on-demand. The following table estimates the cost to the Resort of providing transit service.

An additional option for shuttle service is to contract with an existing shuttle service provider using a voucher system to pay for the shuttle service that is already being provided.

Table 5-8: Summary of Shuttle Van / Bus Alternatives

Shuttle Service Frequency	Number of vehicles Needed	Max Daily Passengers (6 per van)	Comments
15 minute	8	336	No scheduling needed / avg 7.5 minute wait
30 minute	4	168	No scheduling needed / avg 15 min wait
60 minute	2	84	No scheduling needed / infrequent service
On Demand	4	168	Scheduling needed / quick service
TheBus service buy up to double frequency	10		Frequent slow service with multiple stops

The Resort's trip generation is largely influenced by numbers and types of guests that arrive via Honolulu International Airport. The ability to provide high-amenity feasible shuttle service to and from the airport to Turtle Bay and back will be a key TDM strategy moving forward.

Once guests arrive at the Resort without their private vehicle, several options are available for exploring the North Shore. As described in Chapter Two of the SEIS, bike rentals, moped rentals, and Segway tours provide great options for short trips within or near the Resort. However, provision of a Resort shuttle to bring people to popular destinations such as restaurants and shopping in Haleʻiwa, North Shore Beaches, Waimea Valley and the Polynesian Cultural Center in Lāʻie will ease concerns that not renting a car would result in limited activity outside the Resort. While many guests will enjoy all of the amenities at the Resort (e.g. golf, tennis, swimming, surfing, etc.) guests will make periodic trips to off-site destinations during the course of their Resort stay. Another support feature to make the shuttle initiative effective is to have on-site rental or flex car options available. Currently, Enterprise Rental Car provides rental services by the day, but TDM strategies contemplate expanded service to allow for hourly rental car options for users who need less than a day worth of rental.

All of the TDM strategies can be marketed as the best way to travel to the Resort from the first visit to the Resort website. The website currently lists driving directions to the Resort. This can be improved by listing the options currently available for travel between the airport and the Resort, as well and from the Resort to popular destinations.

In addition to revamping the travel section of the website, combined lodging and transportation packages will be created. Packages that include transportation options such as shuttle vouchers, bus passes for the duration of the trip, and Segway, bike, or moped rentals allow people to customize and plan their transportation in a one-stop-shopping manner.

While encouraging Resort guests to travel without a private vehicle for their entire trip is important, to reduce vehicle trips to the Resort, employee-focused TDM will also be implemented as part of the overall TDM strategy. Several of the strategies discussed may encourage employees to switch from a private automobile to a different mode. For example, the concept of service buy-ups with TheBus could be applied to routes through areas where employees live. Buy-ups could coincide with typical shift change times. In addition, the Resort will consider providing complimentary or reduced rate bus passes to employees. Bus pass programs are often paired with a guaranteed ride home program to ease concerns about emergency trips or last minute schedule changes. The guaranteed ride home program does exactly what it says and ensures that if employees get in a bind, they will be able to call a cab or other form of costs effective transportation service and be reimbursed for the expense if there was not transit service available to fulfill their travel need.

To help address questions and concerns about any of the transportation options available to Turtle Bay, a transportation coordinator position is planned to be created and staffed or contracted. This person would be in charge of the TDM marketing, shuttle or transit service

coordination, transportation and lodging packages, and any other transportation-related questions Resort guests and employees might have. Including organization of a Transportation Management Association on the north shore to better coordinate regional traffic management issues and concerns.

For any of the transit alternatives, encouragement through marketing and other information distribution will be critical to successfully transitioning the "norm" from using a private automobile to using shuttles and other alternatives to private vehicle trips.

In summary, the following steps planned to be taken by the Resort to implement a successful TDM strategy that will encourage employees and guests to get out of their cars and generally enhance the experience for all Turtle Bay residents, neighbors, visitors, and employees.

- **Airport Shuttle or Transit Service:** Build a relationship with a transit or shuttle service provider to provide quality transit service for guests.
- **Resort Shuttle Service:** Contract with a service provider to provide shuttle service from the Resort to popular destinations on the island once a certain level of new development is in place creating the necessary economy of scale to make this strategy feasible.
- **Transportation Marketing Online:** Update the transportation section of the Resort website to include all options available for transportation to and from the Resort.
- **Lodging and Transportation Packages:** Create lodging and transportation packages that make using alternatives to the private automobile easy and convenient.
- **Employee Focused Service Buy-Ups:** Engage in conversations with TheBus service to improve service during strategic employee shift change times to encourage employees to travel using transit.
- **Employee Transit Pass Program:** Develop an employee transit pass program that provides reduced rate or complementary transit passes to Resort employees.
- **Guaranteed Ride Home Program:** Set up some form of feasible guaranteed ride home program in conjunction with the employee transit pass program.
- **Transportation Coordinator:** Staff or hire a Transportation Coordinator to manage the TDM programs listed here, facilitate the relationships with shuttle and transit service providers, create lodging and transportation packages, and be available for Resort guest and employee questions about transportation to and from the Resort.

Based on the trip generation estimates for new development presented in the SEIS, implementation of the TDM program described above is expected to reduce traffic volumes by at least 125 to 150 trips during the peak hours. An additional reduction of approximately 40 trips could be achieved from existing volumes. The combination of these reductions would help to minimize impacts to Kamehameha Highway and the rest of the affected roadway system.

To prove the effectiveness of the TDM strategies, TBR recognizes the importance of a traffic count monitoring program and surveys that will be conducted at logical intervals to measure vehicle trips and travel behavior. The results of the monitoring program could be used to identify reduced or increased traffic improvements over time and would be helpful in modifying the TDM measures to maximize effectiveness.

In addition to these TDM measures, TBR will continue to work with the staff of the State DOT to and City DTS to address regional traffic improvements and strategies. The TIAR prepared for the SEIS provides a mechanism for TBR and the State DOT to determine collaboratively the fair and reasonable contribution that TBR should make towards regional traffic improvements. These "fair share" improvements could include, but are not limited to, the provision of turning lanes or traffic signals elsewhere in the traffic study area.

B. 2. Acoustic Environment

The acoustic impacts of the Proposed Action are related to two principle areas of concern; noise created by vehicular traffic and noise created by construction activities.

B.2. a. Impacts of Future Traffic Noise

The future traffic noise levels and potential traffic noise impacts associated with the Proposed Action were examined by calculating future traffic noise levels in 2025 along Kamehameha Highway, Kuilima Drive, Marconi Road, and the proposed Kaihalulu Drive with and without the Proposed Action. Future traffic noise levels were also compared to existing noise conditions discussed in Chapter Two of the SEIS.

As indicated in Table 5-9, by 2025, if the Proposed Action were not implemented, traffic noise levels on Kamehameha Highway are projected to increase by 1.0 DNL. If the Proposed Action is implemented as described in Chapter Three of the SEIS, traffic noise levels on Kamehameha Highway in the areas fronting the project are predicted to increase by 0.2 to 3.3 DNL over and above the ambient traffic noise levels. The result will be a total increase of 1.2 to 4.3 DNL. These increases in traffic noise levels are considered to be moderate to high, and reflect the growth in forecasted project and non-project traffic in the project environs by 2025.

Table 2-29 summarizes the predicted increases in the future setback distances to the 65, 70, and 75 DNL traffic noise contour lines along the roadways in the project environs and attributable to both project plus non-project traffic in 2025 under the Proposed Action. The setback distances in Table 2-29 do not include the beneficial effects of noise shielding from terrain features and buildings, or the detrimental effects of additive contributions of noise from intersecting streets.

As indicated in Table 2-29, the setback distances to the 65 DNL contour are predicted to range from 81 to 173 FT from the centerline of Kamehameha Highway following project build-out in CY 2025 under the Proposed Action. The setback distances to the 65 DNL contour are predicted to increase from 23 to 33 feet from the centerline of Kuilima

Table 5-9: Calculations of Project and Non-Project Traffic Noise Contributions (CY 2025) (PM Peak Hour LEQ or DNL)

STREET SECTION	NOISE LEVEL INCREASE DUE TO: NON-PROJECT TRAFFIC	PROJECT TRAFFIC
Kamehameha Hwy. West of Kaihalulu Dr. (Posted 35 mph)	1.0	2.6
Kamehameha Hwy. West of Kaihalulu Dr. (Posted 45 mph)	1.0	3.3
Kaihalulu Dr. At Kamehameha Hwy.	N/A	16.2
Kamehameha Hwy. from Kaihalulu to Kuilima (With Median)	1.0	1.8
Kamehameha Hwy. from Kaihalulu to Kuilima (W/O Median)	1.0	0.2
Kamehameha Hwy. East of Kuilima Dr. (Posted 35 mph)	1.1	2.4
Kamehameha Hwy. East of Kuilima Dr. (Posted 45 mph)	1.1	3.1
Kuilima Dr. At Kamehameha Hwy.	0.8	2.4
Kamehameha Hwy. West of Marconi Dr. (Posted 35 mph)	1.1	2.4
Kamehameha Hwy. West of Marconi Dr. (Posted 45 mph)	1.1	3.1
Kamehameha Hwy. East of Marconi Dr. (Posted 35 mph)	1.2	2.3
Kamehameha Hwy. East of Marconi Dr. (Posted 45 mph)	1.2	3.0
Marconi Rd. At Kamehameha Hwy.	0.0	8.4

Notes:

1. With medians and 35 mph posted within 600' of intersections on Kamehameha Highway.
2. Without medians and 45 mph posted beyond 600' of intersections on Kamehameha Highway, except 35 mph posted between Kuilima Dr. and Kaihalulu Dr.
3. At 50' from centerline of Kaihalulu Dr., future traffic noise levels predicted to be 16.2 DNL above existing background noise levels.

Drive following project build-out in CY 2025. Along the proposed Kaihalulu Drive access road through the project site, the setback distance to the 65 DNL contour is predicted to be approximately 29 feet from the centerline of that roadway.

Table 5-10 presents the predicted traffic noise levels resulting from both non-project and project traffic on Kamehameha Highway, Kuilima Drive, and Kaihalulu Drive by CY 2025 at various noise sensitive receptor locations in the project environs. The applicable locations of the noise sensitive receptors in the project environs are shown in Figure 5-5. As indicated in Table 3-10, future traffic noise levels at existing and planned noise sensitive locations along Kamehameha Highway in the project environs are expected to exceed 65 DNL without noise mitigation measures. Existing residences west of Kawela Bay and two existing residences located approximately 0.7 miles east of Kuilima Drive are predicted to experience future traffic noise levels greater than 65 DNL.

Primarily as a result of forecasted traffic along Kamehameha Highway, future traffic noise levels at the Resort Residential (RR-1 and RR-2b) lots at locations W1, W2, W3, and W5 which front the highway are predicted to exceed the 65 DNL FHA/HUD noise standard. Due to even smaller setback distances from the highway, the Park (P-1) west of the Resort Residential (RR-1) lots will also experience traffic noise levels greater than 65 DNL.

Table 5-10: Predicted Traffic Noise Levels at Various Receptor Locations (4.92 ft. High Receptor, 2025 DNL, With Proposed Action)

RECEPTOR LOCATION	SETBACK DIST. FROM EXIST. C.L.	2025 DNL W/O MITIGATION	2025 DNL WITH MITIGATION
Receiver #W1 (RR-1)	110 FT	66.9	61.0
Receiver #W2 (RR-1)	120 FT	66.4	60.2
Receiver #W3 (RR-1)	120 FT	65.9	60.2
Receiver #W4 (RR-2b)	135 FT	63.8	N/A
Receiver #W5 (RR-2b)	115 FT	65.1	60.4
Receiver #W6 (RR-2b)	310 FT	58.2	N/A
Receiver #E1 (TMK: 5-6-003:036)	48 FT	72.1	64.9
Receiver #E2 (TMK: 5-6-003:036)	106 FT	65.7	60.9
Receiver #E3 (RES-2)	110 FT	64.9	N/A
Receiver #E4 (RES-2))	120 FT	64.1	N/A
Receiver #E5 (RES-2)	454 FT	53.1	N/A

Notes:

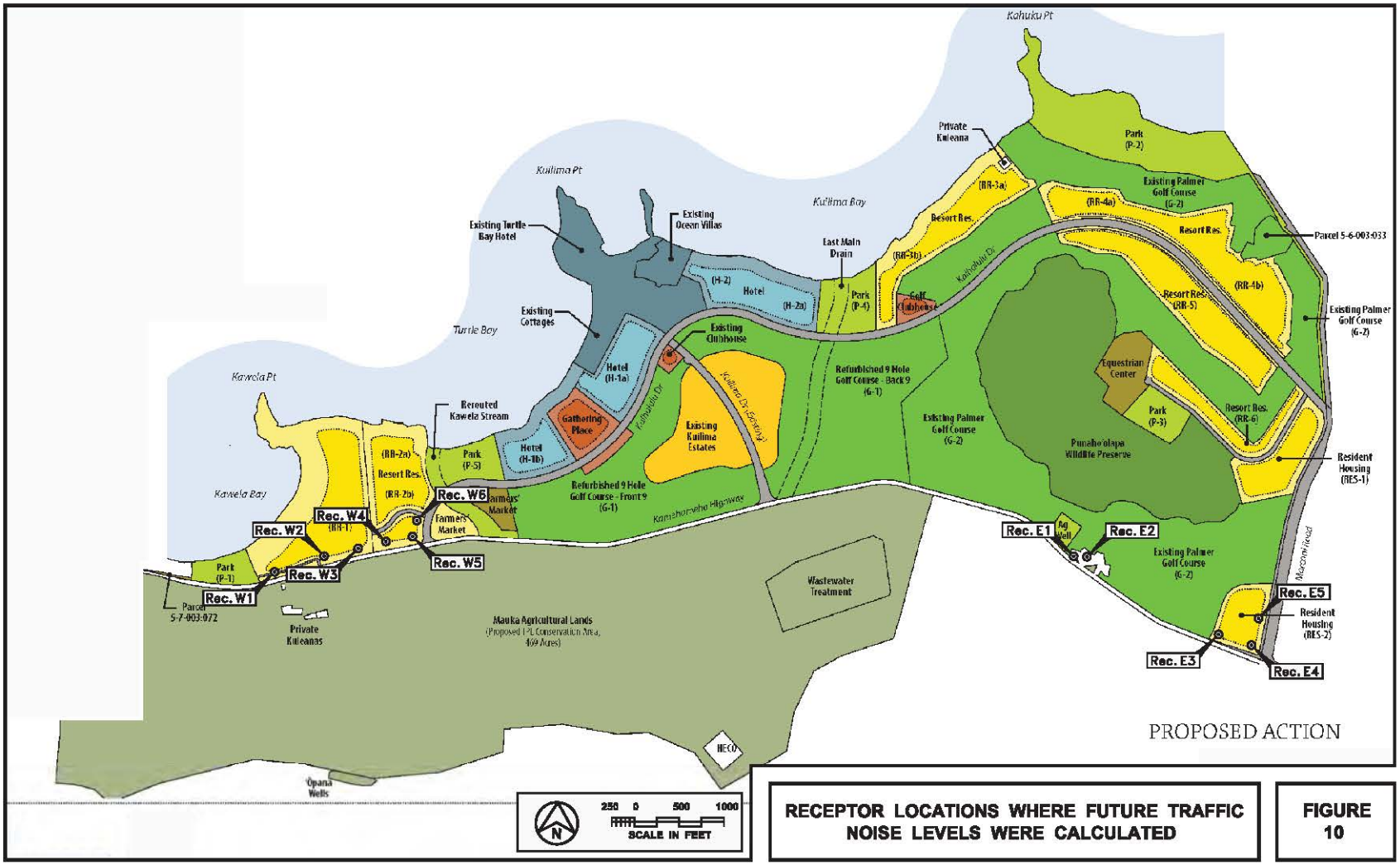
1. Traffic noise levels include contributions from intersecting roadways.
2. "Loose Soil" ground attenuation assumed.
3. Minimum 6 foot high sound attenuation walls assumed for noise mitigation.

The proposed Resident Housing (RES-2) lots at locations E3, E4, and E5 west of the Marconi Road intersection should experience traffic noise levels which do not exceed the FHA/HUD standard of 65 DNL. Noise levels above the 65 DNL FHA/HUD noise standard are also expected at the two existing residences (E1 and E2) 0.7 miles east of the Kuilima Drive intersection. At one of the residences (E1), existing traffic noise levels currently exceed 65 DNL.

Along Kamehameha Highway west of the project to Pahipahi'ālua Beach Park, the number of existing residences which experience traffic noise levels greater than 65 DNL will increase from thirteen to eighteen by 2025 under the Proposed Action. As presented in Table 2-29, the setback distance to the 65 DNL contour in this residential area west of the project is predicted to increase from 75 to 122 foot setback distance to the highway centerline.

Along Kuilima Drive, and probably along the new Kaihalulu Drive, existing and future residences are predicted to experience traffic noise levels below 65 DNL.

Figure 5-5: Receptor Locations Where Future Traffic Noise Levels Were Calculated



RECEPTOR LOCATIONS WHERE FUTURE TRAFFIC NOISE LEVELS WERE CALCULATED

FIGURE 10

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B.2. b. Recommended Mitigation Measures

Increases in traffic noise levels along Kamehameha Highway that are attributable to the Proposed Action are considered to be in the moderate to high category, and are greater than the traffic noise level increases of approximately 1.0 DNL expected as a result of non-project traffic. Except for the two existing residences east of Kuilima Drive, the lands along the highway Rights-of-Way are generally vacant between Kawela Bay and Marconi Road. The closest noise sensitive residences beyond the project area are located west of Kawela Bay.

Along public roadways, where traffic noise levels result from both project and non-project traffic, traffic noise mitigation measures are typically implemented by private land owners. Government agencies (such as the Hawaii State Department of Transportation, Highways Division) typically address traffic noise impacts within the limits of construction during public roadway improvement projects, and include traffic noise mitigation measures if they are considered to be "reasonable and feasible."

At noise sensitive receptor locations W1, W2, W3, W5, E1, and E2 (see Figure 5-5), future traffic noise levels with the Proposed Action are predicted to exceed the 65 DNL FHA/HUD noise standard. At locations W1, W2, W3, E1, and E2, a possible reduction in the posted speed limit from 45 miles per hour to 35 miles per hour would reduce predicted traffic noise levels by approximately 2 DNL and to levels below the 65 DNL FHA/HUD noise standard at locations W3, W5, and E2. Predicted future traffic noise levels at receptor locations W1, W3, and E1 would still remain above 65 DNL with or without a 10 mile per hour reduction in the posted speed limit.

Other possible traffic noise mitigation measures are:

- increasing the setback distances of the receptors from the highway;
- constructing sound attenuating walls or berms between the highway and the receptors; or
- closure and air conditioning of the affected dwellings.

Increasing the setback distances of future Resort residences to 122 FT from the centerline of Kamehameha Highway should be considered as a possible noise mitigation measure. Alternately, the addition of approximately 6 FT high sound attenuating walls (or berms) would reduce future traffic noise levels below 65 DNL at single story structures in the Resort Residential area and at the two existing residences at locations E1 and E2. For two story (or higher) structures, the wall/berm height requirements increase due to the higher elevations of receptors on the upper floors. Whenever mitigation of traffic noise at the upper floors are required, the use of closure and air conditioning, or the use of sound attenuating windows are the more appropriate sound attenuation measures.

At existing receptor locations W1, W2, W3, W5, E1, and E2, the effectiveness of sound attenuating walls was examined. These results are shown in Table 3-10. Driveways to each

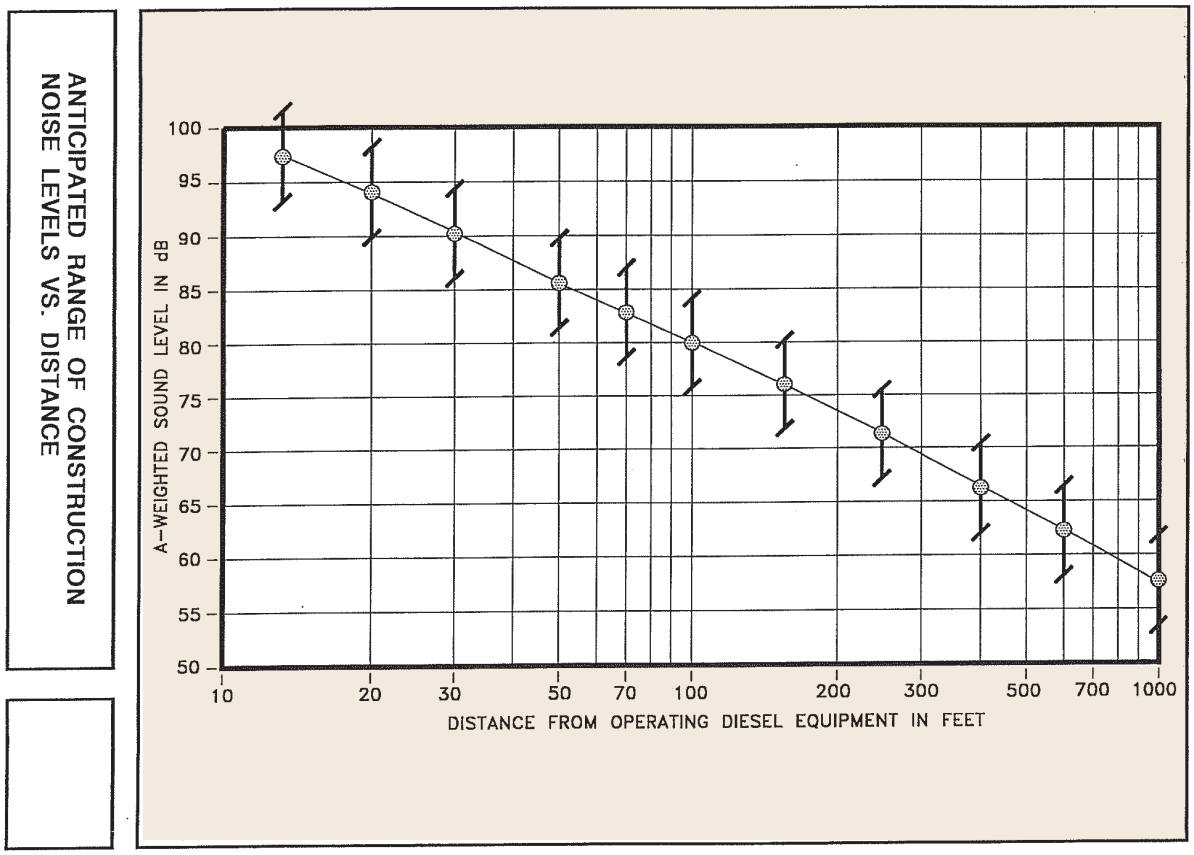
residence will limit the sound attenuation performance of 6 FT high walls to approximately 4 to 7 dB, but these levels of attenuation should be sufficient to reduce future traffic noise to levels below 65 DNL at the affected dwellings.

B.2. c. Impacts of Future Construction Noise

Audible construction noise will probably be unavoidable during the entire project construction period. The total time period for construction is approximately 11 years under the Proposed Action, but it is anticipated that the actual work will be moving from one location on the project site to another during that period. Actual length of exposure to construction noise at any receptor location will probably be less than the total construction period for the entire project.

Typical levels of noise from construction activity (excluding pile driving activity) are shown in Figure 5-6. Risks of adverse noise impacts during construction are highest at the existing hotel Cottages and Ocean Villas, and the existing residences at Kuilima Estates. Adverse impacts from construction noise are not expected to be in the "public health and welfare" category due to the temporary nature of the work and due to the administrative controls available for its regulation. Instead, these impacts will probably be limited to the temporary degradation of the quality of the acoustic environment in the immediate vicinity of the project site.

Figure 5-6: Anticipated Range of Construction Noise Levels vs. Distance



B.2. d. Recommended Mitigation Measures

Elimination of construction noise to inaudible levels will not be practical in all cases due to the intensity of construction noise sources (80 to 90+ dB at 50 FT distance), and due to the exterior nature of the work (grading and earth moving, trenching, concrete pouring, hammering, etc.). The use of properly muffled construction equipment should be required on the job site. The incorporation of State Department of Health construction noise limits and curfew times, which are applicable on the island of Oʻahu, is another noise mitigation measure that can be applied to this project. Figure 5-7 on the next page presents the normally permitted hours of construction for construction noise as well as the curfew periods for construction noise. Noisy construction activities are not allowed on Sundays and holidays under the DOH permit procedures.

B. 3. Archaeological Resources

B.3. a. Impacts

The archaeological resources have been identified through the comprehensive archaeological studies that have been conducted over the last 30 years on the Resort lands. The Supplemental Archaeological Inventory Survey (see Appendix C) supplements and updates the extensive archaeological work completed to date. Although the original archaeological inventory survey technically did not need to be supplemented for the SEIS, TBR determined that it was the most prudent course of action to supplement and update it because of the sensitive nature of historic resources, in particular *iwi kūpuna*. The SAIS incorporated the extensive data from previously conducted archaeological studies, complied with relevant historic preservations laws and regulations, and consultation with various stakeholders. The intention of the SAIS was to take a proactive approach to ensure the protection of cultural resources within the proposed development. The SAIS employed a program of extensive systematic and discretionary archaeological test excavations, both mechanical and manual, for undeveloped areas of the property where substantial construction related excavations are planned.

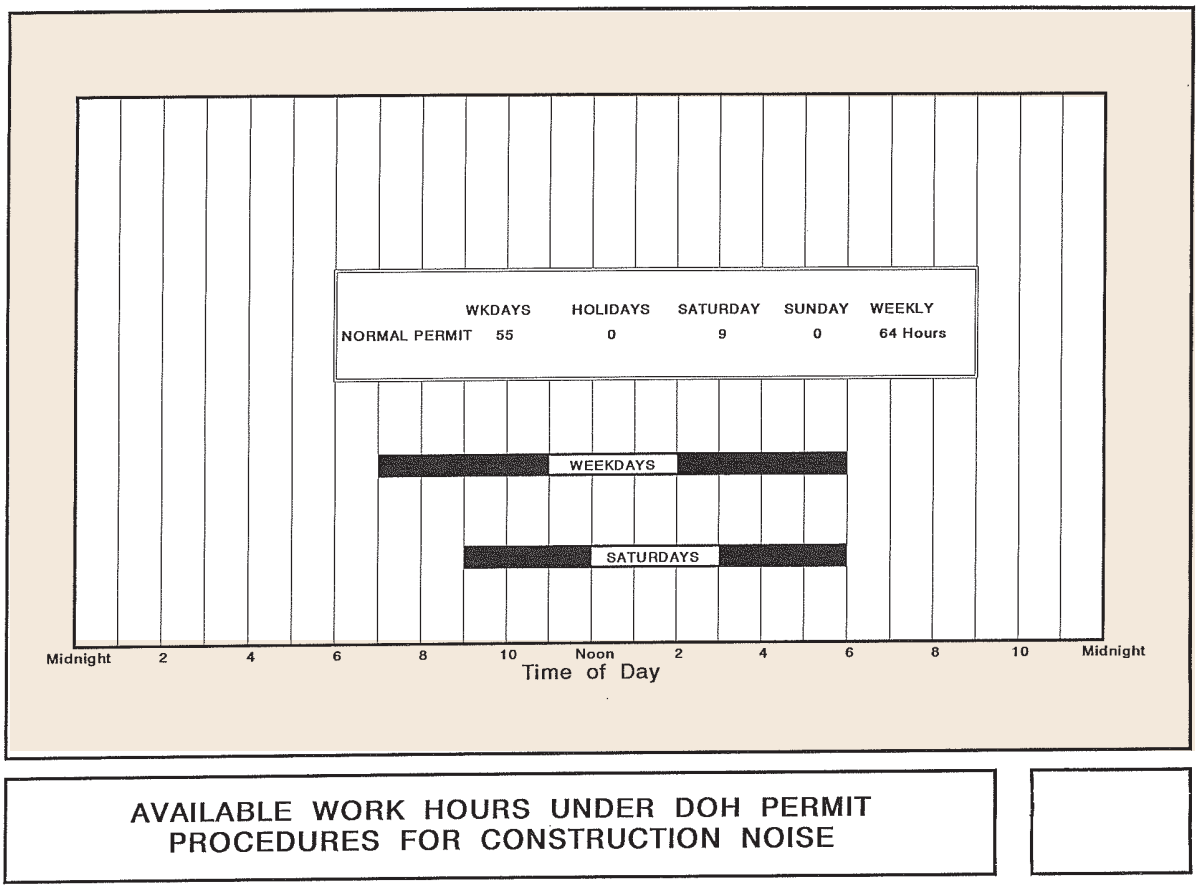
For the purposes of the SEIS, it is assumed that all identified sites that are deemed to be significant by SHPD will be preserved to the extent required by the agency in conformance with the requisite treatment plans.

B.3. b. Recommended Mitigation Measures

The SAIS was not only an attempt to identify potential archaeological resources, including *iwi kūpuna*, but it was also an attempt to avoid adversely impacting archaeological and cultural resources during the implementation of the proposed action. In the case of *iwi kūpuna*, the better course of action is avoidance rather than mitigation.

The mitigation of impacts to archaeological sites includes three procedural steps: consultation, significance assessment, and recommended treatment. It is an ongoing process that ultimately requires approval by the State Historic Preservation Division of the DLNR. All three of these steps have now been completed and the draft SAIS has been submitted to the SHPD for review and approval.

Figure 5-7: Available Work Hours Under DOH Permit Procedures for Construction Noise



B.3.b. [1] ARCHAEOLOGICAL CONSULTATION

An initial step in developing a program to mitigate potential impacts to archaeological resources is to ensure that all parties with a direct interest are properly consulted.

The SAIS Plan was prepared in consultation with DLNR-SHPD and the Office of Hawaiian Affairs (OHA). Consultation ensures that the work complies with applicable laws, regulations and rules; and that the Plan reflects a mutually acceptable scope of work for the SAIS fieldwork prior to implementation.

Consultation with the Oʻahu Island Burial Council (OIBC) included an informational briefing regarding the SAIS work to solicit input regarding the study, and to identify any additional interested parties. DLNR-SHPD approved the SAIS report plan submitted.

Public notices seeking to identify interested parties, including lineal and cultural descendants, were published in Honolulu Star-Advertiser (May 5, 2011 and July 2, 2012) and the monthly OHA newsletter Ka Wai Ola (June 2011 and July 5, 2012). Two responses to the notices were received, including one individual who owns a kuleana parcel within the Resort property.

The consultation process sought input from interested organizations and individuals, including the local community, Hawaiian cultural organizations, recognized lineal and cultural descendants and individuals knowledgeable about the Resort property cultural resources and land use history. Most of this consultation is part of the Cultural Impact Assessment (CIA) prepared by Pacific Legacy, Inc. for the Resort property and was conducted in accordance with HAR §13-13-284-(c)-(3) and §13-13-276-5-(g).

The CIA study (which is discussed in the following Section) concluded:

> ***In summary, the Turtle Bay Resort property contains an array of cultural resources that are currently being used for traditional cultural practices, including marine food sources, medicinal plants, plants used in crafts, wood for woodcarving, and salt for various uses. The presence of human burials on the property has also been established. Furthermore, supernatural and/or divine phenomenon in the project area experienced by a few informants and acknowledged by others, suggests that there is still cultural significance and spiritual connection for those who have ancestral ties to the land (Mooney and Cleghorn 2012:75).***

SAIS consultation included TBR management meetings with the Kahuku Burial Committee (KBC), composed of families who have a connection to Resort lands and who have expressed a desire to take an active role in caring for ancestral remains on the property. Consultation also included TBR management meetings with OHA and with the Koʻolau Loa and Koʻolau Poko Hawaiian Civic Clubs. TBR management has invited cultural practitioners, kūpuna and knowledgeable individuals to be part of a cultural advisory council to share their *manaʻo* on the cultural issues associated with TBR.

The KBC was consulted concerning SAIS identification of all human remains. KBC members provided appropriate cultural protocols for the isolated human remain discovered at Site 4488 in Test Area C and the burials in Test Area B (Site 7288) and Test Area D (Site 7289).

B.3.b. [2] SIGNIFICANCE ASSESSMENTS

Pursuant to DLNR (2003) Chapter 275-6 (d), the initial significance assessments provided in the SAIS are not final until concurrence from the DLNR has been obtained. The report has been submitted and is under review by DLNR-SHPD.

The sites documented during the survey are assessed for significance based on the criteria outlined in the Rules Governing Procedures for Historic Preservation Review (DLNR 2003: Chapter 275). According to these rules, a site must possess integrity of location, design, setting, materials, workmanship, feeling, and association and shall meet one or more of the following criteria:

- Criterion "a". Be associated with events that have made an important contribution to the broad patterns of our history;

- Criterion "b". Be associated with the lives of persons important in our past;
- Criterion "c". Embody the distinctive characteristics of a type, period, or method of construction; represent the work of a master; or possess high artistic value;
- Criterion "d". Have yielded, or is likely to yield, information important for research on prehistory or history; and
- Criterion "e". Have an important traditional cultural value to the native Hawaiian people or to another ethnic group of the state due to associations with traditional cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts--these associations being important to the group's history and cultural identity.

Table 5-11 lists the significance assessments and recommended treatments for the 39 sites documented by the SAIS. Two other sites the Kahuku Point Archaeological Preserve (Site 6411) and Punahoʻolapa Marsh (Site 6412) are also included in the table for a comprehensive list of extant sites on Resort property. These two sites were previously assessed as significant for their research value and approved for data recovery (Walker et al. 1987); however, the landowner subsequently elected to preserve both sites. The remaining 39 sites are all assessed as significant under Criterion "d". The sites have yielded information important for understanding prehistoric and historic land use in project area. Two sites (7261 and Features A, C and D of 7284) are assessed as significant under Criterion "c" as good site type examples because they are the most intact remaining structures on Resort property that are associated with Kahuku Army Airfield. Three sites are additionally assessed as significant under Criterion "e" because human burials of probable Hawaiian ancestry are present (Sites 4488, 7288 and 7289).

B.3.b. [3] RECOMMENDED TREATMENTS

The mapping, written descriptions and photography at 16 sites adequately document them and no further work or preservation is recommended (see Table 3-11). These sites consist of World War II era features (Sites 7265, 7275- 7278, 7281 and 7284-7287), three sites that date to the early 1930s used in conjunction with Marconi Station (Sites 7279, 7280 and 7282), a stone wall (Site 7299), a stone mound (7283) and an abandoned 1950s era bus (Site 7267).

Treatment of the human remains identified at Sites 4488, 7288 and 7289 will be determined by the Oʻahu Island Burial Council (OIBC) in consultation with the Kahuku Burial Committee, other SHPD-recognized lineal or cultural descendants, and TBR. The determination process will require preparation of a Burial Treatment Plan, which is in process.

Fourteen sites and two features of an additional site are recommended for preservation. These sites consist of the Kahuku Point Archaeological Preserve (Site 6411) and Punahoʻolapa Marsh (Site 6412), the extant section of the Site 5791 railroad grade across the marsh, the Site 7261 military pillbox, and 11 WWII-era sites situated within the boundaries of the Kahuku Point Archaeological Preserve (Sites 7262-7264, 7266 and 7268-7274).

Table 5-11: Site Significance Assessments and Recommended Treatments

SIHP Site No.	Formal type	Function	Area	Significance Criteria	Recommended Treatment
4488	Human remains	Burial	C	D, E	OIBC*
5791	Railroad grade	Transportation	Punahoʻolapa Marsh	D	PR
6411	Cultural deposit with burials	Habitation/Burial	Kahuku Point	D, E	PR
6412	Punahoʻolapa Marsh	Agriculture/Resource Area	Punahoʻolapa Marsh	D	PR
7261	Concrete structure	Gun position	Kawela Bay	C, D	PR
7262	Concrete slab	Indeterminate	Kahuku Point	D	PR**
7263	Concrete pier block	Antenna support?	Kahuku Point	D	PR**
7264	Revetment	Storage	Kahuku Point	D	PR**
7265	Concrete slab	Foundation	F	D	NFW
7266	Concrete pier blocks	Antenna support?	Kahuku Point	D	PR**
7267	Transit bus	Transportation	A	D	NFW
7268	Concrete structure	Indeterminate	Kahuku Point	D	PR**
7269	Concrete structure remnant	Indeterminate	Kahuku Point	D	PR**
7270	Metal tank	Storage	Kahuku Point	D	PR**
7271	Asphalt area	Transportation	Kahuku Point	D	PR**
7272	Concrete structure	Gun position?	Kahuku Point	D	PR**
7273	Concrete block	Indeterminate	Kahuku Point	D	PR**
7274	Concrete cylinder	Possible light fixture base	Kahuku Point	D	PR**
7275	Asphalt area	Runway remnant	E	D	NFW
7276	Concrete block	Anchor base	E	D	NFW
7277	Concrete slab	Foundation	E	D	NFW
7278	Concrete structure	Gun position?	E	D	NFW
7279	Concrete block	Antenna support?	E	D	NFW
7280	Concrete structure	Antenna support?	E	D	NFW
7281	Concrete structure	Gun position?	E	D	NFW
7282	Concrete block	Antenna support?	E	D	NFW
7283	Stone mound	Possible agricultural	F	D	NFW
7284	Foundation Complex	Military Support	F	D	NFW
7285	Metal posts	Gate	F	D	NFW
7286	Asphalt area	Pavement	F	D	NFW
7287	Concrete structures	Gun position?	F	D	NFW
7288	Human remains	Burial	B	D, E	OIBC*
7289	Cultural deposit with burial	Habitation/Burial	D	D, E	DR/OIBC*
7290	Cultural deposit	Habitation	D	D	DR
7291	Cultural deposit	Habitation	D	D	DR
7292	Cultural deposit	Habitation	E	D	DR
7293	Cultural deposit	Habitation	E	D	DR
7294	Cultural deposit	Habitation	E	D	DR
7295	Cultural deposit	Habitation	E	D	DR
7296	Cultural deposit	Habitation	E	D	DR
7299	Wall	Livestock control	Punahoʻolapa Marsh	D	NFW

Signficance Criteria - C = Good site type example, D = Important for information content, E = Cultural Value

Treatments - DR = Data Recovery, PR = Preservation, NFW = No further Work

OIBC = Treatment of human remains to be determined by Oʻahu Island Burial Council*

*PR** = Sites within the Kahuku Point Archaeological Preserve*

The eight remaining sites (Sites 7283 and 7290-7296) and the non-burial portion of Site 7289 retain the potential to yield information important for understanding prehistoric and early historic land use. These sites are recommended for data recovery, which would entail excavation to obtain a larger sample of portable remains and dating samples. The plans for data recovery would be detailed in a Data Recovery Plan prepared for DLNR-SHPD review and approval.

Specific plans for treatment of the burial features would be detailed in a Burial Treatment Plan prepared for DLNR- SHPD and the Oʻahu Island Burial Council (OIBC) review and approval. Measures to protect the non-burial sites recommended for preservation would be described in an Archaeological Site Preservation Plan prepared for DLNR- SHPD review and approval.

It is also recommended that all ground disturbing activities within the project area be monitored by an archaeologist. The extent and nature of this monitoring activity would be described in an Archaeological Monitoring Plan prepared for DLNR-SHPD review and approval. The monitoring plan should have provisions for variable intensity monitoring. The highest intensity would be for areas determined to have an increased potential for encountering cultural deposits (see Figure 2-40). At a minimum, construction excavation work in these areas should be done in a manner that maximizes archaeological monitoring effectiveness. The excavation of sand should be done by excavators and not with bulldozers or graders. Each excavating machine should have at least two monitors; one observing the excavation equipment as it digs and the other scanning the excavated material. TBR has proactively developed its own internal Cultural Management Plan that incorporates the above protocols for monitoring and protection of these resources.

B. 4. Cultural Resources

Based upon the ethnographic interviews conducted for the CIA, (presented in Appendix D) a total of 41 individual cultural resources were identified as currently being gathered from within the Resort property and adjacent coastal waters, including 32 marine species of fish, shellfish, and seaweed as well as sea salt, six plant species, and two tree species. These resources are currently being gathered by an array of Hawaiian cultural practitioners for a variety of traditional activities, including *lāʻau lapaʻau* (herbal healing), *kālai kiʻi* (wood carving), *lei* making, cordage making, and consumption. However, the majority of those interviewed shared that these resources have drastically declined in their lifetimes and are now found in diminutive numbers. Further, many fear the over-harvesting of these resources to the point of extinction and keep the locations of these resources guarded secrets. Several informants fear that any expansion of the Resort will impact the already resource deficient marine and terrestrial gathering areas.

There are three potential alternatives to the Proposed Action, consisting of: the Full Build-Out Alternative, a Resort Residential Only Alternative, and a Conservation Partner Alternative.

B.4. a. Impacts

To address potential impacts to identified cultural resources in the Resort's SEIS Lands, surrounding lands, and coastal waters, the locations of identified cultural resources

Figure 5-8: Marine and Terrestrial Resources in Turtle Bay Resort – Proposed Action

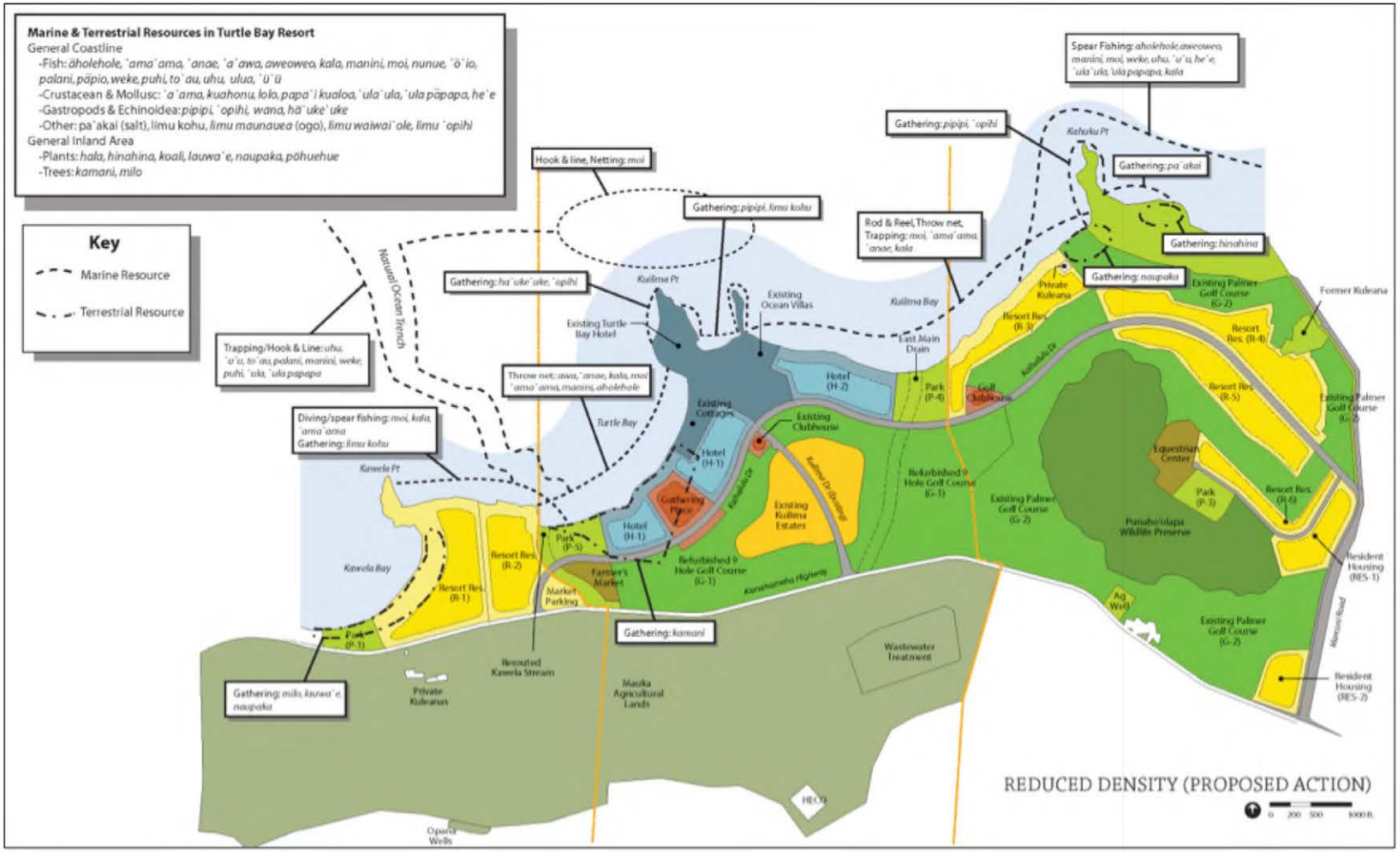


Figure 5-9: Marine and Terrestrial Resources in Turtle Bay Resort – Full Build-Out

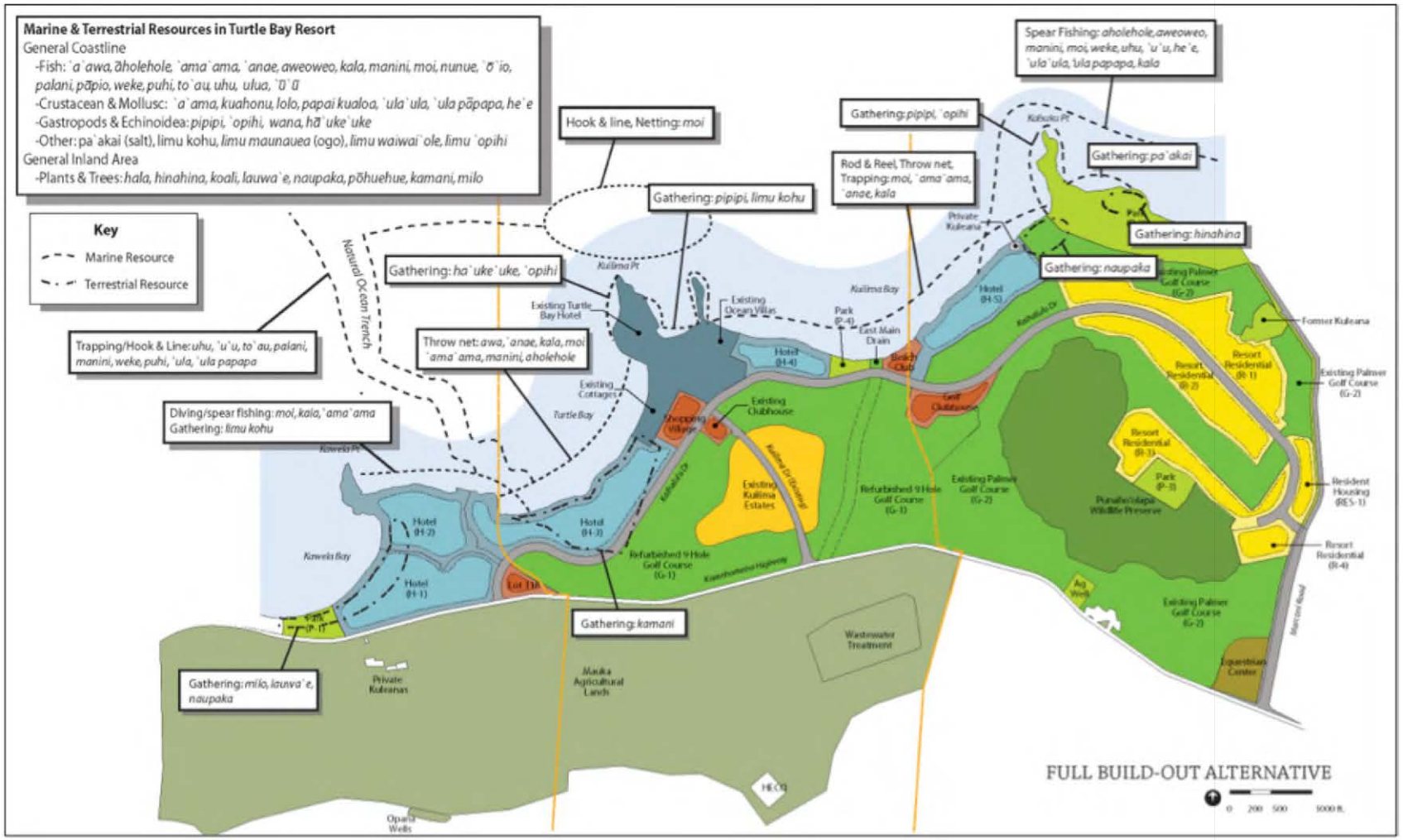


Figure 5-10: Marine and Terrestrial Resources in Turtle Bay Resort – Resort Residential

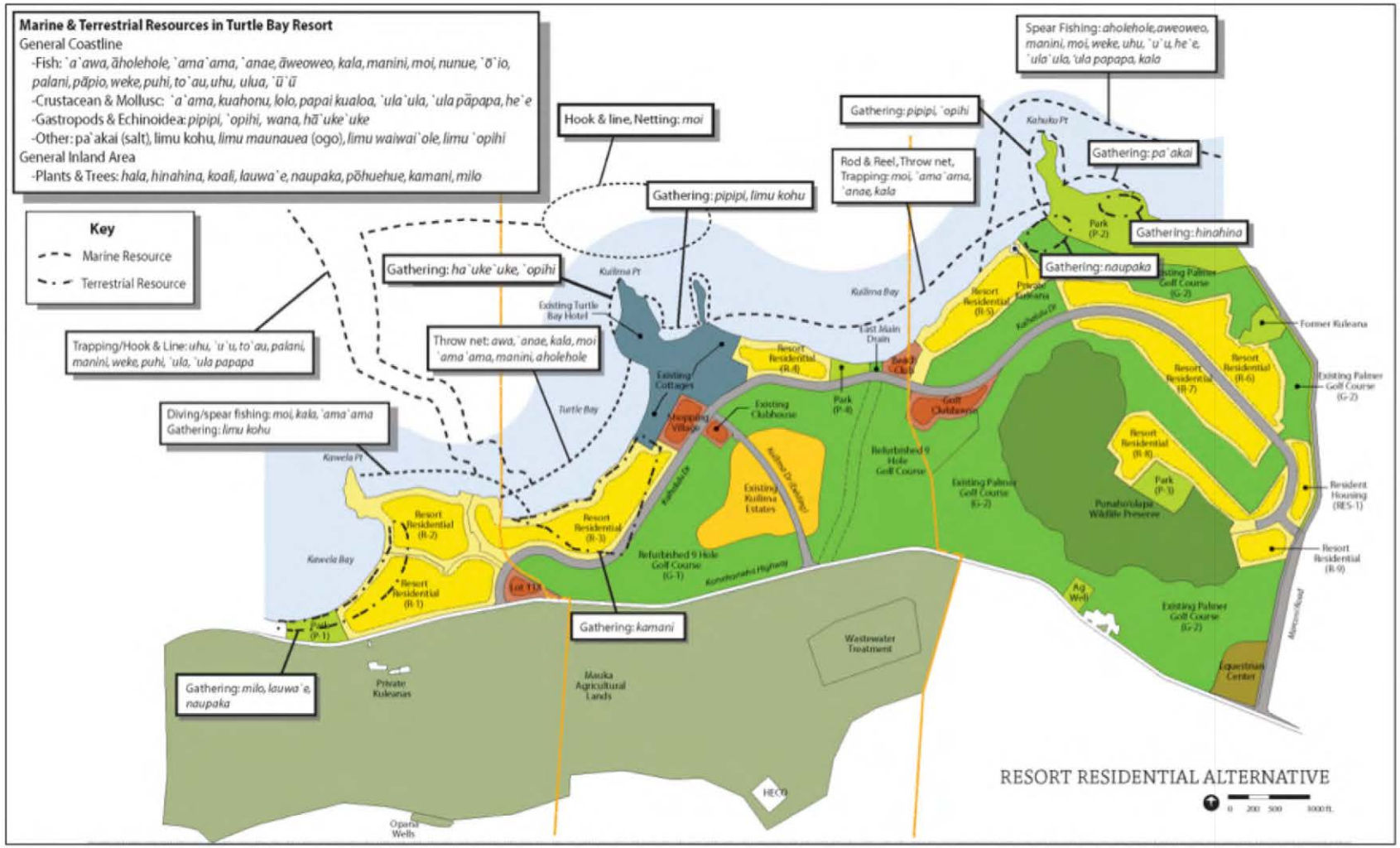
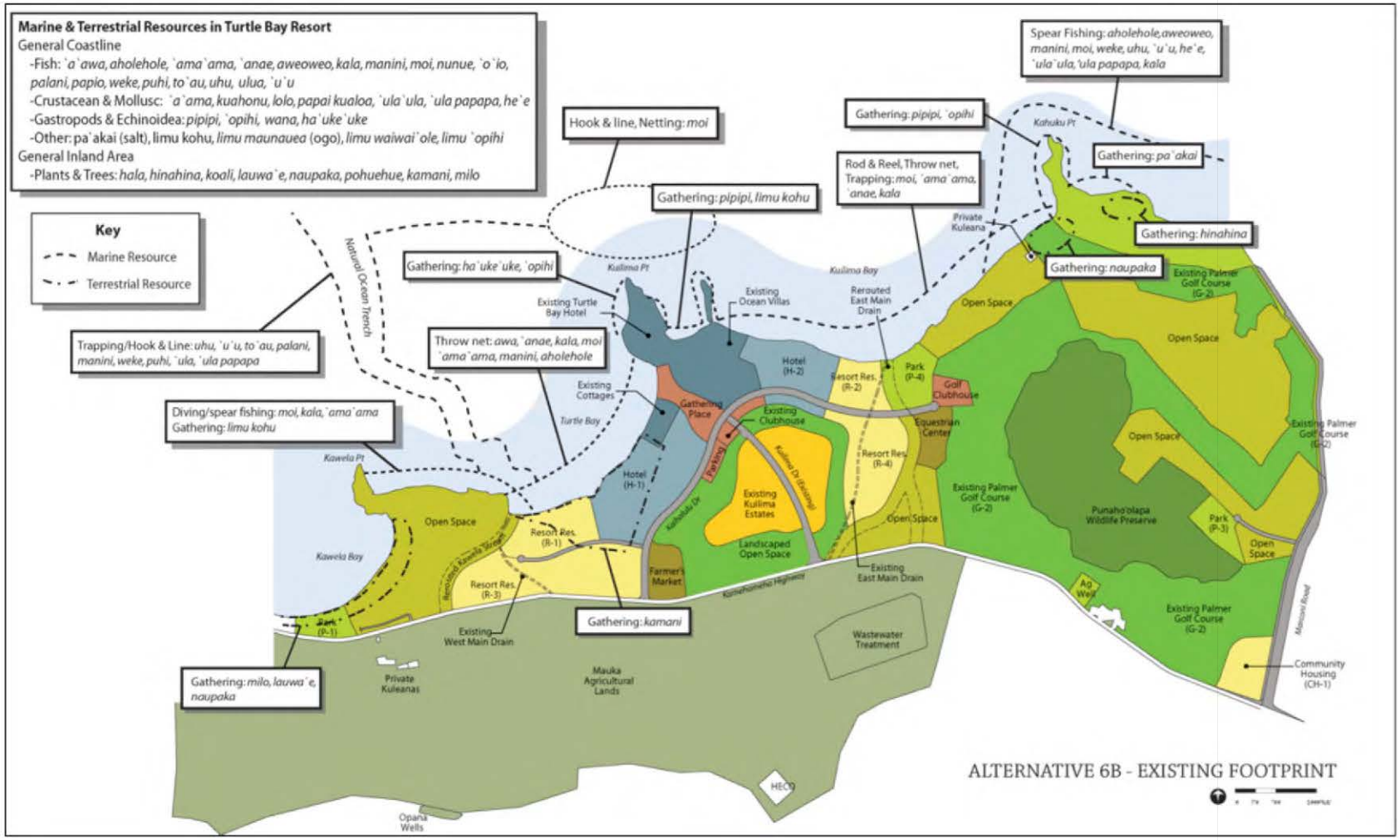


Figure 5-11: Marine and Terrestrial Resources in Turtle Bay Resort – Existing Footprint



have been overlain on plan maps for the Proposed Action (Reduced Density), Full Build-Out, Resort Residential Only, and Conservation Partner alternatives (see Figures 5-8 through 5-11). The Proposed Action and the alternatives under consideration will have unique impacts to these cultural resources.

For the purposes of the SEIS, impacts to cultural resources for each development scenario were determined by the following three criteria:

1) Destruction of the resource (defined as the complete destruction of the area or eradication of identified cultural resource(s) caused by project related activities).
2) Limits access to the resource (defined as any project related environmental change that permanently limits the access to a cultural resource or activity area).
3) Compromises the health of a cultural resource, area, and/or practitioner and/or cultural practitioners caused by the proposed actions (defined as any threat to the physical condition of identified cultural resources, cultural resource area).

Identification of impacts was only possible for cultural resources that informants had assigned provenience to during community consultations.

Following is a discussion of each of the resource categories that were identified as being impacted

B.4.a. [1] MARINE RESOURCES

As previously mentioned, at this time 32 marine species were identified through community consultations as being caught or collected from the coastline and coastal waters off of the Resort. In addition, there are six plant and two tree species that are currently being gathered on the premises (see Tables 6 & 7; Figure 22 of the CIA). The Proposed Action and each alternative were examined individually to identify impacts to marine resources. Figures 5-8 through 5-11 overlay the general locations of cultural resources onto the individual set of plans for the Proposed Action and alternatives. In addition, Table 5-12 summarizes the impacts.

In examining the Resort's proposed development options, all will have some impact to cultural resources identified on the property. The identified impacts for each development scenario are as follow:

Proposed Action: The Proposed Action will likely impact a variety of marine resources, including *ʻaʻawa, ʻamaʻama, ʻanae, kala, moi, manini, āholehole,* and *limu kohu,* found in the near shore waters of Turtle and Kuilima Bays, which under this option will be flanked by up to three (3) hotels, resort residences, and public parks. In addition, terrestrial resources such as *lauwaʻe, naupaka, kamani*, and *milo* found within the horse stable area and Kawela Bay area will be impacted by the planned hotels and resort residences. (see Figure 5-8).

Table 5-12: Impact Summary for Marine and Terrestrial Resources

Species		Proposed Action	Full Build Out	Residential Only	Conservation Partner
Marine Species	*‘A‘awa*	3	2,3	2,3	2,3
	Āholehole	3	2,3	2,3	2,3
	‘Ama‘ama	3	2,3	2,3	2,3
	‘Anae	3	2,3	2,3	2,3
	‘Āweoweo				
	Kala	3	2,3	2,3	2,3
	Manini	3	2,3	2,3	2,3
	Moi	3	2,3	2,3	2,3
	Nunue				
	‘Ō‘io				
	Palani				
	Weke				
	Puhi				
	To‘au				
	Uhu				
	Ulua (juv. *Pāpio*)				
	‘Ū‘ū				
	‘A‘ama				
	Kuahonu				
	Lolo				
	Pāpa‘i kualoa				
	‘Ula‘ula (also *‘ula*)				
	‘Ula pāpapa				
	He‘e				
	Pipipi		3		
	‘Opihi		3		
	Wana				
	Hā‘uke‘uke		3		
	Limu kohu	3	2,3		
	Limu maunawea				
	Limu wāwae’iole				
	Limu ‘opihi				
Terrestrial Species	*Hala*				
	Hinahina				
	Koali				
	Lauwa‘e	1	1,3	1,3	
	Naupaka	1	1,3	1,3	
	Pōhuehue				
	Kamani	1	1,3	1,3	1,3
	Milo	1	1,3	1,3	

Key: 1 = Destruction of the resource; 2 = Limits access to the resource; 3 = Compromises health of the resource, area, and/or practitioner
Source: Cultural Impact Assessment (Appendix D)

- Construction Impacts:
  - limited to terrestrial resources, such as *lauwaʻe, naupaka, kamani*, and *milo in the path of construction* will be likely be destroyed during construction activities (Criterion 1)
- Long Term/Operational Impacts:
  - near shore marine resources, such as *ʻaʻawa, ʻamaʻama, ʻanae, kala, moi, manini, āholehole,* and *limu kohu* may be impacted by increased beach and water users invading sensitive habitats (Criterion 3)
  - terrestrial resources, such as *lauwaʻe, naupaka, kamani*, and *milo,* not destroyed during the construction phase, the health of the remaining plants and may be compromised by increase in population density (e.g. trampling) Resort landscaping (Criterion 3)

Full Build-Out Alternative: The Full Build-Out option will impact the greatest spectrum of marine resources. The effected marine species, include *ʻaʻawa, ʻamaʻama, ʻanae, kala, moi, manini, āholehole,* as well as *pipipi, ʻopihi, hāʻukeʻuke,* and *limu kohu,* which are typically found in or on coral reefs and near-shore waters (see Figure 5-9). The effected terrestrial species include *lauwaʻe, naupaka, kamani*, and *milo,* which are located in the horse stable, eastern Kuilima Bay, and Kawela Bay areas where several hotels are proposed.

- Construction Impacts:
  - Limited to terrestrial resources, such as *lauwaʻe, naupaka, kamani*, and *milo in the path of construction* will likely be destroyed during the construction of the hotels (Criterion 1)
- Long Term/ Operational Impacts:
  - Coastal resources such as *ʻaʻawa, ʻamaʻama, ʻanae, kala, manini,* and *moi*, as well as *pipipi, ʻopihi, hāʻukeʻuke* will have limited access to them due to the buildup of hotels on the coastline (Criterion 2)
  - Near shore marine resources, such as *ʻaʻawa, ʻamaʻama, ʻanae, kala, manini,* and *moi*, as well as *pipipi, ʻopihi, hāʻukeʻuke,* and *limu kohu* may be impacted by increased beach and water users (Criterion 3)
  - Terrestrial resources, such as *lauwaʻe, naupaka, kamani*, and *milo,* not destroyed during the construction phase, the health of the remaining plants and may be compromised by increase in population density (e.g. trampling) Resort landscaping (Criterion 3)

Resort Residential Only Alternative: The Resort Residential Only option will impact numerous marine species, including *ʻaʻawa, ʻamaʻama, ʻanae, kala, moi, manini,* and *āholehole* along most of the coastline. Terrestrial resources, including *lauwaʻe, naupaka, kamani*, and *milo* located in the horse stable, eastern Kuilima Bay, and Kawela Bay areas where will be impacted by the planned residential units and Beach Club (see Figure 5-10).

- Construction Impacts:
  - Limited to terrestrial resources, such as *lauwaʻe, naupaka, kamani*, and *milo in the path of construction* will probably be destroyed during the construction of the residential and commercial areas (Criterion 1)
- Long Term/Operational Impacts:
  - Marine resources such as *ʻaʻawa, ʻamaʻama, ʻanae, kala, manini,* and *moi*, as well as *pipipi, ʻopihi, hāʻukeʻuke* will have limited access to them due to the buildup of residences and commercial areas on the coastline (Criterion 2)
  - Near shore marine species such as *ʻaʻawa, ʻamaʻama, ʻanae, kala, moi, manini,* and *āholehole* may be impacted by increased beach and water users (Criterion 3)
  - Terrestrial resources, such as *lauwaʻe, naupaka, kamani*, and *milo,* not destroyed during the construction phase, the health of the remaining plants and may be compromised by increase in population density (e.g. trampling) resort landscaping (Criterion 3)

Conservation Partner Alternative: The Conservation Partner alternative will impact numerous marine species, such as *ʻaʻawa, ʻamaʻama, ʻanae, kala, manini,* and *moi*. Yet, the impacts appear to be less extensive than the other alternatives as much less of the coastal areas will be developed with fewer units (see Figure 5-11). Only *kamani* found in and around the horse stables appears to be potentially impacted by proposed developments on this alternative.

- Construction Impacts:
  - Limited to *kamani*, if in the path of construction, will probably be destroyed during the construction of the residential and commercial areas (Criterion 1)
- Long Term/Operational Impacts:
  - On a much smaller scale, marine resources such as *ʻaʻawa, ʻamaʻama, ʻanae, kala, manini,* and *moi* will have limited access to them due to the buildup of residences and hotels on the coastlines of Turtle Bay and west Kuilima Bay (Criterion 2)
  - Near shore marine species such as *ʻaʻawa, ʻamaʻama, ʻanae, kala, moi, manini,* and *āholehole* may be impacted by increased beach and water users, though on a smaller scale than the previously mentioned plans (Criterion 3)
  - The *kamani* trees not destroyed during the construction phase, the health of the remaining plants and may be compromised by increase in population density (e.g. trampling) Resort landscaping (Criterion 3)

In summation, the most affected marine species are those that thrive on or near reefs as well as shallow sandy waters. The foreseen impacts are trampling or crowding of habitat by an increased number of beach-going vacationers and/or residents. As the high density hotels of the Full Build-Out option are proposed to front Kuilima Bay, Turtle Bay, and Kawela Bay, these marine resources may be impacted with increased direct human contact including: trampling, dragging gear, picking up/ molesting marine life, (Kerr et al. n.d.) and increase in sunscreen introduced

into water, which has a negative effect on coral reef ecosystems (European Commission 2008; Danovaro et al. 2008; Kerr et al. n.d.). Thus, the health of the cultural resource habitat will likely be compromised (Criteria 3), which will decrease the health and subsequently the population of these resources. As for the terrestrial resources, the clearing of land and construction of structures of any size will likely result in the destruction of these plants and trees.

B.4.a. [2] ARCHAEOLOGICAL RESOURCES

Please refer to the discussion in Section B.3 above.

B.4.a. [3] IWI KŪPUNA

The presence of *iwi kūpuna* in SEIS Lands and surrounding areas is already well established. Burials have been discovered in each *ahupuaʻa*, predominantly near to the coastline (Haun et al. 2011:68-71). In any ground-disturbing activity nearer to the coast, *iwi kūpuna* could potentially be impacted. As the inland portions of SEIS Lands are documented as former cane fields, the chance of encountering *iwi kūpuna* in these lands is less likely.

Currently, the Kahuku Burial Committee (KBC) has accepted the *kuleana* to *mālama i na iwi kūpuna* in compliance with the burial laws.

B.4.a. [4] SPIRITUAL CONNECTIONS TO THE LAND

The fact that the general area has been the associated with many mythical legends and *moʻolelo,* gives it a significant station in Hawaiian pre-history and in the Hawaiian psyche. Thus, it is critical that native Hawaiians and, or cultural practitioners continue to be involved in the protection and preservation of these valued cultural resources to ensure their spiritual connection to the land.

B.4.a. [5] CONTEMPORARY USES OF LAND AND SEA

A wide variety of contemporary and ancient versions of traditional activities as well as non-traditional activities have been identified as occurring on SEIS Lands and surrounding areas, many of which are not mutually exclusive. It is possible that marine and terrestrial activities will be impacted, to varying degrees, by the Proposed Action, Full Build-Out, Resort Residential Only, and Conservation Partner alternatives in terms of access during and after construction (Criterion 2).

B.4. b. Recommended Mitigation Measures

In the opinion of Pacific Legacy, the consulting ethnographer, while none of the cultural resources that may potentially be impacted by the Proposed Action are unique or restricted to the SEIS Lands or surrounding areas, it is clear from the ethnographic interviews, the archival research, and community consultations that this area and its resources are important to the consulted parties, the greater native Hawaiian community, and the community as a whole.

A number of the consulted parties do not wish to stop development or go back to a pre-contact lifestyle, but do share a genuine concern for the land and sea, as well as resources for present and future generations. Many want to hold on their cultural heritage by continuing the practices of their ancestors and make sure that iwi kūpuna are treated with respect.

The Proposed Action proposes to reduce density by over 60% from the density proposed in the original expansion project as formalized under the1985 Unilateral Agreement. The Proposed Action concentrates higher density development in *makai* Hanakaʻoe Ahupuaʻa, the Resort's existing core, by constructing two new hotel sites and a new community Gathering Place near to the existing Turtle Bay Hotel. The originally proposed hotel sites in the *ahupuaʻa* of ʻŌpana-Kawela (to the west) and Kahuku (to the east) will be developed instead with lower density resort-residential units. Density at ʻŌpana-Kawela Ahupuaʻa will be reduced by over 75% of what is allowable under the existing zoning. Similarly, Kahuku Ahupuaʻa is planned for affordable community housing and resort-residential units with sixty-five percent less density than is allowed under existing entitlements. The result is the concentration of development in the central core of the SEIS Lands and the general preservation of a rural character to the east and west. Further, the Proposed Action provides for two hotel sites, rather than the five approved in the current land use entitlements and the number of hotel units is reduced from 2,500 to a range of 625 to 1,000. By implementing generous shoreline setbacks, education, monitoring, and Resort wide stewardship coordination programs, this development concept achieves public access to the entire shoreline intended in the Unilateral Agreement and further enhances the pedestrian experience, affording unencumbered coastal access (Sichter 2012b).

As presented in Appendix A, TBR has elected to incorporate traditional Hawaiian values and the framework of the ahupuaʻa system into the proposed expansion, with the *Tomorrow's Ahupuaʻa* framework. Consistent with the recommendations of the CIA, representatives of TBR will also consult with the ʻAha Kiole Advisory Committee (AKAC), consisting solely of Native Hawaiian traditions experts and cultural practitioners, which was formed in 2007 by the Hawaii State Legislature through Act 212 to create natural and cultural resource management system recommendations that are based on Native Hawaiian traditional land and resource management systems to be integrated into the state's existing governmental organization. The AKAC (2010) describes the *ahupuaʻa* as a sub-unit of land under the *moku* (regional) land management system, termed as the ʻAha Moku System. The AKAC would be instrumental in ensuring that the proposed *Tomorrow's Ahapuaʻa* concept is harmonious with traditional values.

The role of *konohiki* also includes maintaining the balance of resources and prosperity throughout the *ahupuaʻa*, keeping harmony with neighboring ahupuaʻa, and mālama those who depend on the Resort and its leadership. In addition, maintaining respect for the land and its mana is crucial in developing responsibly.. It is, perhaps, the best way to show respect to the host culture and to set a good example for others. TBR will be proactive in embracing the role of konohiki, by consulting with local cultural practitioners and kūpuna to identify the needs of the *kaiāulu* (local community) and present them with possible solutions to help balance resources and prosperity within *Tomorrow's Ahupuaʻa*. TBR proposes to implement a *mauka-makai*

(upland to ocean) and inter-ahupuaʻa resource distribution system to make TBR's *Tomorrow's Ahupuaʻa* concept a leader in cultural and natural resource management. TBR will prioritize commerce for Resort operations between themselves and local agriculturists, horticulturalist, aqua-culturists, craftsmen, tradesmen and other goods or service providers over providers of goods and services from outside areas.

Regarding the marine and terrestrial resources that will inevitably be impacted by the proposed development, TBR will embrace the role of *konohiki* by initiating a Cultural and Natural Resources Management Plan (CNRMP) as well as a multi-media and multi-faceted Education Program. The CNRMP is presented as Appendix L to the SEIS.

To help implement a balanced and integrated CNRMP, TBR will assemble a committee comprised of local *kūpuna* with expertise in marine resources as well as officials from the appropriate government agencies and environmental/wildlife organizations. This plan provides a starting point for TBR to act as *konohiki* by facilitating meetings for the committee and between the committee and the *kaiāulu*. The Resort will also provide a venue to hold Education Program workshops to help preserve cultural practices and natural resources as well as allow non-Hawaiian peoples the opportunity to learn from their host culture. Tourists and visitors could be informed about the sensitive nature of natural resources and their importance in the traditional lifestyle. These concepts will be instrumental in enforcing a CNRMP. Additionally, designing an ethno-botanical garden within the Resort will be a good way to provide a space to continue traditional agricultural and horticultural practices in a way that allows local cultural practitioners to share the merits and importance of *lāʻau lapaʻau*, traditional Hawaiian diet, and traditional crafts to visitors as well as locals.

In regards to concerns about the potential disturbance of archaeological sites, an Archaeological Monitoring Plan (AMP) will be prepared prior to the commencement of construction. The Resort's current Cultural Management Program will continue to be implemented. Further, if archaeological sites are encountered during ground disturbing activities of any alternative chosen by TBR, a cultural interpretive display using artifacts (to the extent possible), archival photos, artistic renderings, and traditional accounts from ʻŌpana, Hanakaʻoe, and Kahuku Ahupuaʻa descendants and Native cultural practitioners will be prepared to educate its patrons of the Resort's colorful past.

TBR will treat *iwi kūpuna* with the utmost respect. To those who have roots in the area, *iwi kūpuna* are the remains of their ancestors and any disturbance to them should be avoided. The AMP will address concerns of encountering inadvertent discoveries during project related construction. TBR will continue to regularly consult with the Kahuku Burial Committee (KBC), which represents individuals and families who have a lineal and cultural connection to the area as well as the *iwi kūpuna*.

A concern has been expressed by community consultations that unsettled or displaced spirits may plague the new development and/or surrounding localities. Further, several localities in the subject area are known as *wahi pana* (legendary places), where *nā kāpuna* (ancestors) lived and

worshiped, and is the final resting place for the ancestors of many local people. Thus, portions of this land are considered to be imbued with *mana* (divine power). Therefore, prior to any major event or construction related activity be preceded with a pule (blessing) ceremony performed by a kahuna or kahu pule.

A plethora of activities perceived as contemporary and ancient versions of traditional activities as well as non-traditional activities have been identified as occurring on SEIS Lands and surrounding areas. To ensure that cultural resources are not impacted, TBR will provide alternate access routes to these activity areas to the extent practicable should current routes be obstructed by project or Resort related activities.

Finally, in the development areas that presently contain milo, TBR will ensure that Hawaiian practitioners can harvest the wood where appropriate before vegetation clearing and site development begins.

B. 5. Agricultural Resources

B.5. a. Impacts

Neither the Proposed Action nor the alternatives will have a significant adverse impact upon agricultural resources. No agricultural activity is conducted on the SEIS Lands.

The Proposed Action will have a beneficial impact upon the agricultural activities associated with agricultural lands the Resort owns mauka of Kamehameha Highway that are not part of the SEIS Lands. To ensure their long-term preservation for agricultural use, the Resort owners are working with the Trust for Public Lands to establish a conservation easement over the agricultural lands. The provision for a Farmers' Market within the SEIS Lands as part of the Proposed Action will directly benefit the farmers by providing them with a new market for their products in close proximity to their fields.

The Resort owners are also exploring ways to strengthen a relationship between the farms and the existing and proposed restaurants at the Resort. By establishing a farm-to-plate relationship, farmers will benefit by having stable long-term market for their produce and the restaurants will benefit by being able to offer fresh locally grown agricultural products.

B.5. b. Recommended Mitigation Measures

Because the Proposed Action results in no significant adverse impacts to agricultural resources, no mitigation measures are warranted.

B. 6. Socio-Economic Characteristics

Following is a discussion of how the Proposed Action will impact the socio-economic characteristics of the region based on the findings of the Socio-Economic Impact Analysis presented in Appendix H.

B.6. a. Population Growth

Population growth at the Resort has already been anticipated in government projections for slow increases in the region's resident population. The population growth anticipated for the Proposed Action is far lower than that which would result if Full Build-Out pursuant to existing land use approvals occurred.

When the new development is built and occupied – by 2025 according to the anticipated project phasing -- the Proposed Action would substantially increase the on-site population at the Resort, bringing not only visitors, but also new part-time and full-time Resort residents to the Resort. The population on-site during the daytime would include visitors and residents staying at Turtle Bay, Resort employees, and day visitors. Based on the socio-economic impact analysis presented in Appendix F, as of 2025, the daytime population of the existing Resort (including visitors, residents, and workers on-site) would amount to 34% of the total Resort population with the Proposed Action.

Table 5-13: Population at Turtle Bay Resort, with Proposed Action

	Existing Resort	Proposed Action, 2025	Combined
Staying at the Resort			
Visitors and Part time Residents	1,044	2,206	3,251
Full-time Resort Residents	223	55	278
Community Residents	-	638	638
Total	1,267	2,900	4,167
On-Site Daytime Population			
Visitors and Part time Residents	783	1,655	2,438
Full-time Residents	167	520	688
Operations Workers	439	561	1,000
Day Visitors	96	180	276
Daytime Total	1,485	2,916	4,401

NOTE: From Tables 4-5, 4-6 in the Socio-Economic Impact Analysis in Appendix F. All tables in this summary bring together estimates and calculations from the body of the socio-econ report. Methodology and references are shown in Chapters 4 and 5 and Appendix B of the socio-econ report. The numbers in the table are rounded, so totals may differ slightly from the sum of the numbers shown.

For purposes of comparison, as of 2025, the existing Resort population would amount to 35% of the future Resort population the Full Build-Out Alternative. However, when the Full Build-Out Alternative is completely absorbed - as of approximately 2053 - the existing Resort would account for only 14% of the total Resort daytime population. Said another way, if the Full Build-Out alternative allowable under existing land use approvals were implemented, in 2025

the population effects would be similar to the Proposed Action. But, while the Proposed Action would be completed, development of the Full Build-Out Alternative would continue another 28 years, rendering the existing population at the Resort to be but one-seventh of the future Resort population.

Nearly all of the Resort's workers and community residents could come from the KNS region. For the purposes of impact assessment, a share of the workforce and on-site community resident population was assumed to come from other locations on Oʻahu. The new population associated with the Proposed Action would account for about 3 percent of the regional resident population, or 37 percent of the projected growth in regional population by 2025.

B.6. b. Recommended Mitigation Measures

Implementation of the Proposed Action is intended to mitigate the impacts of developing the Resort to Full Build-Out as envisioned in the 1985 EIS and allowed under existing entitlements.

B.6. c. Employment and Wages

The Proposed Action will bring both construction jobs and continuing operations jobs, and will significantly increase payrolls in the KNS region.

B.6.c. [1] CONSTRUCTION

Project construction would begin as soon as building permits are granted. Assuming that construction begins in 2014, implementation of the Proposed Action is anticipated to take about 10 years. Construction-related jobs would last until build-out. All construction jobs are estimated as full-time jobs for a given year. These fall into the following categories:

1. On-site construction jobs: workers at the Resort. Their number is estimated on the basis of annual construction spending. The actual number of workers on a given day would vary according to the jobs to be done.
2. Other direct construction jobs: Firms responsible for construction have workers at their offices and base yards as well as on-site. As a rule of thumb, on-site workers account for 80% and off-site workers account for 20% of direct construction jobs.
3. Indirect jobs: These are jobs supported when construction firms buy materials and services locally.
4. Induced jobs: These jobs are supported by expenditure of wages of direct and indirect workers. These include, jobs in retail trade, or educational and health services.

Construction of the Proposed Action will involve an estimated 3,263 direct jobs over 11 years. Construction wage impacts resulting from these new jobs will total about $475 million. Construction workers on-site at the Resort during that period will number annually about 237 on average.

B.6.c. [2] OPERATIONS

Resort development demands staffing not just for accommodations, but also in food services, landscaping, building services, security and real estate. With an increased visitor population, demand for recreation would create additional jobs as well. Some retail jobs would be on-site at the Resort, in hotels, in the new Gathering Place or at the farmer's market. As presented in the socio-economic impact analysis in Table 5-14 below, the number of new continuing operations positions at the Resort will climb to about 753, an increase of 72 percent over current conditions.

Table 5-14: Employment and Wages Associated with the Proposed Project

	Cumulative, through 2025	Annual Average
Construction		
Direct Jobs	3,263	297
On-Site Direct Jobs	2,611	237
Indirect and Induced Jobs	5,482	498
Total	8,746	795
Direct Wages	$225.3	$20.5
Indirect and Induced Wages	$247.7	$22.5
Total	$473.0	$43.0
		Annual, 2025 on
Continuing Operations		
Direct Jobs at Resort		753
Indirect and Induced Jobs		785
Jobs from Off-Site Visitor Spending (Direct and Indirect)		443
Total		1,981
Continuing Jobs in KNS Region		930
Wages from Direct Jobs		$23.8
Wages, Indirect and Induced Jobs		$35.5
Wages, Off-Site Visitor Spending		$18.4
Total		$77.6
Wages, Jobs in KNS Region		$31.1

NOTES: From socio-economic impact report Tables 4-2, 4-3, 4-4, 4-14 in Appendix H. All dollar figures are millions of 2011 dollars. The numbers shown are rounded, so totals may differ slightly from the sum of the individual numbers in the table. Regional wages are for direct jobs at the Resort plus a regional share of jobs from off-site visitor spending.

Operations jobs are expected to continue so long as a Resort attracts visitors and residents. Spending at the Resort would generate approximately 785 indirect and induced jobs in turn. Resort visitors also spend money off-site, for transportation, services, food and goods. The number of jobs involved can be estimated on the basis of statewide data on the jobs supported in the state economy by visitor spending. These jobs are calculated by DBEDT as direct and indirect jobs. For the socio-economic impact analysis, total spending by Resort visitors for items other than lodging is estimated, and the associated jobs are counted. In addition, visitor spending will support jobs outside the Resort as well as on-site, so the attraction of additional visitors, part-time and full time residents to the Resort will support an estimated 443 additional jobs in Hawai'i by 2025. Of these, some 177 are estimated to be located in the KNS region.

Visitor spending will support at least 930 new continuing jobs in the KNS region when the project is fully occupied. The new jobs figure is approximately six percent of the current regional civilian labor force. Regional residents can be expected to absorb nearly all of these jobs. (Potential hires include resident workers who are now unemployed or underemployed and new graduates of local high schools or college programs.)

Wages from both construction and continuing jobs will support island households. After construction is completed, the regional increase in wages is expected to be at least $31 million (2011 dollars, based on $23.8 million in operations wages and $7.4 million in the KNS region for off-site tourism-related work).

As reported earlier, some Resort workers are concerned that new properties at the Resort would be non-union, and that expansion would result in increased workloads for both current and future staff. They ask whether the new hotel properties would be "full-service." At issue is how the new hotels may be operated (traditional full service vs. timeshare). Several factors bear on this concern:

- Because the Proposed Action consists of a resort expansion over several years, not a whole new resort created all at once (as the Waikoloa Hilton was), workforce growth would occur regularly over about ten years.
- Timeshare properties are sometimes thought to demand fewer staff per room for housekeeping and other departments. This may have been true of timeshare properties in areas such as Waikīkī in the past. Timeshares at the Resort will be staffed to support a relaxing full-service resort experience for guests. Also, timeshares would support an early marketing staff as well as staff on-site attending to guests.[1]
- Turtle Bay Resort is an isolated resort, so the operator and on-site subcontractors provide a wide range of services and amenities for guests. With more hotel units and housing on-site, demand for resort services would increase.

[1] Time share marketing staff may be on-site, off-site or even out of state. Consequently, this employment effect is not included in the analysis.

- Successful expansion would depend on maintaining and enhancing the Resort's reputation. New hotel properties would likely be more upscale than the existing hotel, and stand-alone resort residential units could be comparable to the Ocean Villas and other properties in Kapalua and Wailea on Maui. The operators would need to maintain or improve customer service throughout the Resort.
- TBR is considering fair employment rules that could bind future hotel operators to provide jobs with wage scales commensurate with similar jobs in the area.

In light of these factors, it seems likely that the expansion would bring significant job growth and moderately high staffing levels. In 2010, Maui Island had 0.89 accommodations jobs per visitor unit.[2] For the Proposed Action, the accommodations staffing for the new properties is estimated as 0.82 accommodations jobs per hotel unit.[3] This is higher than the current ratio for the Turtle Bay Hotel and Ocean Villas (about 0.70 to 0.75 accommodations jobs per unit).

Both timeshare and condominium hotel properties are likely to achieve high occupancy levels, much like those currently experienced at Turtle Bay. Timeshare properties are especially likely to have continuously high occupancy. Timeshare buyers have already invested in their units, and operators can rent out unsold weeks. With high occupancies would come consistent employment – more full-time jobs, fewer on-call and perhaps fewer part-time jobs.

Regional effects follow largely from changes in employment at the Resort, in off-site employment supported by visitor spending, and in the Resort's contribution to regional traffic congestion (which is analyzed in a separate study for the SEIS). Employment-related issues must be considered in light of (a) the quantity and quality of new jobs, (b) whether the regional population is able to take new jobs on-site and nearby, and (c) implications for housing, public facilities and community life. The first two issues are discussed here, while the last is discussed in relation to particular facilities and communities.

The new jobs created as the result of the Proposed Action would likely be in a range of industries supporting Resort facilities and activities. Similar jobs at the Resort have been described in interviews as the best available in the KNS area, since few employers offer salaries, benefits, and job security found at a unionized resort. Island-wide, the average annual wage for the combined industries is approximately $22,850[4]. Resort workers at Turtle Bay gain union wages and substantial benefits, and many receive tips, over and above their wages.

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[2] Data available from series maintained on DLIR and DBEDT websites: (*http://www.hiwi.org/gsipub/index.asp?docid=421; http://hawaii.gov/dbedt/info/visitor-stats/visitor-plant/2010VPI.pdf*). Unit count includes visitor condominiums as well as hotels. Job count is for accommodations only, i.e., only part of the workforce at hotels.

[3] This estimate was based on occupancy and staffing at other hotels viewed as offering comparable experiences, not on the global comparison mentioned here. See Appendix B for further discussion.

[4] Wages from "hotel" and "food and beverage" jobs combined, based on 2009 data adjusted to 2011 dollars. Source is State Department of Labor and Industrial Relations, *Employment and Payrolls in Hawaii, 2009*.

B.6. d. Recommended Mitigation Measures

The region's workforce can supply workers for both on- and off-site jobs. In addition to the 1,120 persons estimated as unemployed, the local high schools average more than 300 students in their senior class. The local school-leaving population would be far larger than the number of new jobs created annually. Many of these young adults would seek further education and jobs elsewhere. Still, an increase in jobs in the region would offer them the opportunity to stay near their homes – to choose among nearby jobs, long-distance commuting, and relocation to urban areas. In effect, by increasing local demand for workers, Resort expansion would benefit the region as a whole.

The anticipated development schedule for the Resort involves building and opening increments over time. This gradual approach would help to support local access to jobs. Sudden creation of a large number of jobs would be more likely to result in hires from outside the region and off-island.

Establishment of a farmers' market on-site and new demand for local foods in Resort restaurants and kitchens would help support regional agriculture. It is not clear how large an effect is involved, and any growth in local production would also be due to landowners' efforts to support local farms and to the overall growth of the island market for fresh foods.

The new visitors and employees brought by the Proposed Action will contribute to regional traffic. See the Traffic Impact Assessment Report in the SEIS for further detail on the project's contribution to regional congestion and on traffic management strategies.

The contribution of the Proposed Action to the resident housing stock will be of immediate benefit, and will likely be larger than the new demand generated over time by households supported by project-related jobs.

B.6. e. Fiscal Effects

Fiscal impacts consist of revenues generated by new development offset by new costs to local government incurred in order to support the new development and associated populations. New revenues can be estimated from new capital brought to Hawai'i by project development and through visitor spending. New costs can be estimated as the share of the government spending needed to support Hawai'i's visitor and resident populations.

The Proposed Action will result in a cumulative net benefit – i.e., total benefits minus total costs – for the period 2014 to 2025, estimated as $163.4 million for the State of Hawai'i and as $45.6 million for the City and County of Honolulu (in 2011 dollars). After full occupancy has been reached, the annual net benefit for the State will amount to $14.6 million, while the net benefit for the City and County will be about $6.6 million yearly.

B.6.e . [1] REVENUES

New revenues for the State of Hawai'i come from construction spending and construction-related workers' incomes and spending; cash flows with purchase or rental of real estate; and other visitor spending. Annual state construction-related revenues amount to nearly $10 million by 2020 at the peak of construction under the Proposed Action. Operations-related revenues for the state already exceed $10 million as of that year, and grow as spending by Resort visitors increases.

Property tax revenue increases occur as land is redeveloped and new improvements are built. Property tax revenues on new resort and residential units would amount to some $4.7 million in 2020, and would continue to increase until, after full absorption, they stabilize at approximately $8.3 million per year. The cumulative collections through 2025 would amount to $50.3 million and are presented in the Table 4-14 below.

Currently, the City and County of Honolulu collects about $12.4 million in real property taxes annually from residential and Resort properties in the KNS region.[5] As of 2025, real property taxes on residential and Resort units within the Proposed Action would amount to about $8.3 million of additional revenue annually, or about two-thirds of all real property revenue in the KNS region; a major increase in funds available to support municipal services. The detailed fiscal analysis is presented in Tables 4-8, 4-9, and 4-10 of the socio-economic impact analysis in Appendix H.

Table 5-15: Increased Real Property Revenues with Proposed Action

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Acres Redeveloped											
Annual	40	23	22	22	21	20	19	13	14	17	11
Cumulative	40	62	84	106	127	147	166	179	193	210	221
Value of Redevelopment ($ millions)											
Residential Construction	$84.2	$130.8	$176.3	$210.7	$243.0	$275.0	$320.1	$357.6	$392.3	$422.9	$441.0
Residential Land	$118.8	$182.0	$245.9	$309.5	$369.3	$429.9	$481.2	$516.7	$549.1	$577.6	$586.8
Hotel Construction	$11.6	$23.1	$34.7	$59.3	$84.3	$107.4	$120.9	$134.4	$148.2	$163.3	$175.9
Hotel Land	$9.3	$18.7	$28.0	$41.8	$55.7	$68.1	$84.6	$101.2	$124.0	$165.9	$202.7
Property Taxes ($ millions) Annual Collections (new development built to date)											
Residential	$0.7	$1.1	$1.5	$1.8	$2.1	$2.5	$2.8	$3.1	$3.3	$3.5	$3.6
Hotel, Resort	$0.3	$0/5	$0.8	$1.3	$1.7	$2.2	$2.5	$2.9	$3.4	$4.1	$4.7
Cumulative Collections	$1.0	$2.6	$4.8	$7.9	$11.8	$16.4	$21.8	$27.8	$34.4	$42.0	$50.3

B.6.c. [2] GOVERNMENT COSTS AND NET BENEFITS

New development may increase costs to government by increasing demand for services, by relocating demand to areas where service delivery is difficult, or by creating demand for new facilities. For a resort, many of these costs can be estimated using average cost analysis. This analysis identifies on a per-person basis the amount that government agencies actually spend.

[5] Estimated taxes compiled by Belt Collins Hawaii from Hawaii Information Service data (derived from City and County of Honolulu Real Property data), June 2012.

Based on the socio-economic impact analysis presented in Appendix H, revenues from the Proposed Action would exceed project-related costs for both the state and county. Visitor-related and new resident-related costs to the State of Hawai'i associated with the Proposed Action are estimated as totaling about $28 million through build-out – but revenues for the state would be more than $190 million over that time. Revenues would continue to exceed costs by a large margin in later years.

Similarly, the City and County of Honolulu would see revenues greater than costs throughout the project development period and afterwards. At build-out, the net new revenues would exceed $45 million. The Proposed Action would continue to generate additional revenues from property taxes.

After 2025, the State would continue to collect an estimated $19.7 million (2011 dollars) in taxes annually due to visitor spending at the Resort, while the City and County would collect about $8.3 million annually from property taxes. (City and County excise tax revenues are dedicated to the mass transit project and are to be eliminated when the transit project costs are covered.)

B.6. f. Recommended Mitigation Measures

Because implementation of the Proposed Action would result in a significant beneficial impact to the region, county, and state in terms of employment and tax revenue, no mitigation measures are warranted.

B.6. g. Housing Impacts

The Proposed Action would address the regional housing problem discussed in Chapter Two in four ways:

- Affordable housing will be built for members of the local community to buy or lease;
- With more stable jobs in the region, more residents will want to, and be able to, set up their own households nearby; and
- Resort residential housing will supply mostly luxury market-price homes and condominiums that may appeal to upper income residents as well as visitors.
- Resort residential housing at the Resort could attract some of the visitors who would otherwise stay in illegal transient vacation rental units. By reducing demand from that group, the Proposed Action would tend to discourage illegal rentals, and hence encourage some of the region's landlords to make housing available for residents.

While community housing (and, to a lesser extent, resort residential housing) would respond to resident housing demand, new workforce incomes will tend to increase demand. Additional wages for operations-related workers would help them establishfamilies and households of their own. Household formation occurs over time, as workers gain families and savings. It can be affected by economic conditions such as housing prices and mortgage rates.

Table 5-16 below estimates the first two potential housing effects for the KNS region, as of 2025 when the project's new units are fully absorbed by market demand. The regional estimate includes both on-site workers and a share of off-site workers whose jobs are supported by visitor spending. Based on surveys of resort workers in West Hawai'i conducted in the 1980s, new incomes appear sufficient, over time, to support new household formation for 15% to 30% of the regional resort workforce.[6]

The table suggests that the regional effect of the Proposed Action is limited and could be positive: new workforce/affordable community housing creation within the project

Table 5-16: Major Housing Effects Associated with Proposed Action KNS Region

As of 2025	Proposed Action
New Operations-Related Jobs	
On-site	753
Other direct jobs, KNS region (1)	177
	930
Dependents supported by new KNS workforce (2)	965
Households supported by workforce	556
New household formation over time (3)	
Low estimate (15%)	83
High estimate (30%)	167
New community housing at TBR	160
Housing Impact (Demand for Units):	
Low Estimate	77
High Estimate	(7)

Notes: On-site jobs estimated in Table 4-3 of the socio-economic impact analysis presented in Appendix H; off-site jobs derived from Table 4-4 of the report.

(1) Other direct jobs estimated as 40% of direct and indirect workforce supported by off-resort spending.

(2) Dependency ratios from 2006-2010 Five-year estimates for KNS region:
- α. Population in households = 31,111
- β. Workforce = 15,275
- χ. Average household size = 3.41

(3) New housing demand estimated as 15% to 30% of workforce households, based on studies of West Hawaii resorts.

SOURCE: American Community Survey. (www.census.gov)

[6] Research on population and housing effects of resort development has dealt mainly with the introduction of resorts in rural areas. The present case involves expansion, in an area where skilled resort workers are already present. There is no reason to expect resort expansion to draw a large body of workers from other areas, and to have large effects on housing when the new facilities open. (Also, the market study for the project calls for gradual development of facilities from year to year, not a one-time opening event.) The high estimates based on earlier research may consequently overestimate the extent to which resort expansion affects demand for housing.

could be greater than new household formation. Also, the new community housing is expected to be built from the beginning of the construction period, while housing demand due to new operations jobs would grow over time, as working families save for new homes.

The effect of increases in resort residential housing supply on regional housing demand and prices depends on many factors, and is not estimated here. It is expected to be positive, i.e., to increase local supply available to meet resident demand.

B.6. h. Recommended Mitigation Measures

The inclusion of the Community Housing element in the Proposed Action is intended to mitigate the impacts that Resort expansion may have upon housing in the region. As demonstrated above, the regional effect of the Proposed Action is limited and may be beneficial. The Proposed Action includes 160 affordable Community Housing units, which is 101 units more than the 59 required and closely matches the forecasted new household formations.

B.6. i. Impacts to Education Facilities

The State Department of Education is expected to provide its own projections of demand for school services and facilities associated with the Proposed Action. The estimates in this section offer projections for the Proposed Action based on Census data.

The regional population is expected to grow slowly, so demand for schools would likely increase slightly over the next decades.

The Proposed Action would affect several groups with school-age dependents. Some, but not all, would have an effect on schools:

- **Resort Residents:** New resort residential units generate very little or no new public school student enrollment. Most resort housing is occupied only part-time. Full-time resort housing occupants tend not to have school-age children. They are unlikely to enroll in public schools the few children who live in resort homes.
- **Community Housing Residents:** Community housing at Turtle Bay is intended to serve the needs of existing regional residents, not to attract a new population. Some of those residents would vacate existing housing that then could house other families. Many would move from multi-generational homes, where they would not be so quickly replaced. The total number of households in the region would accordingly increase due to the development of community housing, but the increase would likely be a small fraction of the number of new homes built. The increase in the number of new public school students would similarly be small.
- **Workers in New Resort Jobs:** As discussed earlier, operations jobs and visitor spending could increase the regional resident population. Dependents of such new resident workers could attend local schools.

Table 5-17 provides estimates of total regional new enrollment, based on the analysis of regional housing growth over time. The socio-economic impact analysis presented in Appendix F suggests that the likely effect could fall near the midpoint between the low and high estimates.

Table 5-17: Potential New Public School Enrollment, Proposed action, to 2025

	Proposed Action
New Community Housing	160
New Households Formed by Workers	
Low Estimate	83
High Estimate	167
Potential New K-12 Enrollment	
Low Estimate	49
High Estimate	123

NOTES: Enrollment estimate based on the 2010 ratio of households to Department of Education K through 12 students on O`ahu (37.6 students per 100 households). The low enrollment estimate counts, as generating student enrollment, only 30% of the new community housing units plus the low estimate of new households formed by workers as a new source of students. The high enrollment estimate counts all the new community housing plus workers' household formation as sources of new students, and assumes that no double counting is involved in combining the two. In both cases, Resort Residential housing is not treated as source of DOE students. Readers should not that all or nearly all the occupants of community housing are expected to be KNS residents; this estimate follows standard practice for school impact studies but not the full set of assumptions used in other tables in the socio-economic impact analysis.
SOURCES: US Census; Hawai`i State Department of Education enrollment data posted in 2010.

The effect estimated here is regional, not confined to the immediately adjacent schools. It would occur over many years, not immediately. An increase of about 100 students (as compared to the current regional DOE enrollment of 4,826) would amount to about 2% of total enrollment, an amount that would likely not raise problems of capacity for regional schools. Consequently, even the high estimate does not indicate a significant effect on DOE schools.

With regard to preschools, a recent American Community Survey for 2006 to 2010 counted 561 children enrolled in preschool among KNS residents, or 6.14 per 100 households.

The regional population is expected to grow slowly, so demand for preschools would likely increase slightly over the next decades. As noted earlier, demand for preschools has decreased in recent years due to reduced state funding and tight family budgets. Access to preschool education is a theme of the education initiatives supported by the current state administration, so state funding could increase.

With more resort jobs available, some local workers can avoid long commutes. Some young parents may rejoin the labor force, seeking part- or full-time work near home if they can combine work with child-care that meets their needs and standards.

The same analysis used for school enrollments can be made for preschools. Table 5-18 shows the new preschool enrollment associated with the Proposed Action to be modest. This analysis does not address the question of whether new Resort employees would seek child-care facilities near the Resort; the existing Unilateral Agreement for the Resort specifies establishment of such a center on or near the Resort.

Table 5-18: Potential New Preschool Enrollment, Proposed Action, to 2025

	Proposed Action
New Community Housing	160
New Households Formed by Workers	
Low Estimate	83
High Estimate	167
Potential New Preschool Enrollment	
Low Estimate	8
High Estimate	20

B.6. j. Recommended Mitigation Measures

Due to the modest impact that the Proposed Action will have upon education facilities, no specific mitigation measures are proposed. Development of a new child-care facility in accordance with the Unilateral Agreement is intended to mitigate the impacts of the Proposed Action upon working families. What sort of center is needed, what age children need to be served, and how the center can collaborate with existing preschools and programs in the region remain to be seen. (These questions were examined in discussions with the Kuilima North Shore Strategy Planning group and research done for that group by Community Resources, Inc., but the research is now dated.) The developer, employees who may need support from a child-care center, and local providers can all contribute to developing an effective mitigation strategy, not just fulfilling a legal condition.

B.6. k. Impact to Health Care Facilities

A study published in 2003 reviewed both long-term demand trends and changes in technology and operations affecting usage of hospital beds. While increased demand was expected by 2010 and 2025, the report was "cautiously optimistic" about Hawai'i's ability to meet the population's

need for acute and long-term care beds.[7] From 2001 through 2007, O'ahu had approximately 2,513 civilian acute care hospital beds, which were occupied about 67% of the time.[8] That number of beds corresponds to 2.7 beds per thousand persons (in the de facto population). However, the recent closure of a two-hospital corporation serving Honolulu and Leeward O'ahu has aroused new concerns.[9]

The City and County of Honolulu Emergency Medical Service staff currently includes 283.75 positions, or about 0.30 per thousand persons on O'ahu.[10]

B.6. l. Recommended Mitigation Measures

The regional population increase associated with the Proposed Action by 2025 – 951 regional residents and 2,206 visitors – might justify the addition of nine more beds (at historic occupancy levels) to the island's acute care inventory. The population increase associated with the Proposed Action might create demand for an EMS staff position by 2025.[11]

B.6. m. Impact to Recreational Amenities

If no further development occurs at Turtle Bay, both golf courses might remain open as 18-hole courses. Tennis and equestrian activities could be unchanged. Following is discussion of the Proposed Action's impacts on local and regional recreational facilities.

B.6.m . [1] GOLF

With the Proposed Action, a new clubhouse and a new equestrian center would be built. The Fazio golf course would be redeveloped as part of an integrated 27-hole facility, meaning that it would be reduced to a nine whole course but then combined with the Palmer Course to create a 27-hole golf facility. With the onsite visitor and resort resident population increased by about 195%, demand for golf is likely to increase, and usage would increase. The increased demand could affect other courses in the region as well. The Kahuku public course could attract a few more resort residents and visitors. With higher usage, and perhaps higher fees at Turtle Bay, golf tour operators serving the island as a whole might tend to send fewer golfers to Turtle Bay.

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[7] Hawaii Health Information Corporation. "Forecasting Long-Term Care and Acute Care Bed Days in Hawaii: Projections to 2025." Posted at *http://hawaii.gov/shpda/resources-publications/shtrend.pdf*

[8] DBEDT, *State of Hawai'i Data Book 2010,* Table 2.26.

[9] A bill to authorize revenue bonds (HB2345) to cover the debts of Hawaii Medical Center was considered in the 2012 State Legislature but was not passed by both chambers. Both island and Mainland corporations have expressed some interest in re-opening one or both of these hospitals.

[10] The estimate is based on the budget passed by the City Council for the current fiscal year.

[11] As noted before for public safety services, the cost of service to new populations due to the Proposed Action was estimated in the average cost analysis.

B.6.m . [2] BEACH AND OCEAN ACTIVITIES

With no further action, demand for beach and ocean access at the Resort would likely not increase greatly. However, beach, ocean education and beach park maintenance would not be improved. An increase in usage of Kawela Bay is likely, however, since the bay is gaining a reputation as a "secluded" beach where turtles can be seen. Access to Kawela Bay would not be improved, so most visitors would park along the edges of Kamehameha Highway and walk to the beach around the gate.

As part of the sea turtle surveys discussed in Chapter Two, Section H-1-d of the SEIS, observers were asked to note beach and ocean activities in Kawela Bay. This process was initially instituted to merely keep the observer "observant" by decreasing the monotony of the long observation periods, but has over the years proven to provide a unique view to the change in beach and ocean recreational activities over time. Log sheets from individual observations taken from 1989-1993 were re-analyzed in 2011 and data regarding human activities were distributed into two either Beach Activities (playing/walking, shore- fishing) or Water Activities (swimming, boating/surfing). This information was compared to similar data accumulated during the surveys conducted in 2011.

Human activity within the bay has seen marked changes as compared to activities observed in the early 1990's. Table 3.4 in Appendix E displays the average total number of people during a single day observed in 1990 engaging in a variety of activities in the water or on the beach at Kawela Bay. Because of the way the observations are made, these estimates are likely slightly high. For instance, one person walking on the beach for one hour will be counted twice, once in each consecutive 25-minute observation period. This yields a high estimate of total population although it may be balanced somewhat by those people who accessed the beach during the day sometime between the three 2.5-hour sample periods.

During the early 1990's the total average daily number of people either in the water or on the beach was about 22, whereas in 2011 there were about 60 people per day at the bay.

The highest number of people observed during any single 25 minute observation period was 21 on the beach and 5 in the water, during a Saturday afternoon in September of 2011 (see Table 3-5 in Appendix E. All categories of beach and water use except for boating and scuba diving have seen increases. The most significant increase, kayak use, appeared to be related to the regular daily kayak guided tour that is sponsored through the Resort.

In addition to a new inland park, the Proposed Action calls for establishment of oceanfront parks at Kawela Bay, Turtle Bay, Kuilima Bay, and Kahuku Point, with a total of 12 public shoreline access points. These improvements would help residents and visitors spread along the coastline, rather than congregating near the hotels because parking stalls at the new parks will reduce the need for beachgoers to park at the existing hotel parking lot. While beach usage would increase significantly with more hotel guests and resort residents, the easily accessible area for beachgoers would also increase. Higher and more consistent usage of these sites would occur.

Because they would be operated by the City and County of Honolulu, the beach parks at Kawela and Kuilima Point might be staffed by lifeguards, when City and County budgets permit. The Resort's operators can be expected to help maintain these sites and the surrounding area through security, owner associations and partnerships with community and environmental groups, assuring they are kept clean and secure, and helping to lower risks of ocean safety incidents.[12]

B.6.m . [3] OTHER ON-SITE ELEMENTS

The Proposed Action increases the population on-site and hence demand for recreational resources. It would refurbish those resources and greatly improve access to beachfront areas. As discussed above, the number of golf holes would actually decrease from 36 to 27. New restaurants and other amenities may attract new day visitors, but this group is not anticipated to increase greatly.

The Gathering Place, combining retail, food and cultural amenities, could draw new day visitors to the Resort. Some would spend a short time at the Resort; others could combine a visit to the Gathering Place with a half- or full-day trip to the Resort beaches. Day visitors' numbers and time on the property could climb during special events. The Gathering Place has been conceived as serving Resort guests and residents of the region, not as a new draw attracting visitors from outside the KNS region.

Development of a park at Kawela Bay would affect usage of this resource. The bay is already well known to area residents. It is mentioned in Internet reviews as "secluded," so improved access would both allow more users to reach the beach easily and reduce its status as a mysterious find. However, the beauty of the site, calm waters, and wildlife would likely attract many more beachgoers and ocean users, so recreational use would increase significantly.

Effects on the existing properties, owners and residents at Turtle Bay depend first on the fact of new development and secondly on its extent.

First of all, construction would likely bring some traffic, noise, and dust effects. These would be highly controlled. Contractors would be subject to State and City and County regulations limiting these effects. Moreover, the owners of the Resort would presumably seek to minimize construction effects on existing properties in the Resort, assuring operating income through the construction period. Also, the proposed construction schedule, involving incremental development over several years, points to a process that is planned to restrict construction to delimited areas at any one time.

Construction is expected to last over some 11 years for the Proposed Action, and much longer for the Full Build-Out Alternative. Hotel construction and ongoing operations (at Turtle Bay

[12] No claim is made here that the Resort would staff the parks with lifeguards or other full-time staff, only that the presence of beachgoers, surf school staff and/or resort staff, would lower the risk of accidents and harm in ocean sports and that resort operators would be interested in supplementing City and County maintenance activities.

Hotel and new hotels in the Resort) can be successfully combined. This has been evident at the Maui Marriott at Ka'anapali, where workers transformed the concrete and steel structure floor by floor over several years from a traditional hotel to a timeshare property. The hotel retained high occupancy levels despite construction impacts.

The Turtle Bay Hotel would become the central property of a larger destination Resort. The owner would likely maintain and upgrade it as part of the process of attracting upscale clients to the Resort as a whole (committed to approximately $30M in upgrades before the end of 2013). While new resort properties may be more exclusive in reputation and achieve higher returns, their success would depend on the entire Resort. Again, new amenities and activities would serve Turtle Bay Hotel guests as well as new visitors.

The Kuilima Estates condominiums would be affected by additional factors. The overall effect is not entirely clear:

- With development of new hotels near the shoreline, persons in the condominium units facing the ocean would see more buildings and more resort landscaping. In the case of the Proposed Action, the change is likely to involve an increase of visible landscaping (as opposed to ironwoods and brush at the far side of the Fazio golf course) as much as an increase in visible structures. Current plans call for structures to be spread out within the areas designated for hotel development, and for extensive landscaping. (Kuilima Estates units now have golf course or interior views, not unobstructed ocean views.)

- Pursuant to the Proposed Action, the Fazio golf course will be refurbished as a nine-hole course. The concept plan for the Proposed Action shows the entire Fazio Course area as continuing to be a golf course (rather than part being a golf course, and part being used simply as open space). A less cluttered course with appropriate landscaping would result in an improved view amenity for many units with views on and over the golf course.

- Increased activity nearby and the convenience of shopping at the Gathering Place and Farmer's Market would appeal to many residents, owners and renters.

- Reduced traffic on Kuilima Drive once the Kaihalulu and Marconi Road intersections are completed.

Some property owners are concerned that the Proposed Action could result in lower values for units in Kuilima Estates. However, the opposite is likely since much higher quality surrounding improvements historically increases values and as long as (a) TBR takes steps to ensure that visual effects of new development bring attention to the landscaping and open space in the Resort and (b) the condominium owners maintain their properties and common areas. Implementation of the *Tomorrow's Ahupua'a* concept and acceptance of the role of steward for the Turtle Bay lands suggest that the redevelopment would enhance, rather than lower, the value of private property within the bounds of the Resort.

The Resort's neighbors, both in Kuilima Estates and outside the Resort lands, will benefit from improved access to beaches, paths and landscaping with redevelopment. Residents of homes along Kawela Bay would see increased recreational use of the bay, and hence a loss of the feeling of seclusion in their neighborhood.

B.6.m . [4] REGIONAL PARKS AND OTHER RECREATION SITES

In the future without the Proposed Action, resident and visitor usage of beach parks and other public recreation sites in the KNS region would probably increase slowly, in line with growth in the island resident and visitor populations. Park usage along the North Shore at certain times of day and the year already creates problems for traffic circulation, especially at times of high surf and during surf competitions.

With the development of new beach parks at Kawela Bay and Kahuku Point open to the public as the result of the Proposed Action, the Resort could draw off some of the visitor traffic now clogging the roadside near Laniākea Beach and North Shore surf sites. However, the reduction and how much it might affect the overall traffic and pedestrian congestion issue are difficult to forecast.

New parks and pathways, along with improved access to beach areas, will make walking, jogging and bicycling more appealing for Resort residents, visitors, and community neighbors. Much as the new bikeway between Lāʻie and Kahuku encourages walking and sociability for the residents of those towns, so new trails and resources at the Resort can encourage outdoor recreation and social interaction for resort-goers and area residents, especially since new trails are planned to extend the length of the Resort.

B.6. n. Recommended Mitigation Measures

As discussed above, the addition of new parks, public shoreline access ways, bike trails and pedestrian paths, comfort stations, and public parking are intended to mitigate the impacts of the Proposed Action upon regional recreation facilities. The Proposed Action would increase the number of residents and visitors in the region, and especially along the shores from Kawela Bay to Kahuku Point. The Unilateral Agreement directs the developer to deal with this impact through park dedication. Since City and County park budgets are limited, this action may have the unintended consequence of deeding shore lands to the party least able to patrol, maintain and sustain them as a valued resource. The Resort operator, homeowners and residents are interested in assuring peace, quiet and clean enjoyment of the parks. (So, presumably, would their neighbors along the western shore of Kawela Bay.) And many of the parks require private maintenance that will be part of the Master Resort Association responsibilities. They would also need to establish working agreements with each other and the City and County Department of Parks and Recreation to share both enjoyment of and responsibility for the park areas.

B.6. o. Public Services and Facilities

For Fiscal Year 2011/2012, the City and County of Honolulu adopted budget allows for the following positions:

- Police: 1,484 patrol officers (about 1.56 per thousand persons in the island of O'ahu); and
- Fire Protection: 1,018 fire operations positions (about 1.07 per thousand).

The ratio of positions to population provides a basis for estimating need for additional staffing as local populations rise.

The Proposed Action would account for regional population growth of about 3,157 persons (including both residents and visitors). To provide for that increase, some 4.9 police patrol officers and 3.4 fire operations positions could be needed (extrapolating from recent ratios).[13] That increase is within the growth that can reasonably be foreca st given recent DPP expectations.

The population increase does not appear large enough to motivate construction of new public safety facilities.

B.6. p. Recommended Mitigation Measures

Redevelopment of the Resort would bring increased patrols by Resort security. New roadways, park facilities and landscaping would remove large areas of brush from the Resort lands. New construction would be to current fire codes, reducing the risk of fire and increasing access to the entire Resort. All of these factors would tend to reduce demand for public safety services due to new development.

B. 7. Disaster Preparedness

B.7. a. Impacts of Coastal Inundation and Flooding

Occasional flooding will impact elements of the Proposed Action. Planning for the Proposed Action has taken FEMA's flood zone mapping into account. As discussed in the 1985 Revised Final EIS, "[u]nder both County flood hazard ordinances and requirements of the National Flood Insurance Program, proposed structures in regulatory flood plain areas must be elevated or flood proofed to or above the 100-year flood levels established by the Federal Insurance Administration Flood Insurance Rate Map. No habitable spaces will be built below the identified maximum 100-year tsunami/flood elevations and the lower parts of the structure will be designed to withstand bore attack."

Facilities constructed near the shoreline are susceptible to coastal inundation. These areas are designated as VE zones on Flood Insurance Rate Maps.

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[13] The cost of increased fire protection and police protection might be estimated from current expenditures for salaries, overhead and patrol equipment. It is not calculated here, because it has already been estimated using the average cost approach (in Table 4-13).

B.7. b. Recommended Mitigation Measures

The applicant will mitigate the impact of proposed development within the regulatory floodplain areas by observing both County flood hazard ordinances and requirements of the National Flood Insurance Program.

With regard to coastal inundation, the increased setback areas included in the Proposed Action will likely minimize exposure to storm surge. In the event of a tsunami warning, persons in the potential tsunami inundation area will be evacuated to the upper floors of the higher structures in the area as set forth in the Resort's existing emergency evacuation plan.

B.7. c. Impact From Tropical Cyclones

Although the island of Oʻahu has never been directly impacted by a tropical cyclone, it has experienced the secondary impacts of tropical cyclones passing over or near Kauai. Given the location of the Resort on the extreme northern point of the island, it is less likely to experience storm surge associated with tropical cyclones that typically approach the Hawaiian Island from the south. However, its location on the northern side of the Koʻolau mountain range increases the likelihood of exposure to high speed downslope winds resulting from storms that may pass the island's southern coast. Heavy rains and flooding can also result even if the passing cyclone is a hundred or more miles away.

B.7. d. Recommended Mitigation Measures

All new structures at the Resort will be built in compliance with current building codes that require the use of hurricane clips and similar measures designed to withstand hurricane force winds.

Fortunately, current technology enables warnings several hours, if not days, in advance of a potential tropical cyclone threat. The warning system will allow sufficient time for Resort management to implement its emergency evacuation plans as needed. The Resort has been designated as a private hurricane shelter, meaning that while the facilities are not open to the general public as an evacuation center, the Resort contains structures that are designed to accommodate the Resort's residents and guests during an emergency. While this designation does not directly benefit residents of surrounding communities, it indirectly benefits them by ensuring that at the time of an emergency the Resort's population may not need to evacuate the property, with the result being that the Resort will not have a significant adverse impact on regional traffic and emergency evacuation shelters.

B.7. e. Impact of Earthquakes

The SEIS Lands are susceptible to earthquakes to the same extent as the entire island of Oʻahu. Earthquakes of large magnitude can cause catastrophic damage to buildings and infrastructure. Generally, in the United States, with its sophisticated building codes, earthquake damage is usually associated with events that have a magnitude greater than 6 on the Richter scale.

B.7. f. Recommended Mitigation Measures

To mitigate the effects of earthquakes, all construction will conform with the most current building codes and requirements.

B.7. g. Impact of Severe Winds

Due to its location on O'ahu's northern coast, the SEIS Lands have direct exposure to the trade winds. Although trade winds can reach speeds of 40mph or greater, they are not usually considered severe. As discussed in Chapter Two, severe winds are typically associated with tropical cyclones or steep gradients in air pressure.

From an historical perspective, the Resort's location on the north shore means that it is not typically exposed to the severe winds associated with these events. However, this location alone is no guarantee that a future event might not occur.

B.7. h. Recommended Mitigation Measures

To mitigate against the effects of severe winds, all structures proposed for construction in the Proposed Action or alternatives will comply with the most current building codes of the City and County of Honolulu.

B.7. i. Climate Change

As discussed in Chapter Two, climate change can manifest in several ways. However, the most likely potential impact upon the SEIS Lands may be the possible future increase in sea level and the corresponding coastal erosion that may result.

B.7. j. Recommended Mitigation Measures

The Proposed Action and each alternative includes coastal setbacks in excess of those required by law, to not only preserve the rural character of the shoreline, but to also ensure that new structures are setback from the shoreline at a sufficient distance to mitigate against the long-term effects of sea level rise and coastal erosion.

B. 8. Infrastructure

B.8. a. Impacts of Wastewater Collection and Treatment

The estimated number of existing and proposed hotel and residential units, commercial and park square footage, and the calculated wastewater demands are summarized in Table 5-19. (Please note that in accordance with CCH design standards of the Department of Wastewater Management, Volume 1, to determine the design average daily flow of the proposed collection system, an additional flow of 35 gallons per capita per day is added to the estimated daily flow to account for infiltration and inflow.) The estimated daily wastewater flow for the Proposed Action is 598,406 gallons per day and the design average daily flow is 873,690 gallons per day. Although the Proposed Action will result in an increase of approximately 92 percent in daily wastewater flow, this increase does not constitute a significant impact because the design average

daily flow (883,530 gpd) represents only 20 percent of the WWTP's design capacity. In addition, there is adequate capacity within the Palmer Golf Course for the storage of treated effluent.

City and County of Honolulu (CCH) design standards were used to develop the projected flows. Where the CCH standards did not provide design guidance, the State DOH Chapter 62 Wastewater Systems design guidelines were used. The proposed wastewater collection system pipe sizes were determined by using CCH standard hydraulic calculation criteria.

The existing Resort's gravity and force main system will remain in place. The existing Kuilima WWPS (also known as the Turtle Bay Wastewater Treatment Plant) will continue to serve the Resort.

Table 5-19: Summary of Projected Wastewater Demand

Area	Units	Land Area (acres)	Capita per Acre/Unit	Capita	Gallons per Captia	Gallons per Day
Existing TBR Hotel	500	34.5	2	1,000	80	80,000
Existing Kuilima Estates	368	33.1	2.8	1,024.8	80	82,432
Existing Golf Clubhouse		1.2	40	48	80	3,840
Other Existing Flows						61,984
Hotel H-1	375	25.9	2	750	80	60,000
Hotel H-2	250	19	2	500	80	40,000
Lockout Rooms	375		2	750	80	60,000
Resort Residential RR-1 [14]	75	39.5	4	300	80	24,000
RR-2	150	21.0	2.8	420	80	33,600
RR-3	100	24.8	2.8	280	80	22,400
RR-4	120	32.8	2.8	336	80	26,880
RR-5	100	25.2	2.8	280	80	22,400
RR-6	45	11.2	2.8	126	80	10,080
Community Housing RES-1	112	12.4	2.8	134.4	80	25,088
RES-2	48	8.8	2.8	134.4	80	10,752
Gathering Place		9.6	40	384	25	9,600
New Golf Clubhouse		2.3	40	92	25	2,300
Equestrian Center		8.8	40	352	25	8,800
Farmers Market		3.4	40	136	25	3,400
Park P-1	50	4.8	3	150	10	1,500
Park P-2	50	38	3	150	10	1,500
Park P-3[15]	50	6	3	150	5	750
Park P-4	50	9.4	3	150	10	1,500
Park P-5	50	11.3	3	150	10	1,500
TOTAL		**383**		**7,976.8**		**598,406**

[14] Single-family units.

[15] Bird Sanctuary

The Proposed Action will require new underground collection pipelines that augment the existing system. Five new sewage pump stations and force mains will also be constructed. The new force mains will be situated along the proposed Kaihalulu Drive and connect to the existing Kuilima WWPS as shown in Figure 3-5. Table 5-20 summarizes the service areas for the existing and proposed pump stations.

The Proposed Action includes the conveyance of wastewater from each hotel or resort residential development to an equalization basin located onsite. Equalization basins receive the wastewater from an area and dampen, or equalize, the discharge flows. Constant average daily flows will be delivered from the equalization basin to a new pump station while the remaining daily flows are stored. Flows are then conveyed from each new pump station and discharged into the existing Kuilima WWPS. The existing Kuilima WWPS can serve the entire development and will be structurally renovated and outfitted with new equipment to extend its service life.

Table 5-20: New Pump Station Service Areas

Pump Station	Areas Served	Pump Flow (gpm)
Existing Pump Station (Kuilima WWPS)	Existing Turtle Bay Hotel, Cottages, Ocean Villas, Kuilima Estates, and Golf Club House; Proposed H-2 and one half H-1;	241 278
New Pump Station 1	P-1, RR-2, RR-2	60
New Pump Station 2	P-5, Farmers Market, one half H-1, Gathering Place	75
New Pump Station 3	P-4, RR-3, Golf Clubhouse	35
New Pump Station 4	P-2, RR-4, RR-5	55
New Pump Station 5	Equestrian Center, P-1, RR-6, CH-1, CH-2	62

Due to the low wastewater flows anticipated for the proposed parks, the comfort station for the parks will be served by Low Pressure Sewer Systems to connect the wastewater collection systems that serve the individual areas of development.

B.8. b. Recommended Mitigation Measures

As wastewater flows increase in the future with the phased implementation of the Proposed Action, the WWTP will be upgraded to treat wastewater to an R1 level of water quality so that the treated effluent can be used to irrigate common areas. (R1 is the highest quality effluent, with minimal restrictions on use.) However, the decision of when future improvements to the WWTP will be completed is unresolved at this time. At the time that sufficient volumes of effluent warrant the upgrade, the determination will be whether the upgrades will trigger the need for an environmental assessment pursuant to Chapter 343, HRS.

The installation of new underground wastewater collection and transmission lines and force mains will not result in a significant adverse impact. Transmission lines will typically be located

within the rights-of-ways of proposed roadways. The construction of the collection lines, transmission lines, force mains, and pump stations will result in temporary soil disturbance. Anticipated impacts to soil and measures to mitigate those impacts are addressed in Section 2 above.

The use of increased volumes of treated effluent for irrigation purposes is not anticipated to have a significant adverse impact upon residents, visitors, and guests of the Resort. Treated effluent diluted with non-potable water has been used to irrigate the Palmer Golf Course for two decades with no known or identified adverse results. The State DOH has established standards for the quality of treated effluent and its use and the Resort has, and will continue to, comply with those standards.

The use of increased volumes of treated effluent for irrigation purposes is not anticipated to have a significant impact on near shore water quality, as discussed in Section 7a above.

B.8. c. Solid Waste Collection and Disposal

Solid waste generation under the Proposed Action would increase approximately 618% over the current condition. Generation rates are based the projected rates identified in the City's Integrated Solid Waste Management Plan[16]. Rates were adjusted according to existing or proposed land use[17]. The base generation rate for the hotel and residential resort areas is reduced on the premise that occupants are not likely to generate green waste, wood waste, e-scrap, construction and demolition (C&D) debris, tires, auto batteries, auto fluff wastes, and chemicals-oils. Similar reductions are made for other land uses. Rates were also reduced to reflect the seasonal variability in hotel occupancy rates[18]. Rates for most commercial and service establishments rates are based on information from California's Department of Resources Recycling and Recovery[19].

The City's reported 70% diversion rate is applied to estimate the total amount of solid waste sent to landfill[20]. On-site paper, metal, and plastic recycling programs along with on-site green waste processing and reuse are included in the diversion rate and not discounted separately.

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[16] Table 2-3 Waste Generation Projections, Beck, R.W., *Integrated Solid Waste Management Plan Update*, October 2008.

[17] Table 2-10 Waste Generation Projections, Beck, R.W., *Integrated Solid Waste Management Plan Update*, October 2008.

[18] Table 23.41 Hotel Room Occupancy and Room Rates, by Geographic Areas: 2000 through 2010. *The State of Hawaii Data Book,* prepared State of Hawaii Department of Business, Economic Development, and Tourism, 2000 through 2010.

[19] *www.calrecycle.ca.gov/wastechar/WasteGenRates/Commericial.htm and .../Service.htm*. Published generation rates based on gross square footage for Honolulu are not available.

[20] *www.opala.org/solid_waste/archive/Future_Plans.html* , website viewed April 18, 2012.

Most estimated capita are based on either the City and County of Honolulu's *Design Standards of the Department of Wastewater Management* or those shown in the wastewater calculations. Employee numbers are based on the Socio-Economic Assessment.

Existing

Solid waste collection for the existing facilities is calculated to be approximately 507 tons/year. Existing facilities include the Hotel, two golf courses, golf clubhouse, and Equestrian Center.

Proposed Action

Under the Proposed Action, the net solid waste generation is approximately 3,133 tons/year, resulting in a 618% increase. The analysis considers hotel units, resort residential units (multi-family), community housing, the Gathering Place, Farmer's Market, replacement golf clubhouse (existing clubhouse to be retained as a commercial building), larger equestrian center, and parks. The Proposed Action is anticipated to be fully developed as of 2025.

Full Build-Out Alternative

The Full Build-Out Alternative was found to have the greatest estimated increase in solid waste generated. This alternative is anticipated to be completed in 2052. The net generation rate is approximately 4,193 tons/year. This amounts to an 828% increase from the estimated amount for existing conditions. The analysis considers hotel units, resort residential units, community housing, a shopping village, beach club, replacement golf clubhouse (existing clubhouse to be retained as a commercial building), larger equestrian center, and parks.

Resort Residential Alternative

The Resort Residential Alternative was found to have the least estimated increase in solid waste generated. This alternative is anticipated to be completed in 2025. A net generation rate of 1,613 tons/year in solid waste is anticipated as a result of the Resort Residential Alternative. This generation represents a 318% increase from the estimated amount for existing conditions. The analysis considers resort residential units (single family), community housing, a shopping village, beach club, additional golf clubhouse, larger equestrian center, and parks.

Conservation Partner Alternative

A net generation rate of 1,680 tons/year, resulting in a 332% increase, in solid waste generation is expected as a result of the Conservation Partner Alternative. This alternative is anticipated to be completed in 2021. The analysis considers hotel units, resort residential units (multi-family), community housing, the Gathering Place, Farmer's Market, replacement golf clubhouse (existing clubhouse to be retained as a commercial building), larger equestrian center, and parks. With this alternative, no lockoffs would be allowed and one golf course is converted to other uses, most of which would consist of open space.

Table 5-21: Comparison of Solid Waste Generation - 1985 EIS Estimate and Proposed Action

	1985 EIS	Proposed Action
Population	4,783	6,000
Solid waste generation	3,468 tons/year	3,133 tons/year
Solid waste generation rate	9.5 tons/day	8.6 tons/day
Solid waste generation rate	0.72 tons/capita/year	0.52 tons/capita/year

The estimated solid waste generation under the proposed action is 10% less than the generation estimated in the 1985 EIS. This difference is largely contributed to recycling programs that have been developed over the years and the reduced density of the Proposed Action. A de-facto population of 4,783 capita is cited in the 1985 study. The Proposed Action reflects an adjusted population basis of 6,000 accounting for variable hotel occupancy rates, part time residential units, and staggered employee shifts.

As the total annual generation tonnage is less, the annual per capita generation rate is estimated to fall by 27%. Recent programs targeting recycling, reuse, and reduction of solid waste are likely causes of the change. The diversion rate between 1988 and 2006 is estimated at 35%. Estimates based on 2009/2010 data indicate the island wide diversion rate has increased to 70%.

B.8. d. Recommended Mitigation Measures

Implementation of the Proposed Action represents an effort to mitigate the impacts of the Full Build-Out of the Resort as allowable under present land use and zoning approvals. Generation of solid waste resulting from implementation of the Proposed Action can be mitigated by adherence to reuse and recycling programs as discussed in Appendix A.

B.8. e. Water Use and Conservation

Pipe sizing and water flow rates used in the analyses for pipe sizing criteria correlate to dwelling unit demands or per acre demands in accordance with BWS Standards or historical records as shown in Table 5-22. The primary water "source" defined in the computer modeling is the existing 2.0 MG water tank (the Kawela Reservoir). The proposed water system for each stage of development was analyzed using peak hour flow scenarios and fire flow scenarios at critical nodes in the system.

Water system demand for the Proposed Action is based upon the water demand criteria presented in Table 5-22 on the next page.

Table 5-22: Potable Water Demand Criteria

Land Use	Gallons per Unit	Gallons per Acre
Residential		
Single Family or Duplex	500	2,500
Multi-Family Low Rise	400	4,000
Multi-Family High Rise	300	---
Commercial		
Commercial Only	---	3,000
Resort		
Resort	350	4,000
Other		
Parks	---	4,000

The estimated number of existing and proposed hotel and residential units and water demands for the Proposed Action are summarized in Table 5-23 to the right.

As summarized in Table 22, the average daily potable water demand for the Proposed Action, including existing water demands, is 1,201,100 gallons per day. (Existing water daily water demand is approximately 345,000 gpd.) Of this amount, new development on the SEIS Lands will require approximately 856,100 gallons per day. The two existing ʻŌpana Wells are capable of providing a combined total of up to 890,000 gallons per day of average daily demand. Once development reaches approximately seventy-five (75) percent of the Proposed Action (equivalent to a demand of about 890,000 gallons per day), the third Opana Well can be brought on line. With its estimated capacity of 450,000 gallons per day of average daily demand, the combined capacity of the three ʻŌpana Wells (1,340,000 gallons per day) will be more than adequate to meet the anticipated demand created by the Proposed Action. The remaining 151,200 gallons per day generated by the three Opana Wells will be available to supplement the BWS regional system. The Koʻolau Loa Watershed Management Plan estimated the potential permitted amount of water from the ʻŌpana Wells to be 1.0 mgd. The combined capacity of the three ʻŌpana Wells exceeds this by approximately 340,000 gallons per day.

The 1985 EIS estimated that Full Build Out of the Resort would result in an average daily demand of 2,037,000 gallons. The Proposed Action's drinkable water demand is 848,150 gallons per day less than what would be required for Full Build Out. For this reason, drinkable water demand for the Proposed Action does not constitute a significant adverse impact upon regional water systems. Rather, when all three of the existing Opana Wells are functioning, the Proposed Action will have a positive benefit for the regional water system serving Oʻahu from Pupukea to Kawela.

The Resort's water master plan presumes all future golf course irrigation demands will be met with non-potable water (from existing non-potable wells on Resort land mauka of Kamehameha Highway and from treated effluent from the Kuilima Wastewater Treatment Plant) and that the proposed irrigation system will be independent of the potable water system. It is possible

Table 5-23: Potable Water Demand for the Proposed Action

Area	Units	Land Area (acres)	Gallons per Unit	Gallons per Acre	Gallons per Day
Existing TBR Hotel	500	34.5	350		175,000
Existing Kuilima Estates	368	33.1	400		147,200
Existing Golf Clubhouse		1.2		3,000	3,600
Other	NA	NA	NA	NA	19,200
SEIS Lands					
Hotel H-1	375	25.9	350		131,250
Hotel H-2	250	19	350		87,500
Lockout Rooms	375		350		131,250
Resort Residential RR-1[1]	75	39.5	500		37,500
RR-2	150	21.0	400		60,000
RR-3	100	24.8	400		40,000
RR-4	120	32.8	400		48,000
RR-5	100	25.2	400		40,000
RR-6	45	11.2	400		18,000
Community Housing RES-1	112	12.4	400		44,800
RES-2	48	8.8	400		19,200
Gathering Place		9.6		3,000	28,800
New Golf Clubhouse		2.3		3,000	6,900
Equestrian Center		8.8		3,000	26,400
Farmers Market (east)		3.4		3,000	10,200
Farmers Market (west)		4.1		3,000	12,300
Park P-1		4.8		4,000	19,200
Park P-2[2]		38		4,000	8,000
Park P-3[3]		6		4,000	4,000
Park P-4		9.4		4,000	37,600
Park P-5		11.3		4,000	45,200
TOTAL	**1,750**	**228.0**	**NA**	**NA**	**1,201,100**

[1] Single-family units.
[2] Passive Park – 2 acres active
[3] Bird Sanctuary

that circumstances could dictate the need to utilize this non-potable water for irrigation of the proposed parks and common areas of the Resort. If that were the case, the water system would not be adversely impacted. However, further study would be necessary to determine the reduction in water source requirements.

B.8. f. Recommended Mitigation Measures

The continued practice of using treated effluent at the Resort to irrigate the golf courses will mitigate the use of caprock sources. It is recommended that the Kuilima WWTP will be improved to provide for the treatment of effluent to R-1 water quality when feasibly justified, which would enable the treated effluent to be used to irrigate the Fazio Golf Course and possibly some of the common areas.

B.8. g. Utilities

In general, the improvements necessary to serve the Proposed Action are ongoing activities for the respective utility companies; Hawaiian Electric Company, Hawaiian Telcom, and Oceanic Time Warner Cable. The utility companies are mandated by their respective tariff rules and licenses to exercise reasonable diligence and care in providing continuous service to their customers when the development is constructed and maintained according to standard utility and subdivision provisions.

The off-site and on-site facilities should have minimal impact on the environment if noise, aesthetic considerations, safety hazards and loading impact are held to normally applied guidelines.

Forecasts of the anticipated electrical usage for the Proposed Action are based on current utility company billings to the Resort for electricity and on empirical values used by the local utilities for similar facilities, multiplied by the facilities' area or the number of units proposed in the Resort's Comprehensive Plan. As discussed in Chapter Three, the Resort's present electrical usage is estimated to be approximately 1.45 million KW per month.

The estimated electrical usage by the Proposed Action at completion will be approximately 5.57 million KW per month; roughly a 384% increase in consumption.

For purposes of comparison, electrical consumption has been estimated for the three alternatives presented in the SEIS:

- Full Build-Out Alternative = approximately 8.94 million KW per month (a 616% increase over existing use);
- Resort-Residential Alternative = approximately 2.60 million KW per month (a 179% increase over existing use); and
- Conservation Partner Alternative = 3.57 million KW per month (a 245.9% increase over existing use).

B.8. h. Recommended Mitigation Measures

To reduce the demand for electricity created by the Proposed Action, TBR proposes to design and construct sustainable buildings and structures by meeting at a minimum, the perquisites for LEED New Construction for habited structures. (The national green building leadership standard, LEED, was developed to elevate the design and construction industry to a more sustainable level.)

In addition, the full implementation of the energy sustainability strategies of the Proposed Action such as lamp retrofits, solar photovoltaic systems, conservation measures, etc. is anticipated over time to realize a 54.9% reduction in the project's electricity usage. Additional strategies for improved efficiency in energy use are presented in Appendix A of the SEIS.

TBR is also committed to a reuse/recycling program, as discussed in Appendix A. This program includes a commitment to incorporate on-site nonpolluting renewable energy generation, such as solar, wind, and/or biomass, with production capacity of at least 5% of the project's annual electrical and cooling energy cost.

C. Impacts of the Environment on the Proposed Action

As discussed throughout this Chapter, the Proposed Action will be impacted by both the natural and the human environment. From the perspective of the natural environment, regional flooding conditions resulting from the area's topography will impact the design of new structures at the Resort. The Resort's proximity to the shoreline necessitates the implementation of shoreline setbacks to minimize the potential impact of storm surge on coastal development. The presence of a slender strip of native vegetation along the shoreline (the Coastal Strand) may impact certain human activities in the shoreline area, but will not necessarily impact development because the Coastal Strand is generally located within proposed shoreline setback areas. The geology of the region will also impact the Proposed Action by increasing the need to be vigilant in the disposal of storm water runoff and in the use of pesticides and fertilizers to ensure that they do not contaminate near shore waters. The increasing presence of endangered sea turtles and Hawaiian monk seals in near shore waters will require the Resort to continually educate its guests, visitors, residents, and employees about the need to minimize interaction with these species and to protect their habitat.

From the perspective of the human environment, the design of the proposed Resort facilities and their distribution on the property is influenced by a community-wide desire to see that the rural character of the property is preserved. The prevailing traffic conditions on Kamehameha Highway underscore the need of the Resort owners to employ measures to mitigate the Resort's impacts on regional traffic and to contribute the Resort's fair share to regional roadway improvements that will be necessitated by expansion of the Resort. The presence of archaeological and cultural resources on the property alerts the Resort to the need to proceed cautiously and sensitively with its development plans to ensure that these resources are preserved and protected to the extent practicable.

D. Secondary and Cumulative Impacts

In an environmental impact statement, it is important to cover both direct and secondary or cumulative impacts. Secondary and cumulative impacts arise from the interaction of changes due to a project with the existing and expected context. The socio-economic analysis presented in Appendix F addresses all of these effects by considering the existing Resort along with proposed new development, and by identifying effects in the regional, island and state contexts.

A major question is whether new developments will have a cumulative impact that overshadows the impact of any one development. In the KNS region, the Resort and Envision Lāʻie expansions concentrate new development in a fairly small area. They seem more offsetting than likely to have reinforcing impacts. The Lāʻie development would increase enrollments at BYUH and workforce housing for the Lāʻie community. The hotel in the Lāʻie project would not be a resort but an amenity supporting BYUH and the PCC. It would have limited amenities and would likely serve a different market than the existing and proposed Resort hotels.

These two projects should not have significant cumulative effects. They both would address residents' demand for housing – but the demand for housing at reasonable prices is great, and the two projects would encourage workers to live near their work sites, reducing highway commutes. When and if the Envision Lāʻie project's housing is approved and built out, it could reduce local demand for workforce housing appreciably. However, that project is designed to serve the Lāʻie community, not provide housing to attract others to the region or address the problems of Kahuku and the North Shore.

Lāʻie and Kahuku are currently the largest communities in the KNS region. Even with much new housing in the two communities, they would remain distinct both geographically and economically. The development of one or two community housing increments at the Resort would not change the "country" appearance of the region.

The Proposed Action may have an important secondary impact on the regional housing supply. With new Resort housing available, many vacationers will be drawn to units at the Resort, rather than to illegal transient vacation rentals. Demand for the illegal units will be reduced, and some of these will become available for rental at rates that residents can afford.

Relative to the Proposed Action itself, through 2025, it will create a cumulative total of 8,746 construction jobs. Of this total, 5,482 will be indirect and induced jobs, which are defined as jobs that are supported when construction firms buy materials and services locally. Wages generated from indirect and induced jobs are estimated to be $35.5 million annually from 2025 on. Wages resulting from off-site visitor spending are estimated at $18.4 million from 2025 on.

As the result of the Proposed Action, primary population growth in the Koʻolau Loa/North Shore (KNS) region is forecast to include 951 regional residents and 2,206 visitors by 2025. As nearly all the Resort's future workers will likely come from the KNS region, the Proposed Action is not anticipated to generate significant secondary population growth. New household formation in the region is estimated to be between 83 and 167 households as the result of the Proposed Action.

The anticipated population growth is anticipated to generate from 49 to 123 new K-12 school enrollments to 2025, and 8 to 20 new preschool enrollments. It is estimated that the population increase will create demand for nine new acute care beds and one new EMS staff position by 2025, as well as 5 new police patrol officer positions and 3 fire operation positions. No new public safety facilities are forecast to be required.

The cumulative increase in traffic volume on Kamehameha Highway in the vicinity of the Resort is forecast to increase about 64% by the year 2025 during the morning peak hour and by about 42% during the afternoon peak hour. However, this increase in traffic volume will not change the Level of Service (LOS) on Kamehameha Highway, which today is rate at "E", and will remain at "E" in 2025 despite implementation of the Proposed Action

E. Probable Adverse Environmental Impacts That Cannot Be Avoided and Mitigation Measures Proposed to Minimize Impact

E. 1. Traffic

As discussed above, implementation of the Proposed Action will result in increase traffic on Kamehameha Highway in excess of the traffic that will be generated in the future without the project.

To mitigate the impacts of the project's traffic, improvements to the Resort's intersections with Kamehameha Highway will be implemented in compliance with the Unilateral Agreement and will result in the intersections operating at acceptable levels of service. Several traffic demand management strategies will also be employed in an effort to reduce the volume of vehicular trips created by Resort guests, visitors and employees. The Resort is also committed to providing its fair share of regional improvements to Kamehameha Highway in collaboration with the State DOT as discussed B.1.b above.

E. 2. Drainage

After construction is completed and activities within the Resort are in operation, an unavoidable increase in storm water runoff, due to groundwater changes and an increase in permeable surfaces, is expected on a temporary basis. It is anticipated that during periods of heaviest rainfall, the golf courses and Punahoʻolapa Marsh will continue to experience temporary flooding to depths of two (2) to three (3) feet deep as they do today.

To mitigate flood hazards to people and property, all habitable floors will be built above the flood height limits established by the applicable Flood Insurance Rate Map for the area.

E. 3. Dust Generation

Clearing and grubbing activities during construction will temporarily disturb soil retention values of the existing vegetation and expose soils to wind erosion. Soil will also be exposed during utility trench excavation. The use of heavy equipment along unpaved roads will also generate fugitive dust.

To mitigate dust impacts, all construction activities will be conducted in conformance with strict dust control regulations. Regular watering will be employed to wet exposed soil surfaces. Areas of exposed soil will be re-vegetated or paved (in the case of roadways) as soon as is practicable.

E. 4. Construction Noise

The construction phase of development generates noise levels that can be significant, depending upon the methods employed. Earthmoving equipment will likely be the loudest sources of noise during construction.

No mitigate the impacts of construction noise, the project will employ best management practices for all noise generating construction activities. All necessary permits will be secured from the Department of Health. Traffic noise from heavy construction vehicle operation will be conducted in compliance with applicable regulations.

E. 5. Water Consumption

As discussed in earlier in this chapter, the Proposed Action will result in the consumption of over 1.2 million gallons of water per day by the year 2025 when the project is anticipated to be completed.

To mitigate the effects of water consumption upon the region, the Resort has developed a system of potable wells to supply the Resort's water demand. Non-potable irrigation wells have also been developed to help reduce the volume of potable water that is used for irrigation purposes. Further, the use of treated effluent for irrigation is intended to also reduce reliance upon potable water for irrigation.

E. 6. Non-Renewable Resource Consumption

Implementation of the Proposed Action will increase demand for electrical energy at the Resort. To mitigate this impact, physical elements of the Proposed Action will be constructed in compliance with LEED requirements as discussed in Appendix A of the SEIS.

E. 7. Cultural Resources

The Proposed Action will impact cultural resources identified at the Resort property. To mitigate these impacts, implementation of the Proposed Action will be conducted in accordance with the *Tomorrow's Ahuapua`a* concept plan upon which the SEIS has been based (see Appendix A). Oversight by advisory councils will provide guidance as the Proposed Action is implemented. In addition, a Cultural and Natural Resource Management Plan (Appendix L) has been prepared and will be implemented to ensure that cultural resources are managed in a sustainable manner.

F. Any Irreversable and Irretrievable Commitments of Resources

As discussed in the 1985 EIS, the construction and operation of the Proposed Action will involve the irretrievable commitment of certain natural and fiscal resources. Major resource commitments include the land upon which the structures are actually constructed (does not

include open space areas), money, construction materials, human labor, and energy (derived from both fossil fuels and renewable resources). The operation of the Resort will also include the consumption of drinkable water. However, as demonstrated in this document, the Resort has adequate privately developed water resources to address this demand, as well as to contribute to the Board of Water Supply's regional system to benefit the larger community.

The impacts of committing these resources should be weighed against the economic benefits to the residents of the region, County and State. As the SEIS Lands have been approved for the development of 3,500 new units for approximately 25 years, implementing a Proposed Action that represents a substantial decrease in density reduces the corresponding economic benefits. However, this resource commitment is offset to some degree by the increased public benefits derived from the Proposed Action, including an increased focus on sustainable practices, and the provision of additional park space and shoreline access ways over what was previously required.

G. The Relationship Between Local Short-Term Uses of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity

As discussed in the 1985 EIS, inherent in any intensification of land use is the trade-off between short-term gains at the expense of long-term losses and vice-versa. The implementation of the Proposed Action is no exception.

But in the current instance, the short-term goal is the fulfillment of a decades old public policy to increase employment opportunities in the region and contribute to the long-term stability of the visitor economy for both the state and the county. As the Proposed Action represents a substantial reduction in density over that which has been approved for the Resort property, the adverse and unavoidable effects previously identified for the Resort expansion as construed in 1985 are also proportionately reduced. A distinguishing difference between the Proposed Action and the allowable full build-out of the property is the current focus on improving the sustainability of the Resort operations over the long term.

Implementation of the Proposed Action will foreclose future options on the portions of the property dedicated to open space as specified by convents and restrictive conditions (CC&Rs) to be established.

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CHAPTER SIX:

CONTEXTUAL ISSUES

A. Relationship to Land Use Policies and Controls

A. 1. FEMA National Flood Insurance Program

The Emergency Management Agency (FEMA) is part of the Department of Homeland Security (DHS). FEMA plans for disaster response and assists states through natural and manmade disasters.

In 1968, the United States Congress established the National Flood Insurance Program (NFIP) to assist communities in time of flood disaster. The NFIP program enables property owners in participating communities to purchase insurance as a protection against flood losses. States and communities must first establish floodplain management regulations that reduce future flood damages. Participation in the NFIP is based on an agreement between communities and the federal government. If a community adopts and enforces a floodplain management ordinance to reduce future flood risk to new construction in floodplains, the federal government will make flood insurance available within the community as a financial protection against flood losses. This insurance is designed to provide an insurance alternative to disaster assistance to reduce the escalating costs of repairing damage to buildings and their contents caused by floods. The NFIP identifies and maps the Nation's floodplains.

On January 19, 2011, new Federal Insurance Rate Maps (FIRMs) for the island of Oʻahu were published by FEMA to delineate flood hazard zones and base flood elevations lines. Figure 2-68 in Chapter Two of the SEIS presents the FIRM for the portion of Oʻahu within which the SEIS lands are located. As evidenced by the map, the property's shoreline is generally designated as a VE zone with elevations ranging between 12 and 18 feet. A majority of the remaining property is designated as AE zone with a base elevation of 11 feet. Zone VE is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Zone AE is a flood insurance rate zone that corresponds to the 100-year floodplain. The Department of Planning and Permitting and the U.S. Army Corps of Engineers regulate construction in a flood plain. The project developer must demonstrate compliance with federal and local regulations before being granted a building permit for new construction.

A. 2. Hawaiʻi State Land Use Law (Chapter 205, HRS)

In 1986, an approximate 236-acre portion of the property that is the subject of this SEIS was reclassified by the State Land Use Commission (LUC) from the Agricultural District to the Urban District, pursuant to Chapter 205, Hawaiʻi Revised Statutes. On Oʻahu, the City and County of Honolulu has jurisdiction over the State Urban District.

A. 3. Hawai'i State Plan (Chapter 226, HRS)

This section is divided into two parts. Subsection "a" addresses the existing Hawai'i State Plan. Subsection "b" addresses recently enacted legislation amending the Hawai'i State Plan.

A.3. a. Goals, Objectives and Policies

In 1978, the Department of Planning and Economic Development (now known as the Department of Business, Economic Development and Tourism (DBEDT) completed the Hawai'i State Plan to: (1) improve the planning process; (2) increase the effectiveness of government and private actions; (3) improve coordination among agencies and levels of government; (4) provide for the wise use of Hawai'i's resources; and (5) guide the future development of the State. (State of Hawai'i, Department of Planning and Economic Development, 1978, Revised 1989, 1991.)

The State Legislature subsequently adopted 1978 the Hawai'i State Planning Act (Planning Act), as HRS Chapter 226. The Planning Act consists of a series of broad goals, objectives and policies that serve as guidelines for future long-term growth and development. It further (1) provides a basis for determining priorities and allocating limited resources; (2) seeks to improve coordination of Federal, State, and County plans, policies, programs, projects, and regulatory activities; and (3) establishes a system for plan formulation and program coordination to provide for an integration of all major State and County activities.

The Planning Act is divided into three sections: Part I - Overall Theme, Goals, Objectives and Policies; Part II - Planning Coordination and Implementation; and Part III - Priority Guidelines. Part I of the Planning Act consists of three overall themes: (1) individual and family self-sufficiency; (2) social and economic mobility; and (3) community or social well-being. These themes are considered "basic functions of society" and goals toward which government must strive (HRS §226-3). Part II of the Planning Act primarily addresses internal government policies to help streamline, coordinate, and implement various plans and processes between governmental agencies. It seeks to eliminate or consolidate burdensome or duplicative governmental requirements imposed on business, where public health, safety, and welfare would not be adversely affected. Part III of the Planning Act establishes overall priority guidelines to address areas of statewide concern (HRS §226-101). The overall direction and focus are on improving the quality of life for Hawai'i's present and future population through the pursuit of desirable courses of action (HRS §226-102).

The following tables, identified as Table 6-1 and Table 6-2 respectively, presents Parts I and III of the Planning Act, and rates the applicant's conformance and support of the State's goals and objectives. Part II is not presented, as that section primarily pertains to internal government affairs.

Table 6-1: Hawai‘i State Planning Act Part I

SECTION	CHAPTER 226 - PART I. OVERALL THEME, GOALS, OBJECTIVES AND POLICIES	RATING
A = actively supportive C= conforms I = goal is inconsistent with applicant's objectives NA = goal is not applicable		
226-1	Findings and purpose.	
226-2	Definitions.	
226-3	Overall Theme	
226-4	State Goals. In order to guarantee, for present and future generations, those elements of choice and mobility that insure that individuals and groups may approach their desired levels of self-reliance and self-determination, it shall be the goal of the State to achieve:	
(1)	A strong, viable economy, characterized by stability, diversity, and growth, that enables the fulfillment of the needs and expectations of Hawai‘i's present and future generations.	A
(2)	A desired physical environment, characterized by beauty, cleanliness, quiet, stable natural systems, and uniqueness, that enhances the mental and physical well being of the people.	A
(3)	Physical, social, and economic well being, for individuals and families in Hawai‘i, that nourishes a sense of community responsibility, of caring, and of participation in community life.	A
COMMENTARY: As a matter of State and County land use policy, the SEIS lands are intended for resort development to provide employment opportunities for the Ko`olau Loa and North Shore communities. The proposed resort expansion is consistent with those policies. Expansion of the Turtle Bay Resort contributes to the continued strengthening of the island economy.		
226-5	OBJECTIVE AND POLICIES FOR POPULATION	
(a)	It shall be the objective in planning for the State's population to guide population growth to be consistent with the achievement of physical, economic, and social objectives contained in this chapter;	A
(b)	To achieve the population objective, it shall be the policy of this State to:	
(1)	Manage population growth statewide in a manner that provides increased opportunities for Hawai‘i's people to pursue their physical, social, and economic aspirations while recognizing the unique needs of each county.	A
(2)	Encourage an increase in economic activities and employment opportunities on the neighbor islands consistent with community needs and desires.	NA
(3)	Promote increased opportunities for Hawai‘i's people to pursue their socio-economic aspirations throughout the islands.	C
(4)	Encourage research activities and public awareness programs to foster an understanding of Hawai‘i's limited capacity to accommodate population needs and to address concerns resulting from an increase in Hawai‘i's population.	C
(5)	Encourage federal actions and coordination among major governmental agencies to promote a more balanced distribution of immigrants among the states, provided that such actions do not prevent the reunion of immediate family members.	NA

SECTION	CHAPTER 226 - PART I. OVERALL THEME, GOALS, OBJECTIVES AND POLICIES	RATING
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(6)	Pursue an increase in federal assistance for states with a greater proportion of foreign immigrants relative to their state's population.	NA
(7)	Plan the development and availability of land and water resources in a coordinated manner so as to provide for the desired levels of growth in each geographic area.	A
COMMENTARY: The resort expansion project is consistent with the CC&H's population distribution policies. Implementation of the Proposed Action will actually reduce the proposed density of the project over that which was approved by the Honolulu City Council.		
226-6	OBJECTIVES AND POLICIES FOR THE ECONOMY - IN GENERAL.	
(a)	Planning for the State's economy in general shall be directed toward achievement of the following objectives:	
(1)	Increased and diversified employment opportunities to achieve full employment, increased income and job choice, and improved living standards for Hawai'i's people.	A
(2)	A steadily growing and diversified economic base that is not overly dependent on a few industries, and includes the development and expansion of industries on the neighbor islands.	C
(b)	To achieve the general economic objectives, it shall be the policy of this State to:	
(1)	Expand Hawai'i's national and international marketing, communication, and organizational ties, to increase the State's capacity to adjust to and capitalize upon economic changes and opportunities occurring outside the State.	NA
(2)	Promote Hawai'i as an attractive market for environmentally and socially sound investment activities that benefit Hawai'i's people.	C
(3)	Seek broader outlets for new or expanded Hawai'i business investments.	C
(4)	Expand existing markets and penetrate new markets for Hawai'i's products and services.	C
(5)	Assure that the basic economic needs of Hawai'i's people are maintained in the event of disruptions in overseas transportation.	C
(6)	Strive to achieve a level of construction activity responsive to, and consistent with, state growth objectives.	C
(7)	Encourage the formation of cooperatives and other favorable marketing arrangements at the local or regional level to assist Hawai'i's small-scale producers, manufacturers, and distributors.	NA
(8)	Encourage labor-intensive activities that are economically satisfying and which offer opportunities for upward mobility.	C
(9)	Foster greater cooperation and coordination between the government and private sectors in developing Hawai'i's employment and economic growth opportunities.	C
(10)	Stimulate the development and expansion of economic activities which will benefit areas with substantial or expected employment problems.	C
(11)	Maintain acceptable working conditions and standards for Hawai'i's workers.	C

SECTION	CHAPTER 226 - PART I. OVERALL THEME, GOALS, OBJECTIVES AND POLICIES	RATING
A = actively supportive C= conforms I = goal is inconsistent with applicant's objectives NA = goal is not applicable		
(12)	Provide equal employment opportunities for all segments of Hawai'i's population through affirmative action and nondiscrimination measures.	C
(13)	Encourage businesses that have favorable financial multiplier effects within Hawai'i's economy.	C
(14)	Promote and protect intangible resources in Hawai'i, such as scenic beauty and the aloha spirit, which are vital to a healthy economy.	C
(15)	Increase effective communication between the educational community and the private sector to develop relevant curricula and training programs to meet future employment needs in general, and requirements of new, potential growth industries in particular.	C
(16)	Foster a business climate in Hawai'i - including attitudes, tax and regulatory policies, and financial and technical assistance programs - that is conducive to the expansion of existing enterprises and the creation and attraction of new business and industry.	C
COMMENTARY: The resort expansion project was originally conceived in response to the closure of the Kahuku Mill and the demise of the sugar industry. The need to provide new employment opportunities in the region has not changed since the mid-1980s.		
226-7	OBJECTIVES AND POLICIES FOR THE ECONOMY - AGRICULTURE	
(a)	Planning for the State's economy with regard to agriculture shall be directed towards achievement of the following objectives:	
(1)	Viability of Hawai'i's sugar and pineapple industries.	NA
(2)	Growth and development of diversified agriculture throughout the State.	A
(3)	An agriculture industry that continues to constitute a dynamic and essential component of Hawai'i's strategic, economic, and social well-being.	A
(b)	To achieve the agriculture objectives, it shall be the policy of this State to:	
(1)	Establish a clear direction for Hawai'i's agriculture through stakeholder commitment and advocacy.	A
(2)	Encourage agriculture by making best use of natural resources.	A
(3)	Provide the governor and the legislature with information and options needed for prudent decision making for the development of agriculture.	NA
(4)	Establish strong relationships between the agricultural and visitor industries for mutual marketing benefits.	A
(5)	Foster increased public awareness and understanding of the contributions and benefits of agriculture as a major sector of Hawai'i's economy.	A
(6)	Seek the enactment and retention of federal and state legislation that benefits Hawai'i's agricultural industries.	NA
(7)	Strengthen diversified agriculture by developing an effective promotion, marketing, and distribution system between Hawai'i's producers and consumer markets locally, on the continental United States, and internationally.	NA
(8)	Support research and development activities that provide greater efficiency and economic productivity in agriculture.	NA

SECTION	CHAPTER 226 - PART I. OVERALL THEME, GOALS, OBJECTIVES AND POLICIES	RATING
A = actively supportive C= conforms I = goal is inconsistent with applicant's objectives NA = goal is not applicable		
(9)	Enhance agricultural growth by providing public incentives and encouraging private initiatives.	NA
(10)	Assure the availability of agriculturally suitable lands with adequate water to accommodate present and future needs.	NA
(11)	Increase the attractiveness and opportunities for an agricultural education and livelihood.	A
(12)	Expand Hawai'i's agricultural base by promoting growth and development of flowers, tropical fruits and plants, livestock, feed grains, forestry, food crops, aquaculture, and other potential enterprises.	A
(13)	Promote economically competitive activities that increase Hawai'i's agricultural self-sufficiency.	A
(14)	Promote and assist in the establishment of sound financial programs for diversified agriculture.	A
(15)	Institute and support programs and activities to assist the entry of displaced agricultural workers into alternative agricultural or other employment.	A
(16)	Facilitate the transition of agricultural lands in economically nonfeasible agricultural production to economically viable agricultural uses.	NA
COMMENTARY: The Turtle Bay Resort property includes over 400 acres of productive agricultural land. The applicant intends to ensure the preservation of these lands for long-term agricultural use by establishing a conservation easement to protect them in perpetuity. The applicant's efforts to promote farm-to-table programs strengthen the link between the existing farming enterprises on its land and the resort's restaurants. The Proposed Action includes a Farmers Market in support of the region's agricultural activities.		
226-8	OBJECTIVE AND POLICIES FOR THE ECONOMY - VISITOR INDUSTRY.	
(a)	Planning for the State's economy with regard to the visitor industry shall be directed towards the achievement of the objective of a visitor industry that constitutes a major component of steady growth for Hawai'i's economy.	
(b)	To achieve the visitor industry objective, it shall be the policy of this State to:	
(1)	Support and assist in the promotion of Hawai'i's visitor attractions and facilities.	A
(2)	Insure that visitor industry activities are in keeping with the social, economic, and physical needs and aspirations of Hawai'i's people.	A
(3)	Improve the quality of existing visitor destination areas.	A
(4)	Encourage cooperation and coordination between the government and private sectors in developing and maintaining well-designed, adequately serviced visitor industry and related developments which are sensitive to neighboring communities and activities.	A
(5)	Develop the industry in a manner that will continue to provide new job opportunities and steady employment for Hawai'i's people.	A
(6)	Provide opportunities for Hawai'i's people to obtain job training and education that will allow for upward mobility within the visitor industry.	A

SECTION	CHAPTER 226 - PART I. OVERALL THEME, GOALS, OBJECTIVES AND POLICIES	RATING
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(7)	Foster a recognition of the contribution of the visitor industry to Hawai'i's economy and the need to perpetuate the aloha spirit.	A
(8)	Foster an understanding by visitors of the aloha spirit and of the unique and sensitive character of Hawai'i's cultures and values.	A
COMMENTARY: The proposed resort expansion has been carefully planned to integrate new development into the rural character of the region. Implementation of the resort's *Tomorrow's Ahupua`a* concept ensures that the perpetuation of Hawaiian cultural awareness among the resort's guests, residents, employees and patrons.		
226-9	OBJECTIVE AND POLICIES FOR THE ECONOMY – FEDERAL EXPENDITURES.	
(a)	Planning for the State's economy with regard to federal expenditures shall be directed towards achievement of the objective of a stable federal investment base as an integral component of Hawai'i's economy;	
(b)	To achieve the federal expenditures objective, it shall be the policy of this State to:	
(1)	Encourage the sustained flow of federal expenditures in Hawai'i that generates long-term government civilian employment.	NA
(2)	Promote Hawai'i's supportive role in national defense.	NA
(3)	Promote the development of federally supported activities in Hawai'i that respect state-wide economic concerns, are sensitive to community needs, and minimize adverse impacts on Hawai'i's environment.	NA
(4)	Increase opportunities for entry and advancement of Hawai'i's people into federal government service.	NA
(5)	Promote federal use of local commodities, services, and facilities available in Hawai'i.	NA
(6)	Strengthen federal-state-county communication and coordination in all federal activities that affect Hawai'i.	NA
(7)	Pursue the return of federally controlled lands in Hawai'i that are not required for either the defense of the nation or for other purposes of national importance, and promote the mutually beneficial exchanges of land between federal agencies, the State, and the counties.	NA
COMMENTARY: As the Proposed Action is privately-funded and involves no federal programs, objectives and policies pertaining to federal expenditures are not applicable.		
226-10	OBJECTIVE AND POLICIES FOR THE ECONOMY – POTENTIAL GROWTH ACTIVITIES.	
(a)	Planning for the State's economy with regard to potential growth activities shall be directed towards achievement of the objective of development and expansion of potential growth activities that serve to increase and diversify Hawai'i's economic base.	
(b)	To achieve the potential growth activity objective, it shall be the policy of this State to:	
(1)	Facilitate investment and employment in economic activities that have the potential for growth such as diversified agriculture, aquaculture, apparel and textile manufacturing, film and television production, and energy and marine-related industries.	C

SECTION	CHAPTER 226 - PART I. OVERALL THEME, GOALS, OBJECTIVES AND POLICIES	RATING
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(2)	Expand Hawai'i's capacity to attract and service international programs and activities that generate employment for Hawai'i's people.	C
(3)	Enhance and promote Hawai'i's role as a center for international relations, trade, finance, services, technology, education, culture, and the arts.	C
(4)	Accelerate research and development of new energy- related industries based on wind, solar, ocean, and underground resources and solid waste.	NA
(5)	Promote Hawai'i's geographic, environmental, social, and technological advantages to attract new economic activities into the State.	NA
(6)	Provide public incentives and encourage private initiative to attract new industries that best support Hawai'i's social, economic, physical, and environmental objectives.	NA
(7)	Increase research and the development of ocean-related economic activities such as mining, food production, and scientific research.	NA
(8)	Develop, promote, and support research and educational and training programs that will enhance Hawai'i's ability to attract and develop economic activities of benefit to Hawai'i.	NA
(9)	Foster a broader public recognition and understanding of the potential benefits of new, growth-oriented industry in Hawai'i.	NA
(10)	Encourage the development and implementation of joint federal and state initiatives to attract federal programs and projects that will support Hawai'i's social, economic, physical, and environmental objectives.	NA
(11)	Increase research and development of businesses and services in the telecommunications and information industries.	NA
COMMENTARY: As a uniquely rural visitor destination area, the resort offers several opportunities for new investment and economic opportunities, especially in relation to the film industry and the surfing industry.		
226-10.5	OBJECTIVES AND POLICIES FOR THE ECONOMY – INFORMATION INDUSTRY.	
(a)	Planning for the State's economy with regard to the information industry shall be directed toward the achievement of the objective of positioning Hawai'i as the leading dealer in information businesses and services in the Pacific Rim;	
(b)	To achieve the information industry objective, it shall be the policy of this State to:	
(1)	Encourage the continued development and expansion of the telecommunications infrastructure serving Hawai'i to accommodate future growth in the information industry;	NA
(2)	Facilitate the development of new business and service ventures in the information industry which will provide employment opportunities for the people of Hawai'i;	NA

SECTION	CHAPTER 226 - PART I. OVERALL THEME, GOALS, OBJECTIVES AND POLICIES	RATING
A = actively supportive C= conforms I = goal is inconsistent with applicant's objectives NA = goal is not applicable		
(3)	Encourage greater cooperation between the public and private sectors in developing and maintaining a well-designed information industry;	NA
(4)	Ensure that the development of new businesses and services in the industry are in keeping with the social, economic, and physical needs and aspirations of Hawai'i's people;	NA
(5)	Provide opportunities for Hawai'i's people to obtain job training and education that will allow for upward mobility within the information industry;	NA
(6)	Foster a recognition of the contribution of the information industry to Hawai'i's economy; and	NA
(7)	Assist in the promotion of Hawai'i as a broker, creator, and processor of information in the Pacific.	NA
COMMENTARY: Objectives and policies related to the information and communication industries are generally not applicable to the Proposed Action.		
226-11	OBJECTIVES AND POLICIES FOR THE PHYSICAL ENVIRONMENT – LANDBASED, SHORELINE, AND MARINE RESOURCES.	
(a)	Planning for the State's physical environment with regard to land-based, shoreline, and marine resources shall be directed towards achievement of the following objectives:	
(1)	Prudent use of Hawai'i's land-based, shoreline, and marine resources.	A
(2)	Effective protection of Hawai'i's unique and fragile environmental resources.	A
(b)	To achieve the land-based, shoreline, and marine resources objectives, it shall be the policy of this State to:	
(1)	Exercise an overall conservation ethic in the use of Hawai'i's natural resources.	A
(2)	Ensure compatibility between land-based and water-based activities and natural resources and ecological systems.	A
(3)	Take into account the physical attributes of areas when planning and designing activities and facilities.	A
(4)	Manage natural resources and environs to encourage their beneficial and multiple use without generating costly or irreparable environmental damage.	A
(5)	Consider multiple uses in watershed areas, provided such uses do not detrimentally affect water quality and recharge functions.	A
(6)	Encourage the protection of rare or endangered plant and animal species and habitats native to Hawai'i.	A
(7)	Provide public incentives that encourage private actions to protect significant natural resources from degradation or unnecessary depletion.	NA
(8)	Pursue compatible relationships among activities, facilities, and natural resources.	A

SECTION	CHAPTER 226 - PART I. OVERALL THEME, GOALS, OBJECTIVES AND POLICIES	RATING
A = actively supportive C= conforms I = goal is inconsistent with applicant's objectives NA = goal is not applicable		
(9)	Promote increased accessibility and prudent use of inland and shoreline areas for public recreational, educational, and scientific purposes.	A
COMMENTARY: The Proposed Action actively promotes the provision of greater access to the shoreline while incorporating a strong conservation ethic with regard to marine resources. Proposed improvements to the regional drainage system will greatly improve water quality at Kawela Bay. At the same time, the creation of a conservation area at Kawela Bay would help ensure that marine resources are protected and managed in a sustainable manner. On-going activities to preserve and enhance the Punaho`olapa Wildlife Preserve will ensure the long-term protection of this important bird habitat.		
226-12	OBJECTIVE AND POLICIES FOR THE PHYSICAL ENVIRONMENT – SCENIC, NATURAL BEAUTY, AND HISTORIC RESOURCES.	
(a)	Planning for the State's physical environment shall be directed towards achievement of the objective of enhancement of Hawai'i's scenic assets, natural beauty, and multi-cultural/historical resources.	
(b)	To achieve the scenic, natural beauty, and historic resources objective, it shall be the policy of this State to:	
(1)	Promote the preservation and restoration of significant natural and historic resources.	A
(2)	Provide incentives to maintain and enhance historic, cultural, and scenic amenities.	A
(3)	Promote the preservation of views and vistas to enhance the visual and aesthetic enjoyment of mountains, ocean, scenic landscapes, and other natural features.	A
(4)	Protect those special areas, structures, and elements that are an integral and functional part of Hawai'i's ethnic and cultural heritage.	A
(5)	Encourage the design of developments and activities that complement the natural beauty of the islands.	A
COMMENTARY: Implementation of the Proposed Action's cultural initiatives is consistent with these state objectives and policies. By basing the new development plan upon the findings of the Supplemental archaeological inventory survey and the cultural impact assessment, the Proposed Action will ensure that existing cultural and archaeological resources are preserved.		
226-13	OBJECTIVES AND POLICIES FOR THE PHYSICAL ENVIRONMENT – LAND, AIR, AND WATER QUALITY.	
(a)	Planning for the State's physical environment with regard to land, air, and water quality shall be directed towards achievement of the following objectives:	
(1)	Maintenance and pursuit of improved quality in Hawai'i's land, air, and water resources.	A
(2)	Greater public awareness and appreciation of Hawai'i's environmental resources.	A
(b)	To achieve the land, air, and water quality objectives, it shall be the policy of this State to:	
(1)	Foster educational activities that promote a better understanding of Hawai'i's limited environmental resources.	A

SECTION	CHAPTER 226 - PART I. OVERALL THEME, GOALS, OBJECTIVES AND POLICIES	RATING
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(2)	Promote the proper management of Hawai'i's land and water resources.	A
(3)	Promote effective measures to achieve desired quality in Hawai'i's surface, ground, and coastal waters.	A
(4)	Encourage actions to maintain or improve aural and air quality levels to enhance the health and well-being of Hawai'i's people.	A
(5)	Reduce the threat to life and property from erosion, flooding, tsunamis, hurricanes, earthquakes, volcanic eruptions, and other natural or man-induced hazards and disasters.	A
(6)	Encourage design and construction practices that enhance the physical qualities of Hawai'i's communities.	A
(7)	Encourage urban developments in close proximity to existing services and facilities.	A
(8)	Foster recognition of the importance and value of the land, air, and water resources to Hawai'i's people, their cultures and visitors.	C
COMMENTARY: The Proposed Action concentrates new resort density around the existing hotel, thereby making the best use of existing services and facilities. The new development will be designed for compatibility with existing flood plain designations. Proposed improvements to the West Main Drain will greatly improve water quality at Kawela Bay.		
226-14	OBJECTIVE AND POLICIES FOR FACILITY SYSTEMS – IN GENERAL.	
(a)	Planning for the State's facility systems in general shall be directed towards achievement of the objective of water, transportation, waste disposal, and energy and telecommunication systems that support statewide social, economic, and physical objectives.	
(b)	To achieve the general facility systems objective, it shall be the policy of this State to:	
(1)	Accommodate the needs of Hawai'i's people through coordination of facility systems and capital improvement priorities in consonance with state and county plans.	A
(2)	Encourage flexibility in the design and development of facility systems to promote prudent use of resources and accommodate changing public demands and priorities.	A
(3)	Ensure that required facility systems can be supported within resource capacities and at reasonable cost to the user.	A
(4)	Pursue alternative methods of financing programs and projects and cost-saving techniques in the planning, construction, and maintenance of facility systems.	C
COMMENTARY: As a mature resort area, Turtle Bay's ancillary infrastructure has been designed to accommodate the proposed expansion. Because the Proposed Action is privately financed, there will be no burden upon the state or the county to provide additional infrastructure to support the project.		
226-15	OBJECTIVE AND POLICIES FOR FACILITY SYSTEMS -- IN GENERAL.	
(a)	Planning for the State's facility systems with regard to solid and liquid wastes shall be directed towards the achievement of the following objectives:	

SECTION	CHAPTER 226 - PART I. OVERALL THEME, GOALS, OBJECTIVES AND POLICIES	RATING
A = actively supportive C= conforms I = goal is inconsistent with applicant's objectives NA = goal is not applicable		
(1)	Maintenance of basic public health and sanitation standards relating to treatment and disposal of solid and liquid wastes.	C
(2)	Provision of adequate sewerage facilities for physical and economic activities that alleviate problems in housing, employment, mobility, and other areas.	C
(b)	To achieve solid and liquid waste objectives, it shall be the policy of this State to:	
(1)	Encourage the adequate development of sewerage facilities that complement planned growth.	A
(2)	Promote re-use and recycling to reduce solid and liquid wastes and employ a conservation ethic.	A
(3)	Promote research to develop more efficient and economical treatment and disposal of solid and liquid wastes.	C
COMMENTARY: Objective (a) and related policies are directed at government agencies. The proposed project is consistent with Objective (b) and its policies. The Proposed Action is in a location designated for urban growth and the resort's privately funded and operated wastewater treatment plant has sufficient capacity to accommodate the proposed expansion.		
226-16	OBJECTIVE AND POLICIES FOR FACILITY SYSTEMS – WATER.	
(a)	Planning for the State's facility systems with regard to water shall be directed towards achievement of the objective of the provision of water to adequately accommodate domestic, agricultural, commercial, industrial, recreational, and other needs within resource capacities.	
(b)	To achieve the facility systems water objective, it shall be the policy of this State to:	
(1)	Coordinate development of land use activities with existing and potential water supply.	A
(2)	Support research and development of alternative methods to meet future water requirements well in advance of anticipated needs.	C
(3)	Reclaim and encourage the productive use of runoff water and wastewater discharges.	C
(4)	Assist in improving the quality, efficiency, service, and storage capabilities of water systems for domestic and agricultural use.	A
(5)	Support water supply services to areas experiencing critical water problems.	C
(6)	Promote water conservation programs and practices in government, private industry, and the general public to help ensure adequate water to meet long-term needs.	A
COMMENTARY: The State has approved the potable water wells needed to support the Proposed Action, which have been constructed and outfitted for dedication to the City. The developer has funded the development of the potable water system, including wells, reservoirs and transmission lines.		
226-17	OBJECTIVES AND POLICIES FOR FACILITY SYSTEMS – TRANSPORTATION	
(a)	Planning for the State's facility systems with regard to transportation shall be directed towards the achievement of the following objectives:	

SECTION	CHAPTER 226 - PART I. OVERALL THEME, GOALS, OBJECTIVES AND POLICIES	RATING
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(1)	An integrated multi-modal transportation system that services statewide needs and promotes the efficient, economical, safe, and convenient movement of people and goods.	A
(2)	A statewide transportation system that is consistent with and will accommodate planned growth objectives throughout the State.	A
(b)	To achieve the transportation objectives, it shall be the policy of this State to:	
(1)	Design, program, and develop a multi-modal system in conformance with desired growth and physical development as stated in this chapter;	NA
(2)	Coordinate state, county, federal, and private transportation activities and programs toward the achievement of statewide objectives;	A
(3)	Encourage a reasonable distribution of financial responsibilities for transportation among participating governmental and private parties;	A
(4)	Provide for improved accessibility to shipping, docking, and storage facilities;	NA
(5)	Promote a reasonable level and variety of mass transportation services that adequately meet statewide and community needs;	C
(6)	Encourage transportation systems that serve to accommodate present and future development needs of communities;	A
(7)	Encourage a variety of carriers to offer increased opportunities and advantages to interisland movement of people and goods;	NA
(8)	Increase the capacities of airport and harbor systems and support facilities to effectively accommodate transshipment and storage needs;	NA
(9)	Encourage the development of transportation systems and programs which would assist statewide economic growth and diversification;	A
(10)	Encourage the design and development of transportation systems sensitive to the needs of affected communities and the quality of Hawai'i's natural environment;	A
(11)	Encourage safe and convenient use of low-cost, energy-efficient, non-polluting means of transportation;	A
(12)	Coordinate intergovernmental land use and transportation planning activities to ensure the timely delivery of supporting transportation infrastructure in order to accommodate planned growth objectives; and	A
(13)	Encourage diversification of transportation modes and infrastructure to promote alternate fuels and energy efficiency.	A
COMMENTARY: Traffic-related issues are a principal concern among North Shore residents, as well as the applicant. The North Shore's surfing destinations, as will as attractions including Hale`iwa Town, the Polynesian Cultural Center, and Waimea Valley Park attract residents and visitors island-wide. While the Proposed Action will represent an increase to vehicular trips on Kamehameha Highway, any increase is viewed with concern. The applicant is assessing mitigations for resort-oriented traffic impacts on the regional roadway system and is committed to working with the State DOT to determine the Resort's fair share of regional roadway improvements that may be necessary as the result of implementing the Proposed Action.		

SECTION	CHAPTER 226 - PART I. OVERALL THEME, GOALS, OBJECTIVES AND POLICIES	RATING
A = actively supportive C= conforms I = goal is inconsistent with applicant's objectives NA = goal is not applicable		
226-18	OBJECTIVES AND POLICIES FOR FACILITY SYSTEMS – ENERGY	
(a)	Planning for the State's facility systems with regard to energy shall be directed toward the achievement of the following objectives, giving due consideration to all	
(1)	Dependable, efficient, and economical statewide energy systems capable of supporting the needs of the people;	C
(2)	Increased energy self-sufficiency where the ratio of indigenous to imported energy use is increased;	C
(3)	Greater energy security in the face of threats to Hawai'i's energy supplies and systems; and	NA
(4)	Reduction, avoidance, or sequestration of greenhouse gas emissions from energy supply and use.	C
(b)	To achieve the energy objectives, it shall be the policy of this State to ensure the provision of adequate, reasonably priced, and dependable energy services to accommodate demand.	
(c)	To further achieve the energy objectives, it shall be the policy of this State to:	
(1)	Support research and development as well as promote the use of renewable energy sources;	A
(2)	Ensure that the combination of energy supplies and energy-saving systems is sufficient to support the demands of growth;	C
(3)	Base decisions of least-cost supply-side and demand-side energy resource options on a comparison of their total costs and benefits when a least-cost is determined by a reasonably comprehensive, quantitative, and qualitative accounting of their long-term, direct and indirect economic, environmental, social, cultural, and public health costs and benefits;	C
(4)	Promote all cost-effective conservation of power and fuel supplies through measures including: (A) Development of cost-effective demand-side management programs; (B) Education; and (C) Adoption of energy-efficient practices and technologies;	C
(5)	Ensure to the extent that new supply-side resources are needed, the development or expansion of energy systems utilizes the least-cost energy supply option and maximizes efficient technologies;	NA
(6)	Support research, development, and demonstration of energy efficiency, load management, and other demand-side management programs, practices, and technologies;	NA
(7)	Promote alternate fuels and energy efficiency by encouraging diversification of transportation modes and infrastructure;	A
(8)	Support actions that reduce, avoid, or sequester greenhouse gases in utility, transportation, and industrial sector applications; and	C
(9)	Support actions that reduce, avoid, or sequester Hawai'i's greenhouse gas emissions through agriculture and forestry initiatives.	C

SECTION	CHAPTER 226 - PART I. OVERALL THEME, GOALS, OBJECTIVES AND POLICIES	RATING
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COMMENTARY: A number of the policies are directed at government agencies. However, the Proposed Action can contribute to energy efficiency in at least two arenas: energy consumption and transportation. To the extent possible, the developer is to design and construct buildings to meet LEED standards and to incorporate design features to conserve energy and water usage, as discussed in Appendix A of the SEIS. The Proposed Action is to also incorporate principles of waste minimization and pollution prevention. In terms of transportation, the regional roadway mitigations that will result from the project will contribute to improved vehicular circulation in Ko`olau Loa and the North Shore, which translates into less energy consumption. The conceptual design of the project promotes a walkable, bikeable community.		
226-18.5	OBJECTIVES AND POLICIES FOR FACILITY SYSTEMS – TELECOMMUNICATIONS.	
(a)	Planning for the State's telecommunications facility systems shall be directed towards the achievement of dependable, efficient, and economical statewide telecommunications systems capable of supporting the needs of the people.	
(b)	To achieve the telecommunications objective, it shall be the policy of this State to ensure the provision of adequate, reasonably priced, and dependable telecommunications services to accommodate demand.	
(c)	To further achieve the telecommunications objective, it shall be the policy of this State to:	
(1)	Facilitate research and development of telecommunications systems and resources;	NA
(2)	Encourage public and private sector efforts to develop means for adequate, ongoing telecommunications planning;	NA
(3)	Promote efficient management and use of existing telecommunications systems and services; and	C
(4)	Facilitate the development of education and training of telecommunications personnel.	NA
COMMENTARY: The Proposed Action will require the expansion of the existing telecommunications systems to service the proposed project.		
226-19	OBJECTIVES AND POLICIES FOR SOCIO – CULTURAL ADVANCEMENT – HOUSING	
(a)	Planning for the State's socio-cultural advancement with regard to housing shall be directed toward the achievement of the following objectives:	
(1)	Greater opportunities for Hawai'i's people to secure reasonably priced, safe, sanitary, and livable homes, located in suitable environments that satisfactorily accommodate the needs and desires of families and individuals, through collaboration and cooperation between government and nonprofit and for-profit developers to ensure that more affordable housing is made available to very low, low- and moderate-income segments of Hawai'i's population.	A
(2)	The orderly development of residential areas sensitive to community needs and other land uses.	A
(3)	The development and provision of affordable rental housing by the State to meet the housing needs of Hawai'i's people.	A

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(b)	To achieve the housing objectives, it shall be the policy of this State to:	
(1)	Effectively accommodate the housing needs of Hawai'i's people.	A
(2)	Stimulate and promote feasible approaches that increase housing choices for low-income, moderate-income, and gap-group households.	A
(3)	Increase homeownership and rental opportunities and choices in terms of quality, location, cost, densities, style, and size of housing.	A
(4)	Promote appropriate improvement, rehabilitation, and maintenance of existing housing units and residential areas.	NA
(5)	Promote design and location of housing developments taking into account the physical setting, accessibility to public facilities and services, and other concerns of existing communities and surrounding areas.	A
(6)	Facilitate the use of available vacant, developable, and underutilized urban lands for housing.	A
(7)	Foster a variety of lifestyles traditional to Hawai'i through the design and maintenance of neighborhoods that reflect the culture and values of the community.	C
(8)	Promote research and development of methods to reduce the cost of housing construction in Hawai'i.	NA
COMMENTARY: As part of the Proposed Action, the applicant proposes to increase the number of requisite residential housing units at affordable prices by 70 units (from 90 units to 160 units).		
226-20	OBJECTIVES AND POLICIES FOR SOCIO – CULTURAL ADVANCEMENT – HEALTH.	
(a)	Planning for the State's socio-cultural advancement with regard to health shall be directed towards achievement of the following objectives:	
(1)	Fulfillment of basic individual health needs of the general public.	C
(2)	Maintenance of sanitary and environmentally healthful conditions in Hawai'i's communities.	C
(b)	To achieve the health objectives, it shall be the policy of this State to:	
(1)	Provide adequate and accessible services and facilities for prevention and treatment of physical and mental health problems, including substance abuse.	NA
(2)	Encourage improved cooperation among public and private sectors in the provision of health care to accommodate the total health needs of individuals throughout the State.	NA
(3)	Encourage public and private efforts to develop and promote statewide and local strategies to reduce health care and related insurance costs.	NA
(4)	Foster an awareness of the need for personal health maintenance and preventive health care through education and other measures.	NA
(5)	Provide programs, services, and activities that ensure environmentally healthful and sanitary conditions.	C
(6)	Improve the State's capabilities in preventing contamination by pesticides and other potentially hazardous substances through increased coordination, education, monitoring, and enforcement.	NA

SECTION	CHAPTER 226 - PART I. OVERALL THEME, GOALS, OBJECTIVES AND POLICIES	RATING
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COMMENTARY: The Proposed Action will connect to regional infrastructure systems. On-site infrastructure improvements will be constructed to comply with relevant DOH and County standards. Collectively, the on-site and off-site systems will ensure that sanitary and healthful conditions are maintained for the benefit of the area's residents and visitors.		
226-21	OBJECTIVE AND POLICIES FOR SOCIO – CULTURAL ADVANCEMENT – EDUCATION	
(a)	Planning for the State's socio-cultural advancement with regard to education shall be directed towards achievement of the objective of the provision of a variety of educational opportunities to enable individuals to fulfill their needs, responsibilities, and aspirations.	NA
(b)	To achieve the education objective, it shall be the policy of this State to:	
(1)	Support educational programs and activities that enhance personal development, physical fitness, recreation, and cultural pursuits of all groups.	NA
(2)	Ensure the provision of adequate and accessible educational services and facilities that are designed to meet individual and community needs.	NA
(3)	Provide appropriate educational opportunities for groups with special needs.	NA
(4)	Promote educational programs which enhance understanding of Hawai'i's cultural heritage.	NA
(5)	Provide higher educational opportunities that enable Hawai'i's people to adapt to changing employment demands.	NA
(6)	Assist individuals, especially those experiencing critical employment problems or barriers, or undergoing employment transitions, by providing appropriate employment training programs and other related educational opportunities.	NA
(7)	Promote programs and activities that facilitate the acquisition of basic skills, such as reading, writing, computing, listening, speaking, and reasoning.	NA
(8)	Emphasize quality educational programs in Hawai'i's institutions to promote academic excellence.	NA
(9)	Support research programs and activities that enhance the education programs of the State.	NA
COMMENTARY: These objectives and policies are not applicable to a resort expansion project.		
226-22	OBJECTIVE AND POLICIES FOR SOCIO-CULTURAL ADVANCEMENT – LEISURE.	
(a)	Planning for the State's socio-cultural advancement with regard to social services shall be directed towards the achievement of the objective of improved public and private social services and activities that enable individuals, families, and groups to become more self-reliant and confident to improve their well-being.	NA
(b)	To achieve the social service objective, it shall be the policy of the State to:	NA

SECTION	CHAPTER 226 - PART I. OVERALL THEME, GOALS, OBJECTIVES AND POLICIES	RATING
A = actively supportive C= conforms I = goal is inconsistent with applicant's objectives NA = goal is not applicable		
(1)	Assist individuals, especially those in need of attaining a minimally adequate standard of living and those confronted by social and economic hardship conditions, through social services and activities within the State's fiscal capacities.	NA
(2)	Promote coordination and integrative approaches among public and private agencies and programs to jointly address social problems that will enable individuals, families, and groups to deal effectively with social problems and to enhance their participation in society.	NA
(3)	Facilitate the adjustment of new residents, especially recently arrived immigrants, into Hawaii's communities.	NA
(4)	Promote alternatives to institutional care in the provision of long-term care for elder and disabled populations.	NA
(5)	Support public and private efforts to prevent domestic abuse and child molestation, and assist victims of abuse and neglect.	NA
(6)	Promote programs which assist people in need of family planning services to enable them to meet their needs.	NA
COMMENTARY: This objective and its policies are directed towards governmental responsibilities and are, therefore, beyond the scope of the Proposed Action		
226-23	OBJECTIVE AND POLICIES FOR SOCIO-CULTURAL ADVANCEMENT – LEISURE.	
(a)	Planning for the State's socio-cultural advancement with regard to leisure shall be directed towards the achievement of the objective of the adequate provision of resources to accommodate diverse cultural, artistic, and recreational needs for present and future generations.	
(b)	To achieve the leisure objective, it shall be the policy of this State to:	
(1)	Foster and preserve Hawai'i's multi-cultural heritage through supportive cultural, artistic, recreational, and humanities-oriented programs and activities.	C
(2)	Provide a wide range of activities and facilities to fulfill the cultural, artistic, and recreational needs of all diverse and special groups effectively and efficiently.	C
(3)	Enhance the enjoyment of recreational experiences through safety and security measures, educational opportunities, and improved facility design and maintenance.	C
(4)	Promote the recreational and educational potential of natural resources having scenic, open space, cultural, historical, geological, or biological values while ensuring that their inherent values are preserved.	C
(5)	Ensure opportunities for everyone to use and enjoy Hawai'i's recreational resources.	C
(6)	Assure the availability of sufficient resources to provide for future cultural, artistic, and recreational needs.	C
(7)	Provide adequate and accessible physical fitness programs to promote physical and mental well-being of Hawai'i's people.	C
(8)	Increase opportunities for appreciation and participation in the creative arts, including the literary, theatrical, visual, musical, folk, and traditional art forms.	C

SECTION	CHAPTER 226 - PART I. OVERALL THEME, GOALS, OBJECTIVES AND POLICIES	RATING
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(9)	Encourage the development of creative expression in the artistic disciplines to enable all segments of Hawai'i's population to participate in the creative arts.	C
(10)	Assure adequate access to significant natural and cultural resources in public ownership.	C
COMMENTARY: Turtle Bay Resort has a long and respected history of supporting cultural and artistic events that benefit the surrounding communities and the region. The provision of an extensive pedestrian path system throughout the resort, with increased shoreline accessibility, will contribute to the physical and mental well-being of resort guests, visitors, residents and the visiting public.		
226-24	OBJECTIVE AND POLICIES FOR SOCIO-CULTURAL ADVANCEMENT--INDIVIDUAL RIGHTS AND PERSONAL WELL-BEING.	
(a)	Planning for the State's socio-cultural advancement with regard to individual rights and personal well-being shall be directed towards achievement of the objective of increased opportunities and protection of individual rights to enable individuals to fulfill their socio-economic needs and aspirations.	
(b)	To achieve the individual rights and personal well- being objective, it shall be the policy of this State to:	
(1)	Provide effective services and activities that protect individuals from criminal acts and unfair practices and that alleviate the consequences of criminal acts in order to foster a safe and secure environment.	NA
(2)	Uphold and protect the national and state constitutional rights of every individual.	C
(3)	Assure access to, and availability of, legal assistance, consumer protection, and other public services which strive to attain social justice.	NA
(4)	Ensure equal opportunities for individual participation in society.	NA
COMMENTARY: This objective is not directly applicable to the Proposed Action.		
226-25	OBJECTIVE AND POLICIES FOR SOCIO – CULTURAL ADVANCEMENT – CULTURE.	
(a)	Planning for the State's socio-cultural advancement with regard to culture shall be directed toward the achievement of the objective of enhancement of cultural identities, traditions, values, customs, and arts of Hawai'i's people.	
(b)	To achieve the culture objective, it shall be the policy of this State to:	
(1)	Foster increased knowledge and understanding of Hawai'i's ethnic and cultural heritages and the history of Hawai'i.	C
(2)	Support activities and conditions that promote cultural values, customs, and arts that enrich the lifestyles of Hawai'i's people and which are sensitive and responsive to family and community needs.	NA
(3)	Encourage increased awareness of the effects of proposed public and private actions on the integrity and quality of cultural and community lifestyles in Hawai'i.	NA
(4)	Encourage the essence of the aloha spirit in people's daily activities to promote harmonious relationships among Hawai'i's people and visitors.	NA
COMMENTARY: Archaeological sites that have been identified as significant on the SEIS Lands by the SHPD will be preserved. Preserved sites will likely become elements of open space areas throughout the development.		

SECTION	CHAPTER 226 - PART I. OVERALL THEME, GOALS, OBJECTIVES AND POLICIES	RATING
A = actively supportive C= conforms I = goal is inconsistent with applicant's objectives NA = goal is not applicable		
226-26	SECTION 226-26 OBJECTIVES AND POLICIES FOR SOCIO – CULTURAL ADVANCEMENT – PUBLIC SAFETY.	
(a)	Planning for the State's socio-cultural advancement with regard to public safety shall be directed towards the achievement of the following objectives:	
(1)	Assurance of public safety and adequate protection of life and property for all people.	C
(2)	Optimum organizational readiness and capability in all phases of emergency management to maintain the strength, resources, and social and economic well-being of the community in the event of civil disruptions, wars, natural disasters, and other major disturbances.	C
(3)	Promotion of a sense of community responsibility for the welfare and safety of Hawai'i's people.	NA
(b)	To achieve the public safety objectives, it shall be the policy of this State to:	
(1)	Ensure that public safety programs are effective and responsive to community needs.	NA
(2)	Encourage increased community awareness and participation in public safety programs.	C
(c)	To further achieve public safety objectives related to criminal justice, it shall be the policy of this State to:	
(1)	Support criminal justice programs aimed at preventing and curtailing criminal activities.	NA
(2)	Develop a coordinated, systematic approach to criminal justice administration among all criminal justice agencies.	NA
(3)	Provide a range of correctional resources which may include facilities and alternatives to traditional incarceration in order to address the varied security needs of the community and successfully reintegrate offenders into the community.	NA
(d)	To further achieve public safety objectives related to emergency management, it shall be the policy of this State to:	NA
(1)	Ensure that responsible organizations are in a proper state of readiness to respond to major war-related, natural, or technological disasters and civil disturbances at all times.	NA
(2)	Enhance the coordination between emergency management programs throughout the State.	NA
COMMENTARY: Given its proximity to the shoreline, the project's owners are already cognizant of the state and county's public safety objectives and, in working with their counterparts in public service to preserve and protect public safety, have already instituted a comprehensive emergency evacuation program. The program will be expanded as necessary to accommodate the Proposed Action.		

SECTION	CHAPTER 226 - PART I. OVERALL THEME, GOALS, OBJECTIVES AND POLICIES	RATING
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226-27	OBJECTIVES AND POLICIES FOR SOCIO-CULTURAL ADVANCEMENT – GOVERNMENT	
(a)	Planning the State's socio-cultural advancement with regard to government shall be directed towards the achievement of the following objectives:	
(1)	Efficient, effective, and responsive government services at all levels in the State.	NA
(2)	Fiscal integrity, responsibility, and efficiency in the state government and county governments.	NA
(b)	To achieve the government objectives, it shall be the policy of this State to:	
(1)	Provide for necessary public goods and services not assumed by the private sector.	NA
(2)	Pursue an openness and responsiveness in government that permits the flow of public information, interaction, and response.	NA
(3)	Minimize the size of government to that necessary to be effective.	NA
(4)	Stimulate the responsibility in citizens to productively participate in government for a better Hawai'i.	NA
(5)	Assure that government attitudes, actions, and services are sensitive to community needs and concerns.	NA
(6)	Provide for a balanced fiscal budget.	NA
(7)	Improve the fiscal budgeting and management system of the State.	NA
(8)	Promote the consolidation of state and county governmental functions to increase the effective and efficient delivery of government programs and services and to eliminate duplicative services wherever feasible.	NA
COMMENTARY: This objective is not directly relevant to the Proposed Action.		

Table 6-2: Hawai'i State Planning Act Part III

SECTION	CHAPTER 226 - PART III. PRIORITY GUIDELINES	RATING
A = actively supportive C = conforms I = goal is inconsistent with applicant's objectives NA = goal is not applicable		
226-101	Establishes overall priority guidelines to address areas of statewide concern.	
226-102	Overall direction. The State shall strive to improve the quality of life for Hawai'i's present and future population through the pursuit of desirable courses of action in five major areas of statewide concern which merit priority attention: economic development, population growth and land resource management, affordable housing, crime and criminal justice, and quality education.	
226-103	ECONOMIC PRIORITY GUIDELINES.	
(a)	Priority guidelines to stimulate economic growth and encourage business expansion and development to provide needed jobs for Hawai'i's people and achieve a stable and diversified economy:	

SECTION	CHAPTER 226 - PART III. PRIORITY GUIDELINES	RATING
A = actively supportive C = conforms I = goal is inconsistent with applicant's objectives NA = goal is not applicable		
(1)	Seek a variety of means to increase the availability of investment capital for new and expanding enterprises.	NA
(A)	Encourage investments which:	
(i)	Reflect long term commitments to the State;	A
(ii)	Rely on economic linkages within the local economy;	A
(iii)	Diversify the economy;	A
(iv)	Reinvest in the local economy;	A
(v)	Are sensitive to community needs and priorities, and	A
(vi)	Demonstrate a commitment to provide management opportunities to Hawai'i residents.	A
(2)	Encourage the expansion of technological research to assist industry development and support the development and commercialization of technological advancements.	NA
(3)	Improve the quality, accessibility, and range of services provided by government to business, including data and reference services and assistance in complying with governmental regulations.	NA
(4)	Seek to ensure that state business tax and labor laws and administrative policies are equitable, rational, and predictable.	NA
(5)	Streamline the building and development permit and review process, and eliminate or consolidate other burdensome or duplicative governmental requirements imposed on business, where public health, safety and welfare would not be adversely affected.	NA
(6)	Encourage the formation of cooperatives and other favorable marketing or distribution arrangements at the regional or local level to assist Hawai'i's small-scale producers, manufacturers, and distributors.	C
(7)	Continue to seek legislation to protect Hawai'i from transportation interruptions between Hawai'i and the continental United States.	NA
(8)	Provide public incentives and encourage private initiative to develop and attract industries which promise long-term growth potentials and which have the following characteristics:	NA
(A)	An industry that can take advantage of Hawai'i's unique location and available physical and human resources.	NA
(B)	A clean industry that would have minimal adverse effects on Hawai'i's environment.	NA
(C)	An industry that is willing to hire and train Hawai'i's people to meet the industry's labor needs at all levels of employment.	NA
(D)	An industry that would provide reasonable income and steady employment.	NA
(9)	Support and encourage, through educational and technical assistance programs and other means, expanded opportunities for employee ownership and participation in Hawai'i business.	C
(10)	Enhance the quality of Hawai'i's labor force and develop and maintain career opportunities for Hawai'i's people through the following actions:	NA
(A)	Expand vocational training in diversified agriculture, aquaculture, information industry, and other areas where growth is desired and feasible.	NA

SECTION	CHAPTER 226 - PART III. PRIORITY GUIDELINES	RATING
A = actively supportive C = conforms I = goal is inconsistent with applicant's objectives NA = goal is not applicable		
(B)	Encourage more effective career counseling and guidance in high schools and post-secondary institutions to inform students of present and future career opportunities.	NA
(C)	Allocate educational resources to career areas where high employment is expected and where growth of new industries is desired.	NA
(D)	Promote career opportunities in all industries for Hawai'i's people by encouraging firms doing business in the State to hire residents.	NA
(E)	Promote greater public and private sector cooperation in determining industrial training needs and in developing relevant curricula and on-the-job training opportunities.	NA
(F)	Provide retraining programs and other support services to assist entry of displaced workers into alternative employment.	NA
(b)	Priority guidelines to promote the economic health and quality of the visitor industry:	
(1)	Promote visitor satisfaction by fostering an environment which enhances the aloha spirit and minimizes inconveniences to Hawai'i's residents and visitors.	A
(2)	Encourage the development and maintenance of well-designed, adequately serviced hotels and resort destination areas which are sensitive to neighboring communities and activities and which provide for adequate shoreline setbacks and beach access.	A
(3)	Support appropriate capital improvements to enhance the quality of existing resort destination areas and provide incentives to encourage investment in upgrading, repair, and maintenance of visitor facilities.	C
(4)	Encourage visitor industry practices and activities which respect, preserve, and enhance Hawai'i's significant natural, scenic, historic, and cultural resources.	A
(5)	Develop and maintain career opportunities in the visitor industry for Hawai'i's people, with emphasis on managerial positions.	A
(6)	Support and coordinate tourism promotion abroad to enhance Hawai'i's share of existing and potential visitor markets.	A
(7)	Maintain and encourage a more favorable resort investment climate consistent with the objectives of this chapter.	A
(8)	Support law enforcement activities that provide a safer environment for both visitors and residents alike.	C
(9)	Coordinate visitor industry activities and promotions to business visitors through the state network of advanced data communication techniques.	C
(c)	Priority guidelines to promote the continued viability of the sugar and pineapple industries:	
(1)	Provide adequate agricultural lands to support the economic viability of the sugar and pineapple industries.	NA
(2)	Continue efforts to maintain federal support to provide stable sugar prices high enough to allow profitable operations in Hawai'i.	NA

SECTION	CHAPTER 226 - PART III. PRIORITY GUIDELINES	RATING
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(3)	Support research and development, as appropriate, to improve the quality and production of sugar and pineapple crops.	NA
(d)	Priority guidelines to promote the growth and development of diversified agriculture and aquaculture:	
(1)	Identify, conserve, and protect agricultural and aquacultural lands of importance and initiate affirmative and comprehensive programs to promote economically productive agricultural and aquacultural uses of such lands.	A
(2)	Assist in providing adequate, reasonably priced water for agricultural activities.	A
(3)	Encourage public and private investment to increase water supply and to improve transmission, storage, and irrigation facilities in support of diversified agriculture and aquaculture.	C
(4)	Assist in the formation and operation of production and marketing associations and cooperatives to reduce production and marketing costs.	NA
(5)	Encourage and assist with the development of a waterborne and airborne freight and cargo system capable of meeting the needs of Hawai'i's agricultural community.	NA
(6)	Seek favorable freight rates for Hawai'i's agricultural products from interisland and overseas transportation operators.	NA
(7)	Encourage the development and expansion of agricultural and aquacultural activities which offer long-term economic growth potential and employment opportunities.	A
(8)	Continue the development of agricultural parks and other programs to assist small independent farmers in securing agricultural lands and loans.	NA
(9)	Require agricultural uses in agricultural subdivisions and closely monitor the uses in these subdivisions.	NA
(10)	Support the continuation of land currently in use for diversified agriculture.	A
(e)	Priority guidelines for water use and development:	
(1)	Maintain and improve water conservation programs to reduce the overall water consumption rate.	A
(2)	Encourage the improvement of irrigation technology and promote the use of nonpotable water for agricultural and landscaping purposes.	A
(3)	Increase the support for research and development of economically feasible alternative water sources.	NA
(4)	Explore alternative funding sources and approaches to support future water development programs and water system improvements.	NA
(f)	Priority guidelines for energy use and development:	
(1)	Encourage the development, demonstration, and commercialization of renewable energy sources.	C
(2)	Initiate, maintain, and improve energy conservation programs aimed at reducing energy waste and increasing public awareness of the need to conserve energy.	C
(3)	Provide incentives to encourage the use of energy conserving technology in residential, industrial, and other buildings.	C
(4)	Encourage the development and use of energy conserving and cost-efficient transportation systems.	C

SECTION	CHAPTER 226 - PART III. PRIORITY GUIDELINES	RATING
A = actively supportive C = conforms I = goal is inconsistent with applicant's objectives NA = goal is not applicable		
(g)	Priority guidelines to promote the development of the information industry:	
(1)	Establish an information network that will serve as the catalyst for establishing a viable information industry in Hawai'i.	NA
(2)	Encourage the development of services such as financial data processing, products and services exchange, foreign language translations, telemarketing, teleconferencing, a twenty-four-hour international stock exchange, international banking, and a Pacific Rim management center.	NA
(3)	Encourage the development of small businesses in the information field such as software development, the development of new information systems and peripherals, data conversion and data entry services, and home or cottage services such as computer programming, secretarial, and accounting services.	NA
(4)	Encourage the development or expansion of educational and training opportunities for residents in the information and telecommunications fields.	NA
(5)	Encourage research activities, including legal research in the information and telecommunications fields.	NA
(6)	Support promotional activities to market Hawai'i's information industry services.	NA
226-104	POPULATION GROWTH AND LAND RESOURCES PRIORITY GUIDELINES.	
(a)	Priority guidelines to effect desired statewide growth and distribution:	
(1)	Encourage planning and resource management to insure that population growth rates throughout the State are consistent with available and planned resource capacities and reflect the needs and desires of Hawai'i's people.	C
(2)	Manage a growth rate for Hawai'i's economy that will parallel future employment needs for Hawai'i's people.	C
(3)	Ensure that adequate support services and facilities are provided to accommodate the desired distribution of future growth throughout the State.	C
(4)	Encourage major state and federal investments and services to promote economic development and private investment to the neighbor islands, as appropriate.	NA
(5)	Explore the possibility of making available urban land, low-interest loans, and housing subsidies to encourage the provision of housing to support selective economic and population growth on the neighbor islands.	A
(6)	Seek federal funds and other funding sources outside the State for research, program development, and training to provide future employment opportunities on the neighbor islands.	NA
(7)	Support the development of high technology parks on the neighbor islands.	NA
(b)	Priority guidelines for regional growth distribution and land resource utilization:	

SECTION	CHAPTER 226 - PART III. PRIORITY GUIDELINES	RATING
A = actively supportive C = conforms I = goal is inconsistent with applicant's objectives NA = goal is not applicable		
(1)	Encourage urban growth primarily to existing urban areas where adequate public facilities are already available or can be provided with reasonable public expenditures, and away from areas where other important benefits are present, such as protection of important agricultural land or preservation of lifestyles.	A
(2)	Make available marginal or nonessential agricultural lands for appropriate urban uses while maintaining agricultural lands of importance in the agricultural district.	NA
(3)	Restrict development when drafting of water would result in exceeding the sustainable yield or in significantly diminishing the recharge capacity of any groundwater area.	NA
(4)	Encourage restriction of new urban development in areas where water is insufficient from any source for both agricultural and domestic use.	NA
(5)	In order to preserve green belts, give priority to state capital-improvement funds which encourage location of urban development within existing urban areas except where compelling public interest dictates development of a noncontiguous new urban core.	C
(6)	Seek participation from the private sector for the cost of building infrastructure and utilities, and maintaining open spaces.	A
(7)	Pursue rehabilitation of appropriate urban areas.	C
(8)	Support the redevelopment of Kakaako into a viable residential, industrial, and commercial community.	NA
(9)	Direct future urban development away from critical environmental areas or impose mitigating measures so that negative impacts on the environment would be minimized.	A
(10)	Identify critical environmental areas in Hawai'i to include but not be limited to the following: watershed and recharge areas; wildlife habitats (on land and in the ocean); areas with endangered species of plants and wildlife; natural streams and water bodies; scenic and recreational shoreline resources; open space and natural areas; historic and cultural sites; areas particularly sensitive to reduction in water and air quality; and scenic resources.	A
(11)	Identify all areas where priority should be given to preserving rural character and lifestyle.	A
(12)	Utilize Hawai'i's limited land resources wisely, providing adequate land to accommodate projected population and economic growth needs while ensuring the protection of the environment and the availability of the shoreline, conservation lands, and other limited resources for future generations.	A
(13)	Protect and enhance Hawai'i's shoreline, open spaces, and scenic resources.	A
226-105	CRIME AND CRIMINAL JUSTICE. PRIORITY GUIDELINES IN THE AREA OF CRIME AND CRIMINAL JUSTICE:	
(1)	Support law enforcement activities and other criminal justice efforts that are directed to provide a safer environment.	NA

SECTION	CHAPTER 226 - PART III. PRIORITY GUIDELINES	RATING
A = actively supportive C = conforms I = goal is inconsistent with applicant's objectives NA = goal is not applicable		
(2)	Target state and local resources on efforts to reduce the incidence of violent crime and on programs relating to the apprehension and prosecution of repeat offenders.	NA
(3)	Support community and neighborhood program initiatives that enable residents to assist law enforcement agencies in preventing criminal activities.	NA
(4)	Reduce overcrowding or substandard conditions in correctional facilities through a comprehensive approach among all criminal justice agencies which may include sentencing law revisions and use of alternative sanctions other than incarceration for persons who pose no danger to their community.	NA
(5)	Provide a range of appropriate sanctions for juvenile offenders, including community-based programs and other alternative sanctions.	NA
(6)	Increase public and private efforts to assist witnesses and victims of crimes and to minimize the costs of victimization.	NA
226-106	AFFORDABLE HOUSING. PRIORITY GUIDELINES FOR THE PROVISION OF AFFORDABLE HOUSING:	
(1)	Seek to use marginal or nonessential agricultural land and public land to meet housing needs of low-and moderate-income and gap-group households.	A
(2)	Encourage the use of alternative construction and development methods as a means of reducing production costs.	A
(3)	Improve information and analysis relative to land availability and suitability for housing.	A
(4)	Create incentives for development which would increase home ownership and rental opportunities for Hawai'i's low- and moderate-income households, gap-group households, and residents with special needs.	A
(5)	Encourage continued support for government or private housing programs that provide low interest mortgages to Hawai'i's people for the purchase of initial owner-occupied housing.	A
(6)	Encourage public and private sector cooperation in the development of rental housing alternatives.	A
(7)	Encourage improved coordination between various agencies and levels of government to deal with housing policies and regulations.	A
(8)	Give higher priority to the provision of quality housing that is affordable for Hawai'i's residents and less priority to development of housing intended primarily for individuals outside of Hawai'i.	A
226-107	QUALITY EDUCATION. PRIORITY GUIDELINES TO PROMOTE QUALITY EDUCATION:	
(1)	Pursue effective programs which reflect the varied district, school, and student needs to strengthen basic skills achievement;	NA

SECTION	CHAPTER 226 - PART III. PRIORITY GUIDELINES	RATING
A = actively supportive C = conforms I = goal is inconsistent with applicant's objectives NA = goal is not applicable		
(2)	Continue emphasis on general education "core" requirements to provide common background to students and essential support to other university programs;	NA
(3)	Initiate efforts to improve the quality of education by improving the capabilities of the education work force;	NA
(4)	Promote increased opportunities for greater autonomy and flexibility of educational institutions in their decision-making responsibilities;	NA
(5)	Increase and improve the use of information technology in education by the availability of telecommunications equipment for:	NA
(A)	The electronic exchange of information;	NA
(B)	Statewide electronic mail; and	NA
(C)	Access to the Internet.	NA
(6)	Encourage programs that increase the public's awareness and understanding of the impact of information technologies on our lives;	NA
(7)	Pursue the establishment of Hawai'i's public and private universities and colleges as research and training centers of the Pacific;	NA
(8)	Develop resources and programs for early childhood education;	NA
(9)	Explore alternatives for funding and delivery of educational services to improve the overall quality of education; and	NA
(10)	Strengthen and expand educational programs and services for students with special needs.	NA

In 2011, the Governor signed into law Act 181 amending Chapter 226 to add a new definition (Sustainability) and new priority guidelines and principles to promote sustainability. Following is a discussion of how the Proposed Action fulfills the intent of these amendments.

As set forth in Act 181, "Sustainability means achieving the following:

1. Respect of the culture, character, beauty, and history of the State's island communities;
2. Striking a balance between economic, social, community, and environmental priorities; and
3. Meeting the needs of the present without compromising the ability of future generations to meet their own needs.

New Priority Guidelines:

(1) Encouraging balanced economic, social, community, and environmental priorities;
(2) Encouraging planning that respects and promotes living within the natural resources and limits of the State;
(3) Promoting a diversified and dynamic economy;
(4) Encouraging respect for the host culture;
(5) Promoting decisions based on meeting the needs of the present without compromising the needs of future generations;

(6) Considering the principles of the ahupuaʻa system; and
(7) Emphasizing that everyone, including individuals, families, communities, businesses, and government, has the responsibility for achieving a sustainable Hawaii.

Discussion: TBR has addressed these seven Priority Guidelines, as well as the State's definition of sustainability, through the concept of *Tomorrow's Ahupuaʻa*, that has become the basis for the planning, design, and implementation of the Proposed Action. Appendix A of the SEIS presents a detailed discussion of the full range of actions that are proposed as part of the Proposed Action.

A.3. b. Recently Enacted Legislation Amending the Hawaiʻi State Plan

In July 2012, the Governor signed Senate Bill 2745 CD1 into law, amending the Hawaiʻi State Plan by adding climate change adaptation priority guidelines that are intended to serve as guiding policy for all major state and county activities, programs, land use and other decision making processes, and county general plans and development plans. Following is a discussion of the Proposed Action's relationship to climate change adaptation priority guidelines.

(1) ***Ensure that Hawaiʻi's people are educated, informed and aware of the impacts climate change may have on their communities;***

Discussion: The SEIS includes a specific section (Chapter Two, Section H4b) that addresses issues related to climate change that may impact the SEIS Lands and the Proposed Action. As a disclosure document, the SEIS will contribute to the fulfillment of this policy.

(2) ***Encourage community stewardship groups and local stakeholders to participate in planning and implementation of climate change policies;***

Discussion: Among the mitigation measures proposed as part of the Proposed Action is the creation of an advisory council to assist the landowner in the formulation of policies and programs to preserve cultural and natural resources identified within the SEIS Lands. Issues pertaining to climate change and how the resort's natural and cultural resources may be affected by it would be appropriate for the advisory council to consider. Thus, the Proposed Action is consistent with and supportive of this policy.

(3) ***Invest in continued monitoring and research of Hawaiʻi's climate and the impacts of climate change on the State;***

Discussion: While the principal focus of this policy is on governmental agencies that are capable of conducting statewide research, such as the University of Hawaiʻi, the Department of Health, and the Department of Business, Economic Development and Tourism, among others, the Turtle Bay Resort may be able to contribute to this effort. Since the mid-1980s, the resort's owners have sponsored the regular and systematic collection of monitoring data pertaining to near shore water quality along the Turtle Bay Resort coastline. This data may be useful to governmental research agencies. Thus, the Proposed Action is supportive of this policy.

(4) ***Consider native Hawaiian traditional knowledge and practices in planning for the impacts of climate change;***

Discussion: As discussed in Chapter Two, implementation of the Proposed Action is based upon a program specifically intended to perpetuate traditional Hawaiian knowledge and practices. The Proposed Action is supportive of this policy.

(5) ***Encourage the preservation and restoration of natural landscape features, such as coral reefs, beaches and dune, forests, streams, floodplains, and wetlands that have the inherent capacity to avoid, minimize, or mitigate the impacts of climate change;***

Discussion: Chapter Five of the SEIS presents numerous mitigation measures pertaining specifically to the restoration of natural landscape features, such as coral reefs, beaches and dune, forests, streams, floodplains, and wetlands. The Proposed Action is consistent with and supportive of this policy.

(6) ***Explore adaptation strategies that moderate harm or exploit beneficial opportunities in response to actual or expected climate change impacts to the natural and built environments;***

Discussion: The inclusion of generous coastal setbacks beyond what are required by law is and example of the adaptive strategy employed by the Proposed Action. The Proposed Action is consistent with and supportive of this policy.

(7) ***Promote sector resilience in areas such as water, roads, airports, and public health, by encouraging the identification of climate change threats, assessment of potential consequences, and evaluation of adaptive options;***

Discussion: This policy appears to pertain most directly to governmental agencies responsible for public health and infrastructure. However, to the extent possible for a private property, the landowners have, and will continue to, explore adaptive options for the implementation of the Proposed Action. The Proposed Action is supportive of this policy.

(8) ***Foster cross-jurisdictional collaboration between county, state, and federal agencies and partnerships between government and private entities and other non-governmental entities, including non-profit entities;***

Discussion: Although this policy is best implemented by government agencies, the Proposed Action is receptive to it, and is therefore, supportive.

(9) ***Use management and implementation approaches that encourage continual collection, evaluation, and integration of new information and strategies into existing practices, policies, and plans; and***

Discussion: Implementation of the Proposed Action is intended to be consistent with and support of this management approach.

(10) *Encourage planning and management of the natural and built environments that effectively integrate climate change policy.*

Discussion: As demonstrated throughout the SEIS, the Proposed Action is consistent with and supportive of this policy.

A. 4. State Functional Plans

The Planning Act called for the creation of functional plans to set specific objectives, establish policies, and implement actions for a particular field of activity. These functional plans further identified those organizations responsible in carrying out the actions, the implementing timeframe, and the proposed budgets.

The most current functional plans and the relationship, if any, to the Turtle Bay Resort expansion project are discussed in the following sections.

A.4. a. State Agricultural Functional Plan (1991)

Goals of the Plan: The State Agricultural Functional Plan sought to ultimately increase the overall level of agricultural development in Hawai'i. Its fundamental objectives were to (1) ensure the continued viability of Hawai'i's sugar and pineapple industries, and (2) encourage the continued growth and development of diversified agriculture throughout the State. The functional plan for agriculture also sets objectives to develop capabilities to convert Hawai'i-grown crops into potential new value/added products for the local community, visitor industry, and export markets.

Conformance with the Goals of the Plan: Because the Turtle Bay Resort's agricultural lands are not included in the proposed expansion project, the State Agricultural Function Plan is not directly relevant to the proposed project. However, it is indirectly relevant because the proposed project intends to strengthen the relationship between the agricultural lands mauka of Kamehameha Highway and resort lands makai of the highway. The inclusion of a farmers' market in the proposed development and the promotion of farm-to-plate market opportunities for the lessees of the agricultural lands are both consistent with the goals of the plan to encourage diversified agriculture.

A.4. b. State Conservation Functional Plan (1991)

Goals of the Plan: The State Conservation Lands Functional Plan addresses the impacts of population growth and economic development on Hawai'i's natural environment and provides a framework for the protection and preservation of pristine lands and shore lands. The objective of the plan is to provide for a management program allowing the judicious use of the State's natural resources balanced with the need to protect these resources to varying degrees. The State is primarily responsible to provide the management of conservation areas. However, counties play a key role in directing urban and agricultural activities and in retaining open space and cultural sites as lands become urbanized.

Conformance with the Goals of the Plan: The proposed project is consistent with goal to protect natural resources and sensitive shoreline areas. The increased shoreline setbacks provided in the proposed project (over those that have been previously established by ordinance) result in approximately 42 acres being set aside as protected shoreline area. While only the portion of this shoreline situated seaward of the certified shoreline falls under the direct jurisdiction of the State of Hawai'i, the property owner is committed to working with the State to ensure that the coastline fronting the resort remains in open space for the enjoyment of residents and visitors alike. In addition, the property owner is committed to the enhancement of near-shore aquatic resources and will employ best efforts toward the designation of Kawela Bay as a marine-life conservation district and pursue proposed improvements to existing drainage channels to reduce the sediment load entering Kawela Bay.

A.4. c. State Educational Functional Plan (1989)

Goals of the Plan: The State Educational Functional Plan reflects the State Department of Education's (DOE) strategy to address the goals, policies, and priority guidelines of the Planning Act and the goals of the Board of Education (BOE). The plan outlines actions to be taken by the DOE to improve the public school system and to attend to various societal needs and trends.

Conformance with the Goals of the Plan: As implementation of the State Educational Function Plan is the responsibility of the DOE, it is not directly relevant to the proposed project.

A.4. d. State Higher Education Functional Plan (1984)

Goals of the Plan: The objectives of the State Higher Education Functional Plan are to provide (1) a number of diverse postsecondary education institutions; (2) quality educational, research, and public services programs; (3) appropriate opportunities for all who can benefit; (4) financing to ensure accessibility; and (5) coordination of educational resources.

Conformance with the Goals of the Plan: The State Higher Educational Function Plan is not relevant to the proposed project because its implementation is largely the responsibility of the DOE and the University of Hawaii.

A.4. e. State Employment Functional Plan (1990)

Goals of the Plan: The 1990 State Employment Functional Plan's objectives, policies, and implementing actions address four major issue areas: (1) education and preparation services for employment; (2) job placement; (3) quality of work life; and (4) employment planning information and coordination.

Conformance with the Goals of the Plan: Upon completion, the Proposed Action will be a principal source of new employment opportunities for the Ko'olau Loa region. To that end, it is supportive of the Employment Functional Plan.

A.4. f. State Energy Functional Plan (1991)

Goals of the Plan: The State Energy Functional Plan sought to (1) support the commercialization of Hawai'i's alternative energy resources, (2) implement a wide range of energy conservation and efficiency technologies; (3) prepare for disruptions in the energy supply; and (4) reduce the State's dependence on imported fossil fuels, such as oil, for 90 percent of its total energy needs as opposed to 42 percent nationally.

The plan called for objectives and courses of action to lessen Hawai'i's dependence on imported fossil fuels. The objectives were to: (1) moderate the growth in energy demand through conservation and energy efficiency; (2) displace oil and fossil fuels through alternate and renewable energy sources; (3) promote energy education and legislation; (4) support and develop an integrated approach to energy development and management; (5) ensure the State's abilities to implement energy emergency actions immediately in the event of fuel supply disruptions, and ensure essential public services are maintained and provisions are made to alleviate economic and personal hardships that may arise.

Conformance with the Goals of the Plan: As discussed in Appendix A, the project will utilize advanced best management practices (BMP) for green building to incorporate sustainable principals from conceptual design through the end of construction. These BMP's address aspects of site, water efficiency and reuse, energy consumption, day-lighting, recycling and construction waste management, materials (local, recycled), fixtures, indoor environmental quality, low-emitting materials, and natural resources.

The proposed resort expansion project will seek to minimize its impact on the environment through the appropriate selection of energy efficient systems, and considering sustainable material choices to achieve an environmentally responsible design that strikes a balance between known established practices and emerging sustainable best management practices. In this manner, the proposed project is consistent with the objective to moderate the growth in energy demand through conservation and energy-efficient practices. As discussed in Appendix A, *Tomorrow's Ahupua'a* includes guidelines that emphasize the overall moku (land district) and how each individual *ahupua'a* within the SEIS Lands has a symbiotic relationship between its natural resources and built environment. The proper balance of this relationship ensures economic and social/political sustainability and supports strong health and welfare of its residents, guest and visitors.

The intent of these guidelines is to respond to Hawai'i's complex growth challenges by promoting sustainable practices, high performance energy efficient buildings, economically viable and environmentally mindful development, and by encouraging best practices in new development today.

With the intent of providing a measurable basis for assessment, many of these standards are modeled after and based on highly respected and established programs like the US Green Building Council's LEED (Leadership in Energy and Environmental Design) Green Building Rating System and other similar industry standard best practice rating and measurements systems.

A.4. g. State Health Functional Plan (1989)

Goals of the Plan: The 1989 State Health Functional Plan addressed six issue areas: (1) health promotion and disease prevention; (2) communicable disease prevention and control; (3) special populations with impaired access to health care; (4) healthcare services (acute, long-term, primary and emergent) for rural communities; (5) environmental health and protection; and (6) Department of Health (DOH) leadership. The plan also sought to boost the long-term economy by attracting a share of the rapidly developing, affluent, wellness-oriented market. It also sought to develop and implement new environmental protection and health services that would protect, monitor, prevent degradation, and enhance the quality of Hawai'i's air, land, and water.

Conformance with the Goals of the Plan: The State Health Function Plan is not directly relevant to the proposed project.

A.4. h. State Historic Preservation Functional Plan (1991)

Goals of the Plan: The State Historic Functional Plan identifies issues, policies, and implementing actions that seek to preserve and protect the unsurpassable beauty, history, and culture of the Hawaiian Islands. Hawai'i's natural scenic beauty, clean environment, and rich multi-cultural heritage (including historic/cultural sites) are reasons why so many people have made Hawai'i their home, and why so many visit the State.

Conformance with the Goals of the Plan: The proposed project is supportive of the Historic Preservation Functional Plan. The property owners' voluntary commitment to a supplemental archaeological inventory survey for the expressed purpose of identifying archaeological and cultural resources so that they can be avoided is consistent with the spirit and intent of the Plan. The preparation of the Cultural Impact Assessment included in this EIS furthers the understanding of the region's valued cultural resources. Finally, the formulation of the overall conceptual development plan in the context of the property's historic land divisions ensures that the area's cultural traditions will be preserved.

A.4. i. State Housing Functional Plan (1990)

Goals of the Plan: The 1990 State Housing Functional Plan identified a need to develop affordable housing throughout the State, and found that the housing needs of lower income households would not be adequately met in future residential developments. Obstacles identified to the development of affordable housing include (1) the lack of infrastructure, particularly on the neighbor islands; (2) the high cost of zoned land, high development costs, and the regulatory system particularly on O'ahu; (3) government policies that have created a shortage of urban land zoned for housing; (4) lack of government funds to develop rental housing; (5) building codes and subdivision standards that constrain innovative, cost-saving technologies; and (6) current labor wages. The Plan recommended increased densities in residential developments where feasible, smaller and basic units, funding for rental developments, and state subsidies.

Conformance with the Goals of the Plan: The proposed project is consistent with the goals of the plan pertaining to the provision of housing that is affordable to Hawai'i's residents. The proposed project includes nearly double the number of community-focused housing units that are presently required by law.

A.4. j. State Human Services Functional Plan (1989)

Goals of the Plan: The Human Services Functional Plan addressed: (1) elder abuse; (2) child abuse and neglect; and (3) spouse/domestic abuse and violence. The plan details statistics, causes, and prevention measures that can help to combat very pressing societal issues.

Conformance with the Goals of the Plan: The State Human Services Function Plan is not directly relevant to the proposed project.

A.4. k. State Recreation Functional Plan (1991)

Goals of the Plan: The 1991 State Recreation Functional Plan focused on six issue areas: (1) ocean and shoreline recreation; (2) *mauka*, urban, and other recreation; (3) public access to the shoreline and upland recreation areas; (4) resource conservation and management, (5) management of recreation programs and facilities; and (6) wetlands protection and management.

Conformance with the Goals of the Plan: The proposed project is consistent with all the goals of the State Recreational Functional Plan. The proposed development plan greatly improves opportunities for ocean and shoreline recreation through the provision of an extensive coastal trail system that also integrates pedestrian uses with equestrian and bicycle activities. The proposed plan increases the number of public access paths to the shoreline over what is required by ordinance. The plan preserves the natural resources of the coastline as well as the extensive Punaho'olapa Marsh area. And finally, the coordinated management of these resources under the auspices of a visitor-destination resort will ensure adequate security and safety for all guest, visitors and residents pursuing recreational opportunities at the Turtle Bay Resort.

A.4. l. State Tourism Functional Plan (1991)

Goals of the Plan: The 1991 State Tourism Functional Plan focused on six issues: (1) the positive and negative impacts of tourism growth on the community; (2) physical development in terms of product quality, product diversity, land use planning, adequate infrastructure, and visitor use of public services; (3) environmental resources and cultural heritage; (4) community, visitor, and industry relations; (5) employment and career development; and (6) effective marketing.

Conformance with the Goals of the Plan: The proposed resort expansion plan is consistent with the State Tourism Functional Plan. The Honolulu General Plan designated Turtle Bay as a visitor destination area over thirty years ago. The proposed expansion of the resort in a manner that is consistent with and complimentary to the region's rural character fulfills the State and County's desire to ensure that the visitor industry benefits the quality of life of Hawai'i's residents.

A.4. m. State Transportation Functional Plan (1991)

Goals of the Plan: The 1991 State Transportation Functional Plan sought to (1) construct facility and infrastructure improvements in support of Hawai'i's thriving economy and growing population base; (2) develop a transportation system balanced with an array of new alternatives; (3) implement Transportation Systems Management to maximize the use of existing facilities and systems; (4) foster innovation and use of new technology in transportation; (5) maximize joint efforts with the private sector; (6) pursue land use initiatives which help reduce travel demand; (7) encourage resident quality-of-life improvements through improved mobility opportunities and travel reduction.

Conformance with the Goals of the Plan: The proposed resort expansion plan is consistent with the Transportation Functional Plan's goals to help reduce travel times and improve the quality of life for area residents. Given that the resort, as well as the entire North Shore of O'ahu is served by a single two-lane highway; the mitigation of transportation-related impacts must concentrate on transportation demand management (TDM). Neither the State nor the City and County of Honolulu have the financial resources, the desire, nor the intent to widen the existing highway. Implementation of TDM measures is consistent with the Transportation Functional Plan.

A.4. n. State Water Resources Development Functional Plan (1984)

Goals of the Plan: The 1984 State Water Resources Development Functional Plan set objectives to: (1) clarify the State water policy and improve management framework; (2) maintain the long-term availability of freshwater supplies while considering environmental values; (3) improve management of flood plains; (4) assure adequate municipal water supplies for planned urban growth; (5) assure the availability of adequate water for agriculture; (6) encourage and coordinate development of self-supplied industrial water and the production of water-based energy; (7) provide for the protection and enhancement of Hawai'i's freshwater and estuarine environment; (8) improve state grant and loan procedures for water programs and projects; and (9) pursue water resources data collection and research to meet changing needs.

Conformance with the Goals of the Plan: The integration of the resort's privately-funded water into the Board of Water Supply's regional water system has benefitted the entire community. The proposed reduction in the density of development will provide a greater surplus for the BWS system.

A. 5. State Ocean Resources Management Plan

The State Ocean Resources Management Plan (ORMP) was adopted by the State Department of Land and Natural Resources in 2006 to establish management goals and strategic actions pertaining to three broad areas of concern. Following is a review of how the proposed resort expansion plan relates to the ORMP.

Management Goals and Strategic Actions	Supports	Conforms	Inconsistent	Not Applicable

Improve coastal water quality by reducing land-based sources of pollution.	**S**	**C**	**I**	**NA**
Reduce soil erosion from upland forest ecosystems and conservation lands.	x			
Reduce pollutant loads from residential, agricultural, and commercial uses in priority watersheds.	x			

Discussion: The entire resort property, including the mauka agricultural lands, are managed by a single entity whose primary environmental interest is to ensure that the quality of the coastal resources are improved, preserved, and protected for the benefit of guests, visitors and residents. In addition to establishing internal operational procedures for its users and tenants, the property owner is coordinating with the U.S. Army, which owns the land mauka of the resort property to reduce soil erosion from mauka lands.

Protect beaches, wetlands, and coastal communities from shoreline erosion and other coastal hazards.	**S**	**C**	**I**	**NA**
Develop and implement a comprehensive and integrated shoreline policy that addresses the impacts of chronic and episodic coastal hazards.	x			
Develop a Hawai`i beach and shoreline management plan with specific management measures to address coastal erosion and other hazards in priority coastal areas.				x
Encourage appropriate coastal-dependent development that reduces risks from coastal hazards and protects coastal and cultural resources.	x			

Discussion: The proposed expansion plan incorporates development restrictions imposed by the Federal Emergency Management Agency through its Flood Insurance Rate Map (FIRM) program. Shoreline setback areas in excess of those imposed by ordinance have been included in the proposed development plan to ensure that risks for coastal hazards are reduced.

Improve and ensure maintenance and appropriate use of environmental infrastructure.	**S**	**C**	**I**	**NA**
Repair leaking sewers in priority watersheds.	x			
Reduce the number of individual wastewater disposal systems in the coastal environment.	x			
Reduce unpermitted storm-water discharges to the sewers in priority watersheds.	x			
Provide appropriate waste management infrastructure to support commercial and recreational marine facilities.	x			

Discussion: The resort's privately funded and operated wastewater treatment plant will accommodate the proposed development.

Management Goals and Strategic Actions	Supports	Conforms	Inconsistent	Not Applicable

Improve coastal water quality by reducing marine sources of pollution.	**S**	**C**	**I**	**NA**
Minimize the introduction and spread of marine alien and invasive species into and throughout archipelagic waters.				x
Establish wastewater-discharge restricted zones and conditions for commercial vessels in archipelagic waters.				x

Discussion: As the existing and proposed development does not include facilities to allow the launching of boats from the coastline fronting the resort, the regulation and/or control of marine sources of pollution, in the form of boats that sail or motor into the Turtle Bay Resort coastal waters are beyond the authority of the applicant.

Improve the health of coral reef resources for sustainable traditional, subsistence, recreational, and commercial uses.	**S**	**C**	**I**	**NA**
Strengthen and expand marine protected area management.	x			
Develop ecosystem-based approaches for near-shore fisheries management.	x			
Establish and institutionalize approaches for restoring, operating, and preserving ancient Hawaiian coastal fishponds for the benefit of coastal communities around the State.	x			
Improve enforcement capacity and voluntary compliance with existing rules and regulations for ocean resource protection.	x			

Discussion: The proposed creation of a Kawela Bay conservation management district will be based upon traditional cultural practices associated with the Turtle Bay Resort coastal area. While the resort does not have the authority to regulate the activities of persons who access the coastline on public land, it can implement and enforce a marine-based conservation program for those who access the coastline through the resort property.

Enhance public access and appropriate coastal-dependent uses of the shoreline.	**S**	**C**	**I**	**NA**
Enhance and restore existing public shoreline areas and scenic vistas.	x			
Establish new shoreline areas public and appropriate coastal-dependent uses.	x			

Discussion: The proposed resort expansion plan nearly doubles the number of required public shoreline accesses (from the 8 required by ordinance to a total of 12).

Management Goals and Strategic Actions	Supports	Conforms	Inconsistent	Not Applicable

Promote appropriate and responsible ocean recreation and tourism that provide culturally informed and environmentally sustainable uses for visitors and residents.	**S**	**C**	**I**	**NA**
Develop community-based frameworks and practices for identifying and mitigating ocean recreational use conflicts.	x			
Develop responsible and sustainable ocean-based tourism.	x			

Discussion: The resort operator is committed to ensuring that resort visitors and guests conduct themselves in a manner that will not result in adverse environmental impacts upon the shoreline or near-shore waters.

Encourage cutting edge and appropriate ocean science and technology with safeguards for ocean resource protection.	**S**	**C**	**I**	**NA**
Promote alternative ocean energy sources.				x
Plan and develop sustainable commercial aquaculture in coastal areas and ocean waters to diversify and expand Hawai`i's economy and provide locally produced sources of seafood.				x
Expand ocean science and technology.				x

Discussion: Achievement of this goal is beyond the scope of the proposed action.

Apply integrated and place-based approaches to the management of natural and cultural resources.	**S**	**C**	**I**	**NA**
Develop integrated natural and cultural resources planning process and standardized tools.	x			
Build capacity for community participation in natural and cultural resources management.	x			

Discussion: The applicant's development plan as reflected in its *Tomorrow's Ahupuaʻa* management concept bases proposed resort expansion and long-term operations on the implementation of a culturally-based program that is consistent with traditional and customary practices. The program will be implemented through a coordinated community-based effort.

Improve the existing legal, regulatory, and institutional framework for integrated natural resources management based on scientific data, traditional knowledge, and field experience.	**S**	**C**	**I**	**NA**
Establish a legislative and administrative reform agenda to improve management of natural resources.				x
Develop integrated information management systems for priority watersheds and coastal areas.				x
Document and share experiences and lessons learned in Hawai`i and globally to promote natural and cultural resource policy reforms and adoption.				x
Monitor and evaluate ORMP implementation.				x

Discussion: The implementation of this goal and its accompanying strategic actions lies with the State Department of Land and Natural Resources.

A. 6. State of Hawaiʻi Water Plan

The Hawaiʻi Water Plan (HWP), under HRS §174C-31, consists of four parts: (1) a water resource protection plan prepared by the water commission; (2) water use and development plans for each county prepared by each separate county and adopted by ordinance, setting forth the allocation of water to land use in that county; (3) a state water projects plan prepared by the agency which has jurisdiction over such projects in conjunction with other state agencies; and (4) a water quality plan prepared by the DOH.

All water use and development plans shall be conditioned upon and be consistent with: (1) water resource protection and water quality plans; (2) respective county land use plans and policies including general plan and zoning as determined by each respective county; (3) state land use classification and policies.

The State Water Code's Declaration of Policy recognizes the need for comprehensive water resources planning and establishes the HWP as the guide for developing and implementing

this policy. The HWP is intended to serve as a continuing long-range guide for the State Water Commission in executing its general powers, duties, and responsibilities assuring economic development, good municipal services, agricultural stability, and environmental protection.

The Water Code recognizes that the HWP must be continually updated to remain useful and relevant and further specifies that "[e]ach county shall update and modify its water use and development plans as necessary to maintain consistency with its zoning and land use policies". §l74C-31(q) HRS. In response, City Ordinance 90-62, Water Management, established the Oʻahu Water Management Plan (OWMP), which has evolved into a framework of regional WMPs by City development plan district to plan for the management of all water resources within each watershed. The WMPs are prepared by the Honolulu Board of Water Supply (BWS) and its consultants, in collaboration with the City's DPP and the Commission on Water Resource Management (CWRM). Each of the eight WMPs together will constitute the OWMP.

To that end, in March 2011, the State Commission on Water Resource Management adopted the Koʻolau Loa Watershed Management Plan. Section 7 below discusses how the Turtle Bay Resort expansion plan relates to the Koʻolau Loa Watershed Management Plan.

A. 7. Koʻolau Loa Watershed Management Plan

The 2009 Koʻolau Loa Watershed Management Plan (KLWMP) presents objectives, sub-objectives that reflect the desired outcome of the plan, and strategies to implement them. The plan is generally intended to guide agencies and organizations in implementing the most important initiatives for Koʻolau Loa watersheds and water resources. However, as stated in the plan, "… implementation will likely depend on budgetary priorities, grant availability and partnering efforts over the long term. Following is a summary of the sub-objectives, and strategies that are applicable to the Turtle Bay Resort, as a major land use in the Koʻolau Loa region.

Sub-Objective	Strategies	
1.1		Strive to enhance and protect natural resources including land, streams and near shore waters ecosystems.
	1.1.2	Manage agricultural lands for watershed health in addition to income generation.
	1.1.3	Ensure that the additional urban growth is clustered within the Sustainable Communities Plan Rural Community Boundary and is designed for minimal impact on the environment.
1.3		Collaborate with responsible agencies to identify and implement environmentally-friendly measures to alleviate flooding issues and reduce pollution caused by runoff.
	1.3.1	Plan and implement flood control measures.
	1.3.2	Improve management of streams and stream banks.
	1.33	Restore muliwai and wetlands for flood protection.

Discussion: While no resort expansion is directly associated with the Turtle Bay Resort agricultural lands, they are an important element of the overall resort. The water quality of surface drainage and of the near shore coastal waters is greatly affected by the proper

management of these properties, which include both the farmlands mauka of Kamehameha Highway and the Punahoʻolapa marsh (classified as State Agricultural District). To that end, the applicant has proposed several measures to improve flood control on the property (see discussion in Chapter Two and Chapter Five). Restoration of the Kawela Stream to align with the West Main Drain, in particular, will also help reduce the sediment load on Kawela Bay. Continued restoration efforts at the marsh will help improve near shore water quality by capturing nutrients that might otherwise make there way to the ocean and improving the capacity of the marsh for storm water retention during flood events. In addition, the applicant is reviewing the construction of approximately 30 acres of storm water retention and detention basins on the agricultural lands mauka of Kamehameha Highway. These basins would be intended to intercept storm water runoff during heavy rainfall events and reduce flooding across Kamehameha Highway and into the makai resort lands.

The Resort property is fully contained within the Rural Community Boundary established by the Koʻolau Loa Sustainable Communities Plan. The applicant's proposed expansion plan represents a substantial reduction in density over that which was previously approved by ordinance, thereby greatly reducing the project's potential environmental impacts.

Sub-Objective	Strategies	
1.4		Promote initiatives that preserve species and habitat biodiversity, particularly native species.
	1.4.1	Protect native species by reducing the threats of invasive plant species.

Discussion: As discussed in the botanical inventory survey conducted for the SEIS, native species are generally limited to the coastal strand fronting the resort property. The Proposed Action increases the development setback from the shoreline, and in so doing, creates a 42-acre expanse of property that will be retained in open space and help protect the fragile coastal strand. Selective pruning and tree removal in the setback area will also help reduce the density of invasive ironwood trees, whose needle litter prohibits understory growth and inhibits native plant re-vegetation. Elsewhere, native plants will be incorporated into landscape features on the resort grounds.

Sub-Objective	Strategies	
1.5		Ensure the export of water from Ko`olau Loa will not be detrimental to Ko`olau Loa.

Discussion: The applicant owns three wells on the mauka side of Kamehameha Highway (the ʻŌpana Wells). Two of these wells have been improved and have been transferred to the Board of Water Supply (BWS). The third well has been tested, not yet improved, and is also intended to be transferred to the BWS. The total capacity of the two wells being transferred to the BWS is 2 mgd. The estimated capacity of the third well is 1 mgd. The capacity of the Opana Well system greatly exceeds the resort's maximum estimated demand. The excess water provided by the Opana Wells will benefit the greater Koʻolau Loa water system, as owned and operated by BWS, to ensure the potable water needs of the Koʻolau Loa area are met.

Sub-Objective	Strategies	
2.2		Maintain and improve the water quality of near shore waters.
	2.2.1	Implement measures that improve the quality of surface waters that come from urban and agricultural land uses.
	2.2.2	Monitor near shore water quality.

Discussion: As mentioned above, the proposed restoration of the Kawela Stream alignment will redirect storm water flow away from Kawela Bay and greatly improve water quality in the bay. Outflow from the redirected channel will enter the ocean in an area that is exposed to much greater wave energy than the bay, resulting in much more rapid flushing of the sediment load.

The applicant and its predecessors have conducted regular shoreline water quality monitoring of the near shore waters over the past 20 years and this monitoring will continue.

Sub-Objective	Strategies	
3.1		Plan for the enhancement of Native Hawaiian water rights and cultural and traditional uses.
	3.1.2	Develop new groundwater sources that do not impact surface waters.
	3.1.3	Promote and preserve Native Hawaiian practices in the watershed.
3.2		Consult with Native Hawaiian agencies/community on water-related issues.
	3.2.1	Prior to constructing projects in culturally sensitive areas, consult with the Native Hawaiian community.
	3.2.2	Use the guidance from the *Kapa`akai* (2000) court decision on Native Hawaiian consultation on providing for the ability to exercise traditional and customary rights.

Discussion: The development of the ʻŌpana Wells, together with the use of reclaimed water from the resort's wastewater treatment plant, reduces the resort's impact upon surface waters. As discussed in Chapter Two of the SEIS, the implementation of the *Tomorrow's Ahupuaʻa* concept is intended to restore a land management system to the area that is consistent with traditional and customary practices. This plan has been carefully developed in consultation with the Native Hawaiian community. A cultural impact assessment has been prepared for the SEIS and is presented in Appendix A and summarized in Chapter Two as a means of documenting traditional and customary practices associated with the property. The applicant is committed to fulfilling its obligations under the *PASH* and *Kapaʻakai* court decisions.

Sub-Objective	Strategies	
4.1		Implement watershed management projects and programs, through a combination of agency initiatives, watershed partnerships and community-based implementation entities.
	4.1.1	Support the existing and future watershed partnerships in Ko`olau Loa.

Discussion: The applicant has been engaged in discussions with its farming tenants as well as the owners of land inland of the resort to encourage improved watershed management practices.

Sub-Objective	Strategies	
5.2		Efficiently meet water demands and match quality (i.e. potable, brackish, recycled) with use (drinking, irrigation, etc.)
	5.2.1	Increase water conservation measures.
	5.2.2	Develop and use recycled water to meet non-potable demands, where feasible.

Discussion: As discussed above, the dedication of the ʻŌpana Wells to the BWS not only addresses the resort expansion's water demands, but also provides a value contribution to the BWS's regional system. The resort's ongoing use of recycled water helps to offset demand of potable water for irrigation purposes.

A. 8. State of Hawaiʻi Historic Preservation Act (Chapter 6E, HRS)

As set forth in Section 1 of Chapter 6E, HRS, "The Constitution of the State of Hawaiʻi recognizes the value of conserving and developing the historic and cultural property within the State for the public good. The legislature declares that the historic and cultural heritage of the State is among its important assets and that the rapid social and economic developments of contemporary society threaten to destroy the remaining vestiges of this heritage. The legislature further declares that it is in the public interest to engage in a comprehensive program of historic preservation at all levels of government to promote the use and conservation of such property for the education, inspiration, pleasure, and enrichment of its citizens. The legislature further declares that it shall be the public policy of this State to provide leadership in preserving, restoring, and maintaining historic and cultural property, to ensure the administration of such historic and cultural property in a spirit of stewardship and trusteeship for future generations, and to conduct activities, plans, and programs in a manner consistent with the preservation and enhancement of historic and cultural property."

The Proposed Action does not include any land registered as a State or National historic site. As discussed in Chapter Two of the SEIS, a supplemental archaeological inventory survey (SAIS) has been conducted on the SEIS lands, pursuant to a plan approved by the SHPD in December 2011, and consistent with the rules enacted by SHPD to fulfill its obligations under Chapter 6E. In addition, burials that have been previously identified and inadvertently discovered on the Resort land have been respectfully cared for and disposition (preservation in place of relocation) have followed the Hawaiʻi State Burial Laws as contained in chapter 6E. A CIA was prepared pursuant to Act 50, 2000 Hawaiʻi Session Laws, as part of the SEIS process. The CIA and the community consultation process identified cultural and natural resources within the Resort Lands and a proposed consultation process has been recommended to address potential impacts of the proposed project on these valuable cultural, natural and historic resources.

A. 9. General Plan for the City and County of Honolulu

The Oʻahu General Plan, first enacted in 1977 and amended in 2002, is a statement of the long-range social, economic, environmental, and design objectives for the general welfare and prosperity of the people of Oʻahu and a statement of broad policies that facilitate the attainment of those objectives. The General Plan identifies eleven areas of concern. Following is a discussion of those objectives and policies that are directly relevant to the Proposed Action.

In 2011, the DPP initiated a General Plan Update program to solicit public input on possible revisions to the Oʻahu General Plan. At the time the SEIS was being prepared, the initial round of public meetings had begun.

Population Objective	Policy	
B		To plan for future population growth.
	2	Provide adequate support facilities to accommodate future growth in the number of visitors to Oahu.
C		To establish a pattern of population distribution that will allow the people of Oahu to live and work in harmony.
	3	Manage physical growth and development in the urban-fringe and rural areas so that: a. An undesirable spreading of development is prevented; and b. Their population densities are consistent with the character of development and environmental qualities desired for such areas.

Discussion: The Proposed Action represents a considerable improvement over the resort master plan that was previously enacted by ordinance. The proposed plan includes a substantial reduction in the number of visitor units and a generous increase in the amount of open space at the resort. At the same time, it better integrates the resources of the property with the resort, especially through the strengthening of the relationship between the mauka agricultural lands and the resort. The proposed expansion fulfills the long-delayed commitment to providing new employment opportunities for the Koʻolau Loa and North Shore districts.

Economic Activity Objective	Policy	
A		To promote employment opportunities that will enable all the people of Oahu to attain a decent standard of living.
	1	Encourage the growth and diversification of Oahu's economic base.
	2	Encourage the development of small businesses and larger industries which will contribute to the economic and social well-being of Oahu residents.
	3	Encourage the development in appropriate locations on Oahu of trade, communications, and other industries of a nonpolluting nature.

Discussion: As a long-planned visitor destination area, Turtle Bay Resort represents a significant contribution to the diversification of Oʻahu's economic base in the Koʻolau Loa region. The proposed expansion will not only create direct employment in the visitor industry, but will

create new opportunities for small businesses that provide visitor-related services and amenities. The provision of new employment opportunities in the area will also contribute to improving the quality of life for area residents by providing an alternative to having to commute to Honolulu for work.

Economic Activity Objective	Policy	
B		To maintain the viability of Oahu's visitor industry.
	6	Permit the development of secondary resort areas in West Beach, Kahuku (encompassing Kuilima), Makaha, and Laie.
	7	Manage the development of secondary resort areas in a manner which respects existing lifestyles and the natural environment, and avoids substantial increases in the cost of providing public services in the area.
	8	Preserve the well-known and widely publicized beauty of Oahu for visitors as well as residents.
	9	Encourage the visitor industry to provide a high level of service to visitors.

Discussion: Expansion of Turtle Bay Resort fulfills the General Plan policy of providing a secondary resort area at Kahuku. The proposed reduction in density over that which is allowable by ordinance results in a development plan that is more consistent with the rural character of the area and more compatible with principal of natural resource preservation. After nearly 40 years of operation, the success of Turtle Bay is indisputable. The applicant fully recognizes that the rural character of the region is a primary attraction for Turtle Bay visitors, and the proposed development plan is intended to preserve that valued rural character.

Economic Activity Objective	Policy	
C		To maintain the viability of agriculture on Oahu.
	1	Assist the agricultural industry to ensure the continuation of agriculture as an important source of income and employment.
	3	Support the development of markets for local products, particularly those with the potential for economic growth.
	5	Maintain agricultural land along the Windward, North Shore, and Waianae coasts for truck farming, flower growing, aquaculture, livestock production, and other types of diversified agriculture.
	6	Encourage the more intensive use of productive agricultural land.

Discussion: The applicant is working to establish a conservation easement over its agricultural lands *mauka* of Kamehameha Highway, which will ensure the perpetuation of farming over the long term. This action provides the basis for renegotiating longer-term leases with the farming tenants, thereby providing with the security needed to justify the farmers' reinvestment in their farms. The integration of the farms into the resort under the auspices of a farm-to-plate program will help to ensure a reliable market for locally-grown crops.

Natural Environment Objective	Policy	
A		To protect and preserve the natural environment.
	1	Protect Oahu's natural environment, especially the shoreline, valleys, and ridges, from incompatible development.
	2	Seek the restoration of environmentally damaged areas and natural resources.
	3	Retain the Island's streams as scenic, aquatic, and recreation resources.
	4	Require development projects to give due consideration to natural features such as slope, flood and erosion hazards, water- recharge areas, distinctive land forms, and existing vegetation.
	5	Require sufficient setbacks of improvements in unstable shoreline areas to avoid the future need for protective structures.
	6	Design surface drainage and flood-control systems in a manner which will help preserve their natural settings.
	7	Protect the natural environment from damaging levels of air, water, and noise pollution.
	8	Protect plants, birds, and other animals that are unique to the State of Hawaii and the Island of Oahu.
	10	Increase public awareness and appreciation of Oahu's land, air, and water resources.

Discussion: The Proposed Action includes several initiatives that will benefit the natural environment. The restoration of the Kawela Stream alignment is intended to reduce the sediment load on Kawela Bay and improve its water quality. Generous shoreline setbacks incorporated into the expansion plan will help to protect the fragile shoreline and dune system. At the same time, the increased recreational usage of the beaches will hopefully help to discourage the unregulated use of the beach by off-road vehicles for sport, an activity that is severely damaging to the native plants that make up the coastal strand. Selective thinning of invasive ironwood trees in the forest fronting the shoreline will help to reduce the canopy and promote understory growth of native plants, which will, in turn, help to promote the stabilization of the dune system. Implementation of the *ahupuaʻa*-oriented development program, *Tomorrow's Ahupuaʻa*, will provide the basis for visitor education about not only the Native Hawaiian culture, but also the sensitive character of natural resources in the area. Of particular importance is the protection of the Hawaiian monk seals that now regularly visit the Turtle Bay Resort coastline. The resort already supports an extensive volunteer program to protect the seals when they haul out and prevent pedestrians from disturbing them. The proposed resort expansion is not anticipated to have a detrimental impact on resting seals. They are known to haul out in much more active areas such as Kailua Beach. Rather, the additional protection afforded the animals by hotel staff and security will ensure that they will be undisturbed and will help to further public education about this special resource.

Natural Environment Objective	Policy	
B		To preserve and enhance the natural monuments and scenic views of Oahu for the benefit of both residents and visitors.
	1	Protect the Island's well-known resources: its mountains and craters; forests and watershed areas; marshes, rivers, and streams; shoreline, fishponds, and bays; and reefs and offshore islands.
	4	Provide opportunities for recreational and educational use and physical contact with Oahu's natural environmental.

Discussion: The proposed expansion plan will improve views from Kamehameha Highway to the shoreline by opening up a visual corridor along the new access road. New hotel buildings will be limited in height and scale and will not likely be visible from the highway. The reduction in the number of hotel sites, together with the provision of increased setback from the shoreline will create an expanded open space corridor along the coastline, thereby preserving the existing rural character of the area. As an approved visitor destination area, the expansion of Turtle Bay Resort not only fulfills the City's goals for the area, but also provides new opportunities to educate visitors about the sensitive character of the natural environment. The relatively modest expansion (in comparison to the extent of development allowable by ordinance) will help to extend resort management over the area, thereby improving security and resource protection, without compromising natural resource values.

Housing Objective	Policy	
A		To provide decent housing for all the people of Oahu at prices they can afford.
	1	Develop programs and controls which will provide decent homes at the least possible cost.
	3	Encourage innovative residential development which will result in lower costs, added convenience and privacy, and the more efficient use of streets and utilities.
	5	Make full use of State and Federal programs that provide financial assistance for low- and moderate-income homebuyers.
	8	Encourage and participate in joint public- private development of low- and moderate- income housing.
	10	Promote the construction of affordable dwellings which take advantage of Oahu's year-round moderate climate.
	12	Encourage the production and maintenance of affordable rental housing.
	13	Encourage the provision of affordable housing designed for the elderly and the handicapped.
	14	Encourage equitable relationships between landowners and leaseholders, between landlords and tenants, and between condominium developers and owners.

Discussion: 160 units of housing affordable to the community will be built for sale or lease as part of the Proposed Action. With more stable jobs created in the region, as the result of the Proposed Action, more residents will want to, and be able to, set up

their own households nearby. The proposed number of Community Housing units will generally address the demand for affordable units created by the Proposed Action.

Housing Objective	Policy	
C		To provide the people of Oahu with a choice of living environments which are reasonably close to employment, recreation, and commercial centers and which are adequately served by public utilities.
	1	Encourage residential developments that offer a variety of homes to people of different income levels and to families of various sizes.
	2	Encourage the fair distribution of low- and moderate-income housing throughout the Island.
	3	Encourage residential development near employment centers.

Discussion: The Proposed Action will include resort residential units ranging from multi-family condominium units to single family homes, as well as community housing priced to be affordable to residents of the region.

Transportation & Utilities Objective	Policy	
A		To create a transportation system which will enable people and goods to move safely, efficiently, and at a reasonable cost; serve all people, including the poor, the elderly, and the physically handicapped; and offer a variety of attractive and convenient modes of travel.
	5	Improve roads in existing communities to reduce congestion and eliminate unsafe conditions.
	9	Promote programs to reduce dependence on the use of automobiles.
	10	Discourage the inefficient use of the private automobile, especially in congested corridors and during peak-hours.
	11	Make public, and encourage private, improvements to major walkway systems.

Discussion: The applicant recognizes the depth of concern about traffic congestion on Kamehameha Highway, especially between the resort and Haleʻiwa. The traffic study conducted for the SEIS quantifies the extent to which the proposed expansion will add to traffic. It also provides the basis for implementing traffic system management protocols to help reduce peak-period traffic congestion. However, given that the North Shore is a primary visitor destination and neither the City nor the State have the resources to implement anything other than safety-related improvements on the highway, the best that can likely be done is to implement selective improvements along the North Shore highway segment to improve left-turn vehicular movement and pedestrian crossings at choke-points. As determined in cooperation with the State DOT, the applicant will provide its fair share towards these improvements based upon the extent that its traffic contributes to the problem.

The provision of an extensive coastal trail system and intra-resort pedestrian pathways, together with the expanded park area and increased shoreline public accesses included in the expansion plan will greatly benefit the passive recreational activities available to the surrounding community.

Transportation & Utilities Objective	Policy	
B		To meet the needs of the people of Oahu for an adequate supply of water and for environmentally sound systems of waste disposal.
	1	Develop and maintain an adequate supply of water for both residents and visitors.
	2	Develop and maintain an adequate supply of water for agricultural and industrial needs.
	5	Provide safe, efficient, and environmentally sensitive waste-collection and waste-disposal services.

Discussion: The dedication of the ʻŌpana Wells to the BWS ensures that the resort's drinking water needs will be addressed, with the excess water provided by the wells contributing to the benefit of the entire surrounding region. The privately constructed and operated wastewater treatment system a Turtle Bay provides for the safe collection and treatment of resort-generated wastewater.

Energy Objective	Policy	
C		To fully utilize proven alternative sources of energy.
	1	Encourage the use of commercially available solar energy systems in public facilities, institutions, residences, and business developments.
E		To establish a continuing energy information program.
	2	Foster the development of an energy conservation ethic among Oahu residents.

Discussion: It will be the ultimate decision of the future hotel developer(s) to determine the extent of energy saving initiatives that will be implemented as the result of the expansion plan. If the applicant takes on the development obligation, it will work with the State to identify the most appropriate conservation programs for the resort. As discussed in Section B.3.h of Part Four, TBR is committed to requiring that all major development structures meet the LEED certification standards for new structures on all individual site development.

Physical Development & Urban Design Objective	Policy	
A		To coordinate changes in the physical environment of Oahu to ensure that all new developments are timely, well-designed, and appropriate for the areas in which they will be located.
	2	Coordinate the location and timing of new development with the availability of adequate water supply, sewage treatment, drainage, transportation, and public safety facilities.
	3	Phase the construction of new developments so that they do not require more regional supporting services than are available.
	4	Require new developments to provide or pay the cost of all essential community services, including roads, utilities, schools, parks, and emergency facilities that are intended to directly serve the development.
	5	Provide for more compact development and intensive use of urban lands where compatible with the physical and social character of existing communities.
	6	Encourage the clustering of developments to reduce the cost of providing utilities and other public services.

Discussion: An urban design plan for the Resort was established over twenty years ago and remains in force for the property.

Physical Development & Urban Design Objective	Policy	
D		To maintain those development characteristics in the urban-fringe and rural areas which make them desirable places to live.
	4	Maintain rural areas as areas which are intended to provide environments supportive of lifestyle choices which are dependent on the availability of land suitable for small to moderate size agricultural pursuits, a relatively open and scenic setting, and/or a small town, country atmosphere consisting of communities which are small in size, very low density and low rise in character, and may contain a mixture of uses.

Discussion: Over 30 years ago, the City approved the expansion of the Resort as a means of providing new employment opportunities for the region. The concept of a self-contained visitor destination area within a rural region was deemed appropriate then, and remains appropriate today. The proposed expansion plan includes a dramatic reduction in the proposed density of the resort, thereby enhancing the compatibility of a visitor destination in a resort setting with the rural character of the region. The proposed low-density character of the Proposed Action is consistent with this objective.

Physical Development & Urban Design Objective	Policy	
E		To create and maintain attractive, meaningful, and stimulating environments throughout Oahu.
	3	Encourage distinctive community identities for both new and existing districts and neighborhoods.
	4	Require the consideration of urban-design principles in all development projects.
	5	Require new developments in stable, established communities and rural areas to be compatible with the existing communities and areas.
	8	Preserve and maintain beneficial open space in urbanized areas.
	9	Design public structures to meet high aesthetic and functional standards and to complement the physical character of the communities they will serve.

Discussion: The proposed development will be subject to urban design principals that were adopted as part of the resort's original zoning ordinance in 1987. The proposed expansion will be consistent with the rural character of the area by concentrating the resort development in a rural-like village setting surrounded by extensive open space.

Public Safety Objective	Policy	
A		To prevent and control crime and maintain public order.
	1	Provide a safe environment for residents and visitors on Oahu.
B		To protect the people of Oahu and their property against natural disasters and other emergencies, traffic and fire hazards, and unsafe conditions.
	2	Require all developments in areas subject to floods and tsunamis to be located and constructed in a manner that will not create any health or safety hazard.
	4	Cooperate with State and Federal agencies to provide tsunami warning and protection for Oahu.
	6	Reduce hazardous traffic conditions.
	7	Provide adequate fire protection and effective fire prevention programs.
	12	Provide educational materials on civil defense preparedness, fire protection, traffic hazards and other unsafe conditions.

Discussion: The security provided by resort staff will ensure that visitors, guests and area residents will enjoy a safe recreational experience at the resort. Tsunami warning sirens are already located on Kamehameha Highway fronting the resort, thereby ensuring that resort residents are warned of an impending tsunami. The resort's planned intersections with Kamehameha Highway will be designed in a manner that is consistent with highway safety standards.

Culture & Recreation Objective	Policy	
B		To protect Oahu's cultural, historic, architectural, and archaeological resources.
	2	Identify, and to the extent possible, preserve and restore buildings, sites, and areas of social, cultural, historic, architectural, and archaeological significance.
	3	Cooperate with the State and Federal governments in developing and implementing a comprehensive preservation program for social, cultural, historic, architectural, and archaeological resources.
	4	Promote the interpretive and educational use of cultural, historic, architectural, and archaeological sites, buildings, and artifacts.

Discussion: The applicant's commitment to a supplemental archaeological inventory survey, a cultural impact assessment, and an *ahupuaʻa*-based development plan together demonstrate the project's compliance to the objective of protecting Oʻahu's cultural, historic, and archaeological resources.

Culture & Recreation Objective	Policy	
D		To provide a wide range of recreational facilities and services that are readily available to all residents of Oahu.
	1	Develop and maintain community-based parks to meet the needs of the different communities on Oahu.
	6	Provide convenient access to all beaches and inland recreation areas.
	9	Require all new developments to provide their residents with adequate recreation space.
	10	Encourage the private provision of recreation and leisure-time facilities and services.
	13	Encourage the safe use of Oahu's ocean environments.

Discussion: The ordinance granting rezoning for the original expansion project in the 1980s included commitments for a coastal trail system, five public accesses, and approximately 54 acres of park area to be included in the project. The Proposed Action voluntarily expands upon these requirements by providing an additional four public accesses, approximately 19 more acres of park area, and an expanded shoreline setback area that will increase open space along the coastline by approximately 18 acres. At the same time, the applicant has eliminated parking restrictions within the resort as a means of facilitating greater access to the resort's recreational resources by the general community.

A. 10. Koʻolau Loa Sustainable Communities Plan

As set forth in the 1999 Koʻolau Loa Sustainable Communities Plan (KLSCP), "The vision for Koʻolau Loa seeks to preserve the region's rural character and its natural, cultural, scenic and agricultural resources. The region will remain country, characterized by small towns and villages with distinct identities that exist in harmony with the natural settings of mountain ridges and winding coastline." The KLSCP identifies the Resort (then known as Kuilima) as being located within the Rural Community Boundary and characterizes it as a "Major Resort Destination" planned for a total of 4,000 visitor units.

Following is a discussion of how the Proposed Action will comply with the four planning principles presented in the KLSCP:

Design Character: Kuilima Resort is conceived as a destination resort relating to and integrated with the rural North Shore of Oʻahu. It is envisioned as a resort overlaid with the simplicity and timelessness of a kamaʻaina country estate with characteristic hospitality and elegance.

Discussion: The substantial reduction in density for the proposed resort expansion is consistent with this planning principle. By concentrating new resort development around the existing hotel, the rural character of the surrounding property is maintained.

Appropriate Scale and Siting: The master plan reflects the estate-like quality in the low density of buildings, the lush and extensive landscaping on all parcels and common areas, and the gracious entry drive servicing the entire property.

Discussion: The proposed expansion plan is consistent with this planning principle. The overall density of development on the property is reduced by over 60%. The number of new hotel sites has been reduced from five to two. While the new visitor units will be concentrated within the central portion of the resort property, their height and massing will compliment the rural character of the property.

Environmental Compatibility: Kuilima Resort is within a unique environment with several major constraints and guidelines for development, which have been factored into the siting for major facilities. New resort facilities should respect constraints of flooding, wetlands, sand dunes, wildlife, and archaeology.

Discussion: The proposed expansion plan is consistent with this planning principle. The proposed development plan accommodates the environmental constraints associated with the property. Setbacks from the shoreline have been increased over what is allowable by ordinance, resulting in the allocation of approximately 42 acres of open space fronting the coastline. This increase will enhance the protection of ocean front development from storm waves and ensure the preservation of the existing dune system. Several mitigation measures to address the potential impacts of flooding are proposed, including the realignment of the two

existing drainage channels and the continued restoration of the Punahoʻolapa marsh. Activities associated with the latter will also increase the amount of habitat for water birds by expanding the acreage of open water in the marsh. The proposed development plan has been based upon an updated archaeological inventory survey that included extensive subsurface testing to ensure that new construction will avoid archaeological sites.

Community Integration. The master plan includes dedicated public parks at Kawela Bay and Kahuku Point, as well as community access and parking for shoreline use at multiple locations within the resort.

Discussion: The proposed expansion plan increases the number of public beach access at the resort from the 8 required by ordinance to 12 and expands the total acreage of parks from approximately 54 acres to over 73 acres. Together with the already planned coastal trail and pedestrian path along the entire shorefront of the resort, these improvements will greatly increase the public's access to the Turtle Bay shoreline.

The proposed expansion plan will continue to adhere to the design principals previously established for the resort and included in the KLSCP.

A. 11. Revised Koʻolau Loa Sustainable Communities Plan

In October 2010, the City's Department of Planning and Permitting published a Public Review Draft representing its updating of the Koʻolau Loa Sustainable Communities Plan. At the time of this writing, the DPP is preparing the document for submittal to the Honolulu Planning Commission. Following is a discussion of how the Proposed Action complies with the relevant portions of the Public Review Draft.

Sustainability: The Public Review Draft added a discussion explaining how the concept of sustainability relates to the City's planning system and the Sustainable Communities Plans. It includes the following provisions:

> ***Use resources so they are not depleted, permanently damaged or destroyed.***
>
> ***Encourage planning, development and construction technologies that minimize environmental impacts.***
>
> ***Respect the cultural, social and physical resources that shape residents' sense of community and rural quality of life.***
>
> ***Honor the process of change. Make no decisions without first understanding the effects such change will have on the land and community resources.***
>
> ***Strive for balance between economic prosperity, social and community well-being, and environmental stewardship. Adopt a multi-disciplinary approach acknowledging the importance of our community capital in land use and infrastructure planning decisions.***

Consider the long-term effect of our actions and take into account the interests of our future generations when planning for the future

Protect agricultural lands, physical and biological resources, and where desired, open spaces and view planes.

Discussion: Appendix A of the SEIS presents a detailed discussion of how the proposed expansion plan supports the concepts of sustainability. The Proposed Action is consistent with the Public Review Draft's sustainability policies.

Population: The Public Review Draft incorporates the revised General Plan population objective that allocates 1.4 percent of the island's population to the Koʻolau Loa district.

Discussion: The revised population guidelines include the expansion of the Resort as approved in 1985. The Proposed Action would decrease the number of new residential units from 1000 to 750. The Proposed Action is therefore consistent with the Public Review Draft population policy because it would result in a smaller anticipated residential population than what has been estimated based upon developable land.

Planning Horizon: The Public Review Draft extends the City's planning horizon for Koʻolau Loa from 2020 to 2035.

Discussion: The Proposed Action is consistent with this revision.

Importance of *Ahupuaʻa***:** The Public Review Draft adds language that defines the *ahupuaʻa* and its importance to land use and natural resource management.

Discussion: The Proposed Action is consistent with this revision. Implementation of *Tomorrow's Ahupuaʻa* as discussed in Appendix A of the SEIS will fully implement the policies of the KLSCP pertaining to *ahupuaʻa*.

Revised Vision Elements: The Public Review Draft revised several Vision Elements including, the preservation of agricultural lands; the relabeling of the Rural Community Boundary with Community Growth Boundary; the inclusion of the proposed Malaekahana residential development; the recognition of existing and proposed commercial centers; and the addition of a new Vision Element concerning sustainability.

Discussion: The Proposed Action is consistent with this revision.

Modification of Open Space Policies: The Public Review Draft added/revised language addressing provisions for outdoor lighting; enhancing public shoreline access; additional protection for shoreline areas; acknowledgement of the Koʻolau Loa Watershed Management Plan; the future of the Kahuku Golf Course; the Army's use of the Kahuku Training Area; and provisions for telecommunication antennas.

Discussion: The Proposed Action is consistent with this revision.

Agricultural Policies: The Public Review Draft added/revised policies addressing agriculture including the use of agricultural lands; the leasing of agricultural lands; improvements to infrastructure networks; accessory uses; uses within buffer zones; environmental impacts; and identifying Important Agricultural Lands.

Discussion: While the Proposed Action does not include the Turtle Bay agricultural lands mauka of Kamehameha Highway, the policies of the resort owners for those lands are consistent with this revision.

Historic and Cultural Resources: The Public Review Draft updates the description of historic and cultural resources and policies and guidelines related to *kuleana* lands and the treatment of cultural sites.

Discussion: The Proposed Action is consistent with this revision.

Residential Uses: The Public Review Draft adds a description of housing trends, discusses Malaekahana, and addresses density issues and affordable guidelines.

Discussion: Through its provision of affordable housing beyond that which is required by the Unilateral Agreement, and its commitment to maintain the rural character of the resort area, the Proposed Action is consistent with this revision, including the newly added rural residential guidelines.

Commercial Areas: The Public Review Draft adds economic vitality guidelines.

Discussion: The Proposed Action is consistent with this revision.

Visitor Industry: The Public Review Draft updates the description of visitor facilities in the region. It replaces reference to Kuilima with "Turtle Bay Resort"; adds a discussion about the future development of Turtle Bay Resort; deletes references to the resort as a major resort destination; revises policies and guidelines to acknowledge and retain existing resort elements while limiting future resort facilities to within the existing resort destination and encouraging the preservation of undeveloped lands for open space, recreational, and agricultural use.

Discussion: The Proposed Action is consistent with these revisions.

Transportation Systems: The Public Review Draft adds references to Complete Streets and updates discussions about the regional transportation system, including the implementation of transportation demand management strategies and safety improvements along Kamehameha Highway.

Discussion: The Proposed Action is consistent with this revision.

Water Allocation: The Public Review Draft adds reference to the Koʻolau Loa Watershed Management Plan.

Discussion: The Proposed Action is consistent with this revision.

A. 12. Complete Streets

In 2012, the City and County of Honolulu adopted Bill 26 (2012), adopting a Complete Streets policy to guide and direct more comprehensive and balanced planning, design, and construction of City transportation systems. As set forth in the ordinance, the City now encourages the development of transportation facilities or projects that are planned, designed, operated, and maintained to provide safe mobility for all users. The ordinance identifies the following objectives:

(1) Improve safety;
(2) Apply a context sensitive solution process that integrates community context and the surrounding environment, including land use;
(3) Protect and promote accessibility and mobility for all;
(4) Balance the needs an comfort of all modes and users;
(5) Encourage consistent use of national industry best practice guidelines to select complete street design elements;
(6) Improve energy efficiency in travel and mitigate vehicle emissions by providing non-motorized transportation options;
(7) Encourage opportunities for physical activity and recognize the health benefits of an active lifestyle;
(8) Recognize complete streets as a long term investment that can save money over time;
(9) Build partnerships with stakeholders and organizations statewide; and
(10) Incorporate trees and landscaping as integral components of complete streets.

As a visitor destination area, the Resort is committed to ensuring the safety and well-being of everyone who uses its privately owned roadways and pedestrian paths. The resort supports the implementation of the Complete Streets objectives in the implementation of the Proposed Action. As discussed in Appendix A, Complete Street objectives will be included in the planning, design and operation of the proposed vehicular and pedestrian circulation system.

A. 13. Hawaiʻi CZM Program and Special Management Area

Enforcement of the federal Coastal Zone Management Act (CZM) of 1972 has been delegated to the State and enacted as HRS Chapter 205A, HRS. The CZM area encompasses the entire State including all marine waters seaward to the extent of the State's police power and management authority, including the 12-mile U.S. territorial sea and all archipelagic waters. A CZM Certificate of Consistency is required for federal applicants, federal permits, or federal activities.

A.13. a. Coastal Zone Management

The CZM Act is comprised of a number of objectives primarily related to (1) protecting and preserving the coastal zone; (2) improving the quality of coastal scenic and open space resources and ensuring that coastal dependent development such as harbors and ports, and coastal-related development such as visitor industry facilities and energy generating facilities, are located, designed, and constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area; and (3) encouraging research and development of new, innovative technologies for exploring, using, or protecting marine and coastal resources.

Following is a summary of the project's conformance with the ten objectives of the coastal zone management program.

1A: Provide coastal recreation opportunities accessible to the public.

Discussion: The Proposed Action exceeds the public access requirements enacted by ordinance in the 1980s by providing an additional four public access ways along the coastline.

2A: Protect, preserve, and where desirable, restore those natural and manmade historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture.

Discussion: The applicant has imposed an expanded shoreline setback area beyond that which is required by ordinance as a means of ensuring that the coastal dune system (the most likely repository of cultural artifacts) is preserved. In addition, an extensive subsurface testing program was implemented as part of the project's supplemental archaeological inventory survey to confirm the construction of new structures will not impact archaeological resources. Finally, a cultural impact assessment has been prepared to document the presence of cultural features or activities associated with the SEIS Lands and to ensure that they are not adversely impacted by the proposed development.

3A: Protect, preserve, and, where desirable, restore or improve the quality of coastal scenic and open space resources.

Discussion: The proposed project preserves the rural character and open space qualities of the property by concentrating development around the existing hotel and limiting low-density residential development to outlying areas. The applicant has also imposed a voluntary expansion of the requisite shoreline setback area to increase the amount of open space along the shoreline.

4A: Protect valuable coastal ecosystems, including reefs, from disruption and minimize adverse impacts on all coastal ecosystems.

Discussion: The aforementioned shoreline setback area will ensure that no development encroaches into coastal areas. The applicant also proposes the restoration of Kawela Stream to

its original alignment to remove the major source of sediment loading on Kawela Bay in an effort to improve its water quality. Further, the applicant supports the creation of a Marine Life Conservation District at Kawela Bay to help protect the sensitive coastal ecosystem there.

5A: Provide public or private facilities and improvements important to the State's economy in suitable locations.

Discussion: The proposed expansion plan is consistent with the Oahu General Plan, the Koʻolau Loa Sustainable Communities Plan, and zoning ordinances for the property; all of which designate the SEIS lands as a visitor destination area. However, the proposed expansion plan reduces the density of development over that which was previously approved by ordinance.

6A: Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence, and pollution.

Discussion: A tsunami warning system has already been installed along Kamehameha Highway fronting the Resort. The aforementioned expanded setback area will locate structures further inland where they will be built and elevated to meet FEMA flood zone criteria. The Proposed Action also includes provisions to improve flood control on the SEIS lands.

7A: Improve the development review process, communication, and public participation in the management of coastal resources and hazards.

Discussion: While this requirement is largely a function of governmental authority, the applicant is contributing to improved communication and public participation by preparing the SEIS and posting all relevant documents on its public website.

8A: Stimulate public awareness, education, and participation in coastal management.

Discussion: Through the preparation of the SEIS, the applicant hopes to stimulate public awareness about coastal management issues relevant to the Resort.

9A: Protect beaches for public use and recreation.

Discussion: Through the provision of additional public shoreline access ways and the expansion of the shoreline setback area over that which is required by ordinance, the applicant hopes to facilitate greater public access to the Turtle Bay shoreline.

10A: Promote the protection, use, and development of marine and coastal resources to assure heir sustainability.

Discussion: The applicant's support of a Marine Life Conservation District at Kawela Bay will ensure that traditional and customary practices related to fishing and gathering will continue, while limiting those activities, such as jet-skis, boat anchoring, and fish collecting that pose the greatest threat to the marine environment.

A.13. b. Special Management Area

The State CZM review authority has been, in turn, delegated to the counties through the Special Management Area (SMA) controls for development along the shoreline. In the late 1970s, each county delineated the SMA around its coastline, varying in interior depth from a few hundred feet to several miles inland from the coastline. Within the SEIS lands, the SMA extends from the shoreline to Kamehameha Highway. Following is a discussion of the relationship of the Proposed Action to the guidelines presented in Chapter 205A-26.

(*1*) *All development in the special management area shall be subject to reasonable terms and conditions set by the authority in order to ensure:*

(A) *Adequate access, by dedication or other means, to publicly owned or used beaches, recreation areas, and natural reserves is provided to the extent consistent with sound conservation principles;*

Discussion: The Proposed Action includes the provision of eight public shoreline access ways along the coast of the SEIS lands as required by ordinance, plus an additional four public shoreline access ways to be provided by the applicant.

(B) *Adequate and properly located public recreation areas and wildlife preserves are reserved;*

Discussion: The applicant's provision of an expanded shoreline setback area, additional public shoreline access ways over those required by ordinance, and expanded park areas, together with the preservation of Punaho`olapa marsh will ensure that adequate and properly located public recreation areas and wildlife preserves are reserved.

(C) *Provisions are made for solid and liquid waste treatment, disposition, and management which will minimize adverse effects upon special management area resources; and*

Discussion: The resort is served by a privately funded and operated wastewater treatment plant. The existing size of the plant is adequate to serve the demand imposed by the proposed resort expansion plan. Solid waste collection and disposal is contracted to a private firm and that arrangement will continue under the proposed expansion plan.

(D) *Alterations to existing land forms and vegetation, except crops, and construction of structures shall cause minimum adverse effect to water resources and scenic and recreational amenities and minimum danger of floods, wind damage, storm surge, landslides, erosion, siltation, or failure in the event of earthquake.*

Discussion: Given the flat character of the existing topography, the proposed project will require no significant alteration to existing land forms. Alterations to vegetation will be limited to selective thinning and removal of invasive ironwood trees and the removal of some vegetation within the marsh in an effort to increase the amount of open water as bird habitat. These

activities are not anticipated to have an adverse impact upon water resources, scenic vistas, or recreational amenities. The proposed development will be constructed in compliance with all applicable building and developed regulations to minimize danger from floods, wind damage, storm surge, erosion, siltation, or failure from earthquakes. Given the existing topography, the potential for landslides on the property does not exist.

(2) No development shall be approved unless the authority has first found:

(A) *That the development will not have any substantial adverse environmental or ecological effect, except as such adverse effect is minimized to the extent practicable and clearly outweighed by public health, safety, or compelling public interests. Such adverse effects shall include, but not be limited to, the potential cumulative impact of individual developments, each one of which taken in itself might not have a substantial adverse effect, and the elimination of planning options;*

Discussion: Based upon the findings of the SEIS, the proposed project will not result in a substantial adverse environmental or ecological effect over the long term. While the Proposed Action will result in ecological impacts, these are not anticipated to be long-term significant adverse impacts because they are short-term impacts related to construction. Anticipated beneficial impacts included the restoration of the Kawela Steam alignment as a means to improved water quality in Kawela Bay.

(B) *That the development is consistent with the objectives, policies, and special management area guidelines of this chapter and any guidelines enacted by the legislature; and*

Discussion: Based upon the findings of the SEIS, the proposed project has been found to be consistent with the objectives, policies, and special management area guidelines.

(C) *That the development is consistent with the county general plan and zoning. Such a finding of consistency does not preclude concurrent processing where a general plan or zoning amendment may also be required.*

Discussion: The proposed project is consistent with the Oʻahu General Plan, the Koʻolau Loa Sustainable Communities Plan, and existing zoning.

(3) The authority shall seek to minimize, where reasonable:

(A) *Dredging, filling or otherwise altering any bay, estuary, salt marsh, river mouth, slough or lagoon;*

Discussion: Activities associated with the expansion of open water areas within Punahoʻolapa marsh and the rerouting of existing drainage ways will be conducted in a manner consistent with and in compliance with all application regulations and controls.

(B) *Any development which would reduce the size of any beach or other area usable for public recreation;*

Discussion: The Proposed Action does not result in the reduction in size of any beach or public recreation area.

(C) *Any development which would reduce or impose restrictions upon public access to tidal and submerged lands, beaches, portions of rivers and streams within the special management areas and the mean high tide line where there is no beach;*

Discussion: The Proposed Action will not impose any restriction upon public access to tidal and submerged lands, beaches, portions of rivers, or the mean high tide line.

(D) *Any development which would substantially interfere with or detract from the line of sight toward the sea from the state highway nearest the coast; and*

Discussion: Given the size of the property and its physical proximity to Kamehameha Highway, the Proposed Action is not anticipated to substantively interfere or detract from the line of sight toward the sea.

(E) *Any development which would adversely affect water quality, existing areas of open water free of visible structures, existing and potential fisheries and fishing grounds, wildlife habitats, or potential or existing agricultural uses of land.*

Discussion: Based on the findings of the SEIS, the Proposed Action will not adversely affect water quality, existing areas of open water, existing and potential fisheries and fishing grounds, wildlife habitats, or potential or existing agricultural land uses.

A. 14. State of Hawai'i Environmental Protection Act (Chapter 343 HRS)

Chapter 343, HRS, Hawai'i's environmental protection act, establishes the procedures by which environmental impacts are disclosed. The rules governing the implementation of Chapter 343 are found in Section 11-200, Hawaii Administrative Rules (HAR). HAR, §11-200-12, establishes thirteen significance criteria which agencies shall use in evaluating an action's impacts. Following is a discussion of how the proposed action relates to the thirteen criteria.

Pursuant to subparagraph 12, ...an action shall be determined to have a significant effect on the environment if it:

(1) *Involves an irrevocable commitment to loss or destruction of any natural or cultural resource;*

Discussion: The Proposed Action will impact cultural resources in the region. However, these impacts will be mitigated through the implementation of the *Tomorrow's Ahupua'a*

concept plan as described in Chapter Two and Appendix A of the SEIS. The Plan includes the implementation of a Cultural and Natural Resource Management Plan to guide the management and preservation of cultural resources.

(2) *Curtails the range of beneficial uses of the environment:*

Discussion: The range of beneficial uses of the property's environment is guided by the County's General Plan which designates the property as a Visitor Destination Area. The proposed project is consistent with the planned beneficial use of the area. The proposed project increases the range of beneficial uses for the environment by providing additional visitor units at the resort, affordable and market-priced housing units, parks and open space, and increased connectivity with surrounding roads, infrastructure, services, and public facilities.

(3) *Conflicts with the state's long-term environmental policies or goals and guidelines as expressed in chapter 344, HRS, and any revisions thereof and amendments thereto, court decisions, or executive orders;*

Discussion: The stated purpose of Chapter 344 is to establish a state policy which will encourage productive and enjoyable harmony between people and their environment, promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of humanity, and enrich the understanding of the ecological systems and natural resources important to the people of Hawai'i. The proposed project complies with the policies, goals and guidelines of Chapter 344. The project proposes to create a master planned resort expansion that will be integrated with regional transportation network and infrastructure systems, and improve the quality of life for residents by providing affordable housing near employment centers.

(4) *Substantially affects the economic or social welfare of the community or State;*

Discussion: The Proposed Action will have a beneficial impact upon the economic and social welfare of surrounding communities, the region and the State. While it will result in increases in traffic along Kamehameha Highway, these increases will be offset, to some degree, but the provision of new long-term employment opportunities and the provision of housing that is affordable to the community; both of which will directly benefit the residents of the region.

(5) *Substantially affects public health;*

Discussion: The proposed project is anticipated to have negligible impact on public health. Infrastructure systems will be constructed to comply with applicable State, DOH, and County standards and regulations.

(6) *Involves substantial secondary impacts such as population changes or effects on public facilities;*

Discussion: The Proposed Action is not anticipated to have a significant adverse impact upon public facilities. While it will necessitate an increase in some services, e.g. enrollment in public schools for the children of new workers, these increases are not anticipated to be significant and are more than offset by the increased economic benefits that the Proposed Action will bring to the region in terms of new tax revenues and visitor spending.

(7) *Involves a substantial degradation of environmental quality*

Discussion: The proposed project will involve extensive ground disturbance, including clearing, grubbing, and grading of portions of the property. The site development activities are necessary for the development. Grading and construction activities will be required to comply with applicable regulations.

(8) Is individually limited but cumulatively has considerable effect upon the environment or involves a commitment for larger actions;

Discussion: The Proposed Action does not involve a commitment for larger actions. It will result in a beneficial cumulative effect in the form of increased tax revenues and visitor spending in the region. The project's environmental impacts are mostly related to short-term construction impacts that can be mitigated through the implementation of Best Management Practices. Long-term environmental impacts are will be minimized through the implementation of the proposed Cultural and Natural Resources Management Plan.

(9) Substantially affects a rare, threatened, or endangered species, or its habitat;

Discussion: No rare, threatened, or endangered plants or terrestrials animals or birds have been identified on the SEIS Lands. The endangered green sea turtle and Hawaiian monk seal are increasingly present along the resort coastline. However, it is not anticipated that implementation of the Proposed Action will result in a substantial adverse impact to these species.

(10) Detrimentally affects air or water quality or ambient noise levels;

Discussion: As discussed in Chapter Five, the Proposed Action will have no significant adverse impact upon water or air quality. A small number of existing homes along Kamehameha Highway west of the resort will be adversely impacted by increased traffic noise associated with the resort expansion. However, increases in noise can be mitigated by the homeowner through the provision of a sound attenuation barrier such as a wall or landscaping, or the installation of air conditioning in those rooms directly exposed to the highway.

(11) Affects or is likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters;

Discussion: The Proposed Action will be implemented in a manner that conforms to prevailing flood control regulations and requirements. The Proposed Action includes shoreline setbacks in excess of what is required by law to ensure that the beach erosion does not impact proposed development sites. While portions of the property are situated within a tsunami evacuation zone, emergency evacuations plans already in place will help to ensure that the resort community can respond appropriately in during emergencies.

(12) Substantially affects scenic vistas and viewplanes identified in county or state plans or studies,

Discussion: The SEIS lands are not identified as scenic vistas or view planes on county or the state plans or studies.

(13) Requires substantial energy consumption.

Discussion: Energy consumption will be increased in relation to the proposed resort development. The project's design will include features to conserve energy and water usage as discussed in Appendix A.

B. Contributing to the Regional and Island Economy

Construction of the Proposed Action will involve an estimated 3,263 direct jobs over 11 years. Construction wage impacts resulting from these new jobs will total about $475 million. Construction workers on-site at the resort during that period will number annually about 237 on average.

As presented in the socio-economic impact analysis and discussed in Chapter Five, the number of new continuing operations positions at the resort will climb to about 753, an increase of 72 percent over current conditions.

The Proposed Action will result in a cumulative net benefit – i.e., total benefits minus total costs– for the period 2014 to 2025, estimated as $163.4 million for the State of Hawai‘i and as $45.6 million for the City and County of Honolulu (in 2011 dollars). After full occupancy has been reached, the annual net benefit for the State will amount to $14.6 million, while the net benefit for the City and County will be about $6.6 million yearly.

C. Relationship to Short-Term Uses and Long-Term Productivity

Short-term uses and long-term productivity relate to the short-term construction phases and the long-term socioeconomic benefits that would accrue to the State and the County in the form of an expanded employment center in Ko‘olau Loa and added revenue resulting from economic activity that would otherwise not occur on the property. The Resort expansion project responds to the regional need for new employment opportunities and the State and County's collective vision to strengthen and preserve the visitor industry as a major contributor to the economy.

C. 1. Trade-Offs: Short-Term and Long-Term Gains and Losses

Over the short-term, that is to say the construction period for each of the project elements of the Proposed Action, the on-site population, including guests, residents, and visitors, will experience construction-related impacts that may temporarily air and noise quality. These impacts will be mitigated by the implementation of Best Management Practices. The regional population will experience periodic impacts in the form of increased traffic congestion on public highways due to the movement of construction vehicles the delivery of construction materials.

These construction related impacts are offset by an increase in employment opportunities related to construction, and a corresponding increase in economic benefits in the form of increased income for workers and their families, increased revenue for businesses supplying goods and services related to construction activity, and increased tax revenues related to income and general excise taxes. In the case of the proposed community housing, the short-term construction impacts are off-set by the long-term availability of new homes that are affordable to the community.

From a geographical point of view, the placement of new structures on vacant land constitutes a loss of open space and the rural character associated with it. This loss is offset by the long-term economic benefits of the project in terms of new employment opportunities related to resort operations, revenues derived from the sales of goods and services, increased tax revenues, and new housing that is affordable to the community. These impacts are also offset by the low-density character of the Proposed Action and its open space amenities, including new parks and public shoreline accesses.

From an environmental point of view, the loss of ground cover due to grading and grubbing activities and the temporary loss of habitat for fauna and avifauna as the result of construction activity is temporary in nature. The loss of ground cover is offset by the installation of new landscaping including re-vegetation of portions of the resort property with native plants. The loss of fauna and avifaunal habitat is offset by those displaced animals and birds reestablishing themselves in the area once construction activities have ended.

The development of new parks along the Turtle Bay coast will make the shoreline available to more people, thereby potentially increasing the interaction between people and endangered marine species including sea turtles and Monk seals. However, this impact will be offset by the increased public awareness of the importance of preserving and protecting these species that will result from the resort's proposed public education program.

C. 2. Extent to Which the Proposed Action Forecloses Future Options

The commitment to the property's future as a visitor destination was made in the mid-1980s when the Resort expansion was approved by the State Land Use Commission's Findings of Fact, Conclusions of Law, and Decision and Order; and subsequently by the Change of Zone approved by the Honolulu Planning Commission, the Honolulu City Council, and the Mayor of Honolulu, with a Unilateral Agreement being executed pursuant to the Change of Zone.

Development of the property as an expanded resort community as envisioned under the Proposed Action is consistent with that commitment and with the intent of the Unilateral Agreement. Implementation of the Proposed Action forecloses the achievement of unit counts and population levels allowable under previously granted approvals.

C. 3. How the Proposed Action Narrows the Range of Beneficial Uses

The Proposed Action narrows the range of beneficial uses by reducing the allowable density of the Resort, which will, in turn, reduce the corresponding economic benefits that might otherwise be derived from full build out of the resort expansion as envisioned in the mid-1980s.

C. 4. Long-Term Risks to Health and Safety

No long-term risks to health and safety have been identified. The Resort has been operating for approximately 40 years with no known risks to health and safety. Expansion of the resort as envisioned under the Proposed Action will perpetuate a land use that constitutes no significant adverse impact to the health and safety of the community.

C. 5. Culturally Significant Consequences

Implementation of the Proposed Action includes a commitment to the perpetuation of Hawaiian culture, as expressed by the *Tomorrow's Ahupua`a* program described in the SEIS. This will result, not only in the perpetuation of sustainable practices for the benefit of the entire community, but will benefit resort guests, visitors, and residents by increasing their understanding of the host culture.

C. 6. Environmentally Significant Consequences

An environmentally significant consequence of the Proposed Action relates to the proposed improvement of water quality in Kawela Bay resulting from the restoration of the original Kawela Stream alignment and continued commitments to the improvement of Punahoʻolapa Marsh.

Implementation of an education program for resort guests, resort visitors, and resort residents and employees related to the protection of endangered marine species, including sea turtles and Monk seals, also represents a beneficial environmental consequence. This, together with the presence of resort employees and volunteers to monitor hauled out seals, is anticipated to help reduce negative interactions and/or disturbances.

Implementation of the *Tomorrow's Ahupuaʻa* concept is intended to contribute to long-term sustainability, which will, in turn, benefit the environment and the communities' opportunity to enjoy it.

C. 7. Potential Harm to the Environment

Development of the Proposed Action is intended to minimize potential harm to the environment through the implementation of measures to mitigate significant adverse impacts. Those impacts are typically associated with the short-term construction related impacts and

can be mitigated in most cases through the application of Best Management Practices. In some instances, such as increased traffic noise for existing residences in close proximity to Kamehameha Highway, impacts can be mitigated with the implementation of sound attenuation strategies.

D. Irreversible and the Irretrievable Commitments of Resources

D. 1. Unavoidable Impacts and Probable Adverse Effects

Unavoidable impacts and probable adverse effects resulting from implementation of the Proposed Action can be divided into two categories: short-term construction impacts and long-term operational impacts. Short-term construction impacts include dust generation, construction noise, and short-term construction related traffic impacts. Long-term operational impacts include increased traffic, the redistribution of on-site drainage, on-site water consumption, secondary air quality (related to increased demand for offsite energy production), wastewater treatment, solid waste disposal, increased energy consumption, and increased human activity along the coastline.

D. 2. Use of Non-Renewable Resources

The construction and operation of the resort expansion will involve the irretrievable commitment of certain natural, human, and fiscal resources. Major resource commitments include the land upon which buildings are constructed, money, construction materials, manpower, water and energy. The impacts of using these resources is, however, offset by the economic benefits to the residents of the region, Hawaiian culture, the City and County of Honolulu, and the State of Hawaiʻi resulting from implementation of the Proposed Action.

D. 3. Curtailment of the Range of Beneficial Uses

The SEIS Lands have been designated for resort expansion since the mid-1980s. Implementation of the Proposed Action is consistent with that intended use and does not prevent or curtail any uses allowable under applicable land use policies or controls.

D. 4. Possibility of Environmental Accidents

The principal environmental accidents that might be associated with the Proposed Action relate to potential impacts upon near shore water quality resulting from either the accidental release of raw sewage from the resort's privately operated wastewater treatment plant located outside the SEIS Lands, the accidental spillage of pesticides or herbicides stored and used at the resort's golf courses, or a major traffic accident on Kamehameha Highway near the resort resulting in the spill of a large volume of petro-chemicals. While none of these events has occurred during the four decades the resort has been in existence, this does not preclude the possibility of such an event in the future. The potential for these events to occur is offset, to a certain degree, by the continued employment on a day-to-day basis of proper training protocols, best management practices by wastewater treatment plant operators and the golf course superintendent and his/her staff, and the proposed improvements to the resort's intersections with Kamehameha Highway.

D. 5. Loss and/or Destruction of Natural and Cultural Resources

As discussed in Chapter Five, the Proposed Action may impact marine and terrestrial resources, likely due to the increased presence of human activity related to the resort expansion. Some cultural and natural resources, in the form of terrestrial plants, may be destroyed during construction. These impacts will be offset by the mitigation measures discussed in Chapter Five. Specifically, the Proposed Action includes a recommendation for a Cultural and Natural Resource Management Plan, and a protocol for seeking cultural guidance in its implementation.

D. 6. Addressing the Irretrievable and Irreversible Loss of Resources

The Proposed Action constitutes a significant measure to mitigate the loss of resources resulting from expansion of the Resort. It represents an approximate 60 percent reduction in the allowable density of the resort as allowed by previously granted land use approvals. As discussed earlier in the SEIS, taking No Action, that is to say, doing nothing to expand resort facilities and operations at Turtle Bay is contrary to the Oʻahu General Plan and the State Land Use designations for the property. Therefore, the issue is this: how can the resort expansion be implemented in a manner that will minimize potentially significant adverse impacts. After engaging in a two-year long community outreach process, the owners of the resort believe that the Proposed Action represents the best opportunity to fulfill the goals of the State and County and benefitting the region, while reducing impacts to an acceptable level.

E. Government Policies that Offset Identified Adverse Impacts

The discussion of An Indication of What Other Interests and Considerations of Government Policies Are Thought to Offset the Adverse Environmental Effects of the Proposed Action as presented in Part X of the 1985 Revised Final EIS remains generally relevant to the current Proposed Action, and is therefore included by reference as allowed pursuant to Section 11-200-28, HAR.

F. Unresolved Issues

Affordable Housing Program - At the time of the writing of the DSEIS, a specific program has not been prepared that details the manner in which the affordable housing program will be implemented in terms of financing options, restrictions on use, buy-back provisions, etc. Prior to the commencement of the Proposed Action, TBR plans to work with the Department of Planning and Permitting and Hawaii Housing, Finance, and Development Corporation to finalize an acceptable program.

Kuilima Wastewater Treatment Plan Upgrade - At the time of the writing of the DSEIS, TBR plans to upgrade the treatment process to improve the quality of wastewater effluent to R-1 quality so that it may be used within certain portions of the SEIS Lands. Prior to the commencement of the Proposed Action, TBR plans to determine the final feasibility and how beest to implement this upgrade once volume capacity requirements correlate with proximate site development.

Conservation Easement - A conservation easement has been proposed to protect the long-term use of the resort's agricultural lands mauka of Kamehameha Highway. While these lands are not within the SEIS Lands, they are an integral part of the resort's Comprehensive Plan and the concept of *Tomorrow's Ahupua'a*. At the time of the writing of the DSEIS, TBR has signed a letter of intent with the Trust for Public Lands ("TPL") concerning the creation of a conservation easement relative to certain agricultural lands situated outside the SEIS Lands, on the mauka side of Kamehameha Highway; however, there are a number of steps in this process which remain to be completed in order to close this transaction, including obtaining an appropriate appraisal of these mauka agricultural lands and finalizing the conservation easement document. TBR hopes to close the conservation easement transaction with TPL by the end of the 1st quarter 2013, and in any event prior to the commencement of the Proposed Action.

Mauka Storm Water Drainage Retention/Detention - At the time of the writing of the DSEIS, TBR is working with its civil engineering team on a long-term storm water management plan including retention and detention strategies on the mauka agricultural lands owned by Turtle Bay Mauka, LLC situated on the mauka side of Kamehameha Highway. Implementation of this long-term plan is intended to reduce runoff after significant storm events, some of which affect levels of near shore turbidity. However at this time it has not yet been determined whether these proposed plans are technically and or financially feasible or supported by regulatory agencies. Prior to the restoration of Kawela Stream to its West Main Drain alignment as contemplated in the Proposed Action, TBR plans to work through design, feasibility, and construction issues related to this long-term plan.

City and County Zoning District Boundary Amendments - At the time of the writing of the DSEIS, it has not been determined whether the implementation of the Proposed Action will require adjustments to be made to the boundary lines of any existing zoning district. If, and to the extent such adjustments do become necessary, TBR will apply for administrative zoning district boundary amendments.

Implementation of a Marine Life Conservation District at Kawela Bay - As presented in the DSEIS, the creation of an advisory council is recommended to assist the resort in addressing issues that will affect users of the coastal resources for recreational purposes. The resort's Unilateral Agreement requires that best efforts be made to promote the creation of a Marine Life Conservation District at Kawela. But to do so will require broad-based input from the community, and TBR believes that an advisory council would be an appropriate method for receiving and addressing that input. Therefore the issues of if and how to implement a MLCD are not yet resolved. TBR plans to encourage and promote the formation of a Advisory Council prior to development of proximate parcels to Kawela Bay.

Critical Habitat for Hawaiian Monk Seals - At the time of the writing of the DSEIS, a proposal to designate all or a portion of waters of the main Hawaiian Islands as a critical habitat is under consideration by the National Marine Fisheries Service. The potential impact that such a designation by the federal government may have upon the Turtle Bay Resort is unknown and, therefore, the matter is unresolved. The NMFS has extended the deadline for comments on the proposal indefinitely and it is not known when the agency may eventually act on the proposal.

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CHAPTER SEVEN:

DOCUMENT PREPARATION AND REFERENCES

The SEIS was prepared by Lee Sichter of Lee Sichter LLC, 45-024 Malulani Street #1, Kaneʻohe, Hawaiʻi, 96744, with the assistance of the staff of Turtle Bay Resort, LLC and the following consultants and their staff.

Turtle Bay Resort: Mr. Drew Stotesbury, Mr. Scott McCormack, Mr. Ralph Makaiau, Ms. Danna Holck, and Ms. Debbie Graves.

Air Quality Impact Analysis: Mr. Barry D. Neal; B.D. Neal & Associates

Archaeology: Dr. Alan Haun; Alan Haun & Associates

Architectural Design: Mr. Robert Iopa and Mr. Jason Antonio; WCIT Architecture.

Civil Engineering: Mr. Jimmy Yamamoto, P.E.; R.M. Towill & Associates; Ms. Cheryl Palesh, P.E., and Mr. John Chung, P.E.; Belt Collins Hawaii LLC.

Community Outreach: Ms. Dawn Chang, President; Kuiwalu Inc.

Cultural Impact Analysis: Mr. Paul Cleghorn, Ph.D. and Ms. Kimberly Moony; Pacific Legacy, Inc.

Document Format and Editing: Ms. Carole Goodson and Mr. Roger Yu; Goodson+Yu Design.

Flora and Fauna Impact Analyis: Mr. Reginald Davis, Ph.D.; Rana Biological Consulting, Inc.

Graphic Arts: Ms. Diane Yamamoto and Ms. Karon Aoki; Belt Collins Hawaii Ltd.

Marine Resource Impact Analysis: Mr. Robert Bourke; Oceanit Laboratories, Inc.

Market Analysis: Mr. Darius Hatami, MAI; HVS Golf

Noise Impact Analysis: Mr. Yoichi Ebisu, P.E.; Y. Ebisu & Associates

Socio-Economic Impact Analysis: Mr. John Kirkpatrick, Ph.D.; Belt Collins Hawaii Ltd.

Traffic Impact Analysis: Mr. Randall S. Okaneku, P.E.; The Traffic Management Consultant

Transportation System Demand Analysis: Mr. D. Sohrab Rashid, T.E.; Fehr & Peers

Trip Generation Survey: Mr. Hersh Singer; SMS Research

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Draft Supplemental Environmental Impact Statement for

TURTLE BAY RESORT EXPANSION

Portions of Ahupuaʻa O ʻŌpana-Kawela, Ahupuaʻa O Hanakaʻoe, and Ahupuaʻa O Kahuku, Koʻolau Loa District, Island of Oʻahu

Volume Two of Four

PREPARED FOR TURTLE BAY RESORT, LLC by LEE SICHTER LLC • NOVEMBER 2012

CHAPTER EIGHT:

PUBLIC OUTREACH

A. Community Engagement Process

TBR sought to re-establish a meaningful community relationship with the general public and particularly with the range of stakeholders involved with the lands at TBR. To achieve this goal, a multi-faceted consultation process was undertaken. A deliberate attempt was made by the TBR Project Team to initiate a request with various stakeholders to listen to them in settings or forums of their choosing. The following is a brief description of the approaches that were engaged in to reach out to the community and a discussion of some of the results of that engagement.

Individual and small talk story sessions: For many Hawaiians who previously dissociated themselves from community dialogues, requests were made to meet them in informal, one-on-one small talk story sessions. Similarly, elected officials and government agencies were given individualized briefings. For various Hawaiian families, cultural practitioners and resource gatherers, requests were made for small talk story sessions where the discussions could be confidential and respectful.

Group meetings: TBR project team attended regular public meetings of the Koʻolauloa Neighborhood Board and Kahuku Community Association. Presentations were made to various organizations including the Koʻolauloa and Koʻolaupoko Hawaiian Civic Clubs to provide them a briefing of the Revised Master Plan and to get their *manaʻo* on cultural practices or issues and concerns they may have about the project. The Association of Hawaiian Civic Club also held their annual convention at Turtle Bay on October 26, 2011 and hosted a panel discussion including Piʻilani Smith, Creighton Mattoon, Dawn Chang, and Senator Clayton Hee that was moderated by Naʻu Kamalii.

Traditional Public Meetings: In an effort to reach out to the broader community, TBR held a large public forum hosted at Turtle Bay Resort on September 15, 2011. The TBR project team convened a public open house and informational meeting. The event was well attended with over 100 people.

Cultural Advisory Council: The TBR Project Team convened a Cultural Advisory Council composed of Hawaiian cultural practitioners, educators, cultural experts, and individuals who could provide cultural guidance to TBR as it began to revise its Master Plan and prepare the SEIS.

Kahuku Burial Committee: Several years ago, TBR convened a group of individuals who have lineal and cultural connections to these lands who accepted the kuleana to *mālama* (care for) any *iwi kūpuna* that may be discovered on the project site as well as within the Ahupuaʻa of Kahuku. The KBC has met regularly and several may seek formal recognition as lineal or

cultural descendants by the Oʻahu Island Burial Council for any *iwi kūpuna* discovered on the project site. The KBC's Kahu has been Richard and Lynette Paglinawan, well respected cultural practitioners.

Established a website: The TBR project team established the website *www.turtlebayseis.com* to keep the public informed of the progress of the Revised Master Plan and the SEIS. The website also provides an opportunity for the community to provide specific input or *manaʻo* on cultural practices and resources in the area.

Publication: The TBR Project team voluntarily published a notice in the StarAdvertiser on May 5, 2011 and July 2, 2012, and in the Office of Hawaiian Affairs *Ka Wai Ola* on June 11, 2011 and July 5, 2012 informing the public of its intent to develop specific lands identified by tax map keys, also listing the names of the land commission awardees on the property, requesting any information about cultural resources including potential burials. Several responses were received and the TBR project team followed up with the responders.

Ethnographic Interviews: Pacific Legacy conducted 16 ethnographic interviews of individuals who had a personal association with the Resort. Their methodology and results are presented in the Cultural Impact Assessment presented in this SEIS as Appendix D.

Following is a list of all parties consulted during the TBR Community Outreach Program:

Groups	Agencies	Individuals
Adopt-A-Beach Hawaiʻi	Board of Water Supply	Bill Paty
Association of Hawaiian Civic Clubs	Councilmember Ernie Martin	Bob Leinau
Beach Access Hawaiʻi	Department of Land and Natural Resources	Bob Nakata
Brigham Young University of Hawaiʻi	Department Of Transportation	Brett Lee
Building Industry Association	Department of Planning and Permitting	Buddy Ako
Campbell Estates	Governor Neil Abercrombie	Carol Anamizu
Carpenters Union	KHPR - Townsquare	Charlie Toguchi
Continental Pacific/Marconi Point	Land Use Research Foundation	Chhorvy Oung
Defend Oʻahu Coalition	Office of Environmental Quality Control	Christino Bumanglag
Groups (continued)	Agencies (continued)	Individuals (continued)
Electricial Workers Union	Oʻahu Island Burial Council	Chue Vang Outtaphone
Friends of Kewalo Basin	Office of Hawaiian Affairs	David Arakawa
Friends for Waialua Town	Representative Jessica Wooley	David Baker

Haleʻiwa Community Association
Hauʻula Community Association

Hawaiʻi Reserves Inc.
Hawaiʻi State Body Surfing Association

Hiʻipaka LLC

Hui Mālama O Pūpūkea Waimea

Ilioulaokalani Coalition
ILWU

Jeanies Fine Jewelry
Kaʻaʻawa Community Association
Kahana Community Association

Kahuku Burial Committee

Kahuku Community Association
Kahuku Farmers Association
Kahuku Healthcare Family Medical Center
Kahuku Intermediate and High Schools
Kahuku Village Association
Kawailoa Ranch
Kawela Community Association
Keep Kahuku Country
Keep the North Shore Country
Kohala Collections

Ko'olau Loa City Neighborhood Board, District #28
Ko'olau Loa City Sustainable Community Plan
Ko'olau Loa City Watershed Plan
Ko'olau Loa Hawaiian Civic Club
Ko'olau Loa North Shore Alliance
Koʻolaupoko Hawaiian Civic Club
Kualoa Ranch
Kuilima Estates East Community Association
Kuilima Estates West Community Association

Representive Gil Riviere

Senator Clayton Hee
State Historic Preservation Division

State Water Commission

U.S. Army Corp of Engineers
U.S. Army Garrison Hawaiʻi

Doug Cole

Fong Sourivong

Fred Hemmings

Fred Trotter

Hans Hedeman

Inhta Saysiri

Jim Anthony

John Morgan

Junior AhYou
Kathleen Pahinui

Kela Miller

Kent Fonoimoana

Keona Marks
Kylie Matsuda

Lonnie Sanders

Manichanh Phongphila

Mitch Coztino
Nainoa Thompson
Nova Jean McKenzie
Paul Cleghorn
Pete Delacruz
Peter Cole

Pua Colburn

Ran Sok

Randy Rarrick
Ricardo Rabago
Richard Paglinawan
Roger Corpuz
Ron Valencia

Samay Sourivong

Steve Hoag

Kuilima North Shore Strategic Planning Committee

Labors Union
Lāʻie Community Association
Lāʻie Kūpuna Council
Lamont's Sundries
Lei Lei's/Ian and Mike
Les Enderton/ Oahu Visitors Bureau
Local 5
Mālaekahana West Mauka
Mālama ʻOhana
Mason/Bricklayers Union
North Shore Chamber of Commerce
North Shore City Neighborhood Board, District #27
North Shore Community Land Trust
North Shore Health & Wellness Center
North Shore Moto Cross Track
North Shore Outdoor Circle
North Shore Weddings & Flowers
Ocean Villas
Operating Engineers Local 3
Operating Engineers Local 3 Training School
Pacific Resourses INC.
Painters Union
Paradise Helicopters
Park Dedications, City Parks and Recreation
Plumbers Union
Polynesian Cultural Center
Punalu'u Community Association

Pūpūkea Community Association
Queen Liliʻuokalani Childrens Center, Punalu'u
Save the Monk Seals
Save the Sea Turtles
Shaka Kayaks
Sierra Club, Hawaiʻi Chapter
Sunset Community Association
Surfrider Foundation, Oʻahu Chapter

Sunny Greer

Teo Soukhaseum

Tim Law
Tom Kiely
Virgilio Tomas
Warren Soh
Will Schoettle
You Soukaseum

Teamsters Union
Trust for Public Lands
Turtle Bay Golf Employees
Turtle Bay Resort Cultural Advisory Council
Turtle Bay Resort Hotel Employees

UH School of Law/Alliance
U. S. Fish & Wildlife Service

Groups (continued)
VAN's Triple Crown

Waialua Community Association
Waialua Hawaiian Civic Club
Waialua Intermediate and High Schools
Waimea Valley
VAN's Triple Crown

Waialua Community Association
Waialua Hawaiian Civic Club
Waialua Intermediate and High Schools
Waimea Valley

B. SEISPN Comments

On August 23, 2011, a Notice of Availability of the Environmental Assessment & Supplemental Environmental Impact Statement Preparation Notice (SEISPN) was published in the OEQC's *Environmental Notice*.

The following parties were provided with a copy of the SEISPN for review and comment. (An asterisk [*] after the name indicates that the party provided a written comment.)

State Agencies

Office of Environmental Quality Control
Department of Agriculture
Department of Health
Department of Land and Natural Resources*
DLNR – Historic Preservation Division
Department of Transportation
Office of Hawaiian Affairs*
State Librarian's Office
Kahuku Public & School Library

Waialua Public Library
Kaneohe Public Library

State Elected Officials

Governor Neil Abercrombie
Senator Donovan Dela Cruz
Senator Clayton Hee
Representative Gil Riviere
Representative Jessica Wooley

City and County of Honolulu

Department of Planning and Permitting (Accepting Authority)*
Board of Water Supply*
Department of Environmental Services*
Department of Facility Maintenance
Department of Parks and Recreation*
Department of Transportation Services*

City and County of Honolulu Elected Officials

Council Chairman Ernest Martin*
North Shore Neighborhood Board #27
Ko`olauloa Neighborhood Board #28

News Media

Honolulu Star Advertiser

In addition to the formal distribution of the SEISPN, a public information meeting, sponsored by Turtle Bay Resort, was held on September 15, 2011 at a meeting room at the resort. As discussed above, the meeting was attended by over 100 residents of the North Shore and Koʻolau Loa communities and copies of the SEISPN were provided to anyone who requested one. Comment forms were distributed and any that were filled out with a name and an email address have been included as a Consulted Party for the purpose of the SEIS.

The SEISPN was also posted on a Turtle Bay Resort website dedicated to the SEIS. Any comments posted on the website with a name and email address have been included as a Consulted Party for the purpose of the SEIS.

On May 11, 2011, representatives of Turtle Bay Resort participated in a community forum called Talk Story 3 sponsored by the Defend Oʻahu Coalition that was attended by over 100 people. Participants were told by the Turtle Bay Resort representatives that anyone who signed in and provided an email address would be notified when the SEISPN was available for review. An email list of attendees was subsequently sent to Turtle Bay by the DOC and all the parties on the list were subsequently sent an email in mid August 2011 notifying them that they could review the SEISPN at the Turtle Bay website.

Following is a list of the written comments (letters, emails, and comment forms) received by Turtle Bay Resort, Lee Sichter LLC, and/or the City and County of Honolulu's Department of Planning and Permitting in response to the distribution of the SEISPN. Following the list, each written comment is presented, together with a written response. (Please note that in some cases, incomplete names were provided in emailed comments. In other cases, no name was provided or a comment letter was undated, but was received during the official comment period.)

	Date	Name	Source
1	8/20/11	D. Ward	letter to Lee Sichter
2	8/23/11	banksy	TBR website comment page
3	8/23/11	star harthern	email to DPP
4	8/23/11	Steve Wolf	email to DPP
5	8/23/11	Amy Chiang	email to DPP
6	8/23/11	Carl Jerry Vasconcellos	email to DPP
7	8/23/11	Karen Turner	email to DPP
8	8/23/11	linda shea	email to DPP
9	8/23/11	Joseph Grassadonia	email to DPP
10	8/23/11	Angela	email to DPP
11	8/23/11	Bill Sager	TBR website comment page
12	8/24/11	Bart Smith	TBR website comment page
13	8/24/11	Pamela Sue	email to DPP
14	8/24/11	Mary Bilger	email to DPP
15	8/24/11	Bill Quinlan	email to DPP
16	8/24/11	Scott Langford	email to DPP
17	8/24/11	Mark Mead	email to DPP
18	8/24/11	Saralyn Padeken	email to DPP
19	8/24/11	Saralyn Padeken	email to DPP
20	8/24/11	Milica Barjaktarovic	email to DPP
21	8/24/11	Edward J. Jones	TBR website comment page
22	8/25/11	Madeline Neely	email to DPP
23	8/26/11	Jim Anthony	TBR website comment page
24	8/26/11	Jim Anthony	TBR website comment page
25	8/26/11	Jim Anthony	TBR website comment page
26	8/26/11	F. Black	email to DPP
27	8/26/11	Jill Voeks	email to DPP
28	8/27/11	Bea Coffee	TBR website comment page
29	8/27/11	Bruce and Trisha Bila	TBR website comment page
30	8/27/11	Bruce &amp, Patricia Bila	TBR website comment page
31	8/28/11	Jim Anthony	email to Drew Stotesbury
32	8/29/11	Sara	TBR website comment page
33	8/29/11	Friends of Hauula	TBR website comment page

34	8/29/11	Joan Koff	email to DPP
35	8/29/11	Kyle Kennedy	email to DPP
36	8/29/11	Jim Anthony	TBR website comment page
37	8/29/11	Jim Anthony	TBR website comment page
38	8/29/11	Jim Anthony	TBR website comment page
39	8/29/11	Marilyn Cole	TBR website comment page
40	8/29/11	Ken Rubenstein	TBR website comment page
41	8/30/11	Name withheld by request[1]	TBR website comment page
42	9/1/11	Carl Jerry Vasconcellos	email to DPP
43	9/1/11	Neil Freeman	TBR website comment page
44	9/2/11	Joy Silver	TBR website comment page
45	9/2/11	David Druz	email to DPP
46	9/2/11	Jeffrey Mironov	email to DPP
47	9/2/11	Everett Magnuson	email to DPP
48	9/2/11	Maria Pacheco	email to DPP
49	9/2/11	Scott Langford	email to DPP
50	9/2/11	Kekai Paulsen	email to DPP
51	9/2/11	**np**	email to DPP
52	9/2/11	William Barrera	TBR website comment page
53	9/3/11	Paul Nelson	TBR website comment page
54	9/3/11	Beth Hyams	email to DPP
55	9/3/11	Adrian Izweriw	TBR website comment page
56	9/3/11	Mary Jo Buell	email to DPP
57	9/3/11	Emilia Perry	email to DPP
58	9/3/11	Tait Duryea	TBR website comment page
59	9/4/11	Edie Claire	TBR website comment page
60	9/5/11	Kathleen Pahinui	TBR website comment page
61	9/5/11	Maxwell Brick	TBR website comment page
62	9/6/11	Kainalu Hecomovich	email to DPP
63	9/6/11	Sarah Restle	email to Lee Sichter
64	9/7/11	Clyde Namuo (OHA)	letter to Drew Stotesbury
65	9/8/11	Karen Banes	TBR website comment page
66	9/12/11	Elizabeth Nelson	email to DPP
67	9/12/11	Lynette Gehring	letter
68	9/14/11	Odin Hill	TBR website comment page
69	9/14/11	Susan Cortes	TBR website comment page
70	9/14/11	Matt Kester	TBR website comment page
71	9/14/11	Garid	TBR website comment page
72	9/14/11	Edward J. Jones	TBR website comment page

[1]The author of the email has requested that any identifying information be deleted.

73	9/14/11	Chip Hartman	TBR website comment page
74	9/15/11	Susan Uyesugi (BWS)	letter
75	9/15/11	Sandy McClanahan	public info meeting comment form
76	9/15/11	Randy Ching (Sierra Club)	letter
77	9/15/11	Julie Cooke	public info meeting comment form
78	9/15/11	Bonnie Corrigan	public info meeting comment form
79	9/15/11	Sean Ginella	public info meeting comment form
80	9/16/11	DeeDee Letts	email to DPP
81	9/18/11	Nancy McGovern	TBR website comment page
82	9/19/11	Justin Parker	TBR website comment page
83	9/19/11	Rob Barreca	email to DPP
84	9/19/11	Paul Nelson	email to DPP
85	9/19/11	Wayne Yoshioka (DTS)	letter
86	**np**	Alecia Van Atta (NMFS)	letter
87	9/20/11	Jess Snow	TBR website comment page
88	9/20/11	Creighton Mattoon	email to DPP
89	9/20/11	Cathleen Mattoon	email to DPP
90	9/21/11	Mike Dixon	email to DPP
91	9/21/11	Karen Turner	email to DPP
92	9/21/11	Everett Magnuson	email to DPP
93	9/21/11	Michael Schwinn	email to Lee Sichter
94	9/21/11	Ann Palacios	email to Lee Sichter
95	9/21/11	Elaine Hornal	email to DPP
96	9/21/11	Carl Higgins	email to Lee Sichter
97	9/21/11	Priscilla Magallanes	email to Lee Sichter
98	9/21/11	Jason	email to Lee Sichter
99	9/21/11	Linda Shea	email to Lee Sichter
100	9/21/11	Jim Anthony	emailed to Turtle Bay 9/22
101	9/21/11	Paul and Judy Nelson	email to Lee Sichter
102	9/21/11	David Tanoue (DPP)	letter
103	9/21/11	Sarah Cadiz (First Hawn Bank)	email
104	9/21/11	Lucky Cole	email to Lee Sichter
105	9/21/11	Jean and Mark Martinson	letter to DPP
106	9/22/11	John Ritter	email to DPP
107	9/22/11	Eric Burton	email to Lee Sichter
108	9/22/11	Gil Riviere	email to DPP
109	9/22/11	Keep the North Shore Country	letter to Lee Sichter
110	9/22/11	Tim Tybuszewski	email to DPP

111	9/22/11	Kent Fonoimoana	email to DPP
112	9/22/11	Raymond Beatty	email to DPP
113	9/22/11	Barbara Fisher	email to Lee Sichter
114	9/22/11	Stanley May	email to DPP
115	9/22/11	Bill Quinlan	email to Lee Sichter
116	9/22/11	Mark Manley	email to DPP
117	9/22/11	David Nagamine (DES)	letter to Lee Sichter
118	9/22/11	Ernest Martin (City Council)	letter to Drew Stotesbury
119	9/23/11	Bill Quinlan	email to Lee Sichter
120	9/23/11	Meleana Judd	email to DPP
121	9/23/11	Mike and Kathy Mociun	email to Lee Sichter
122	9/23/11	Bob Leinau	email to DPP
123	9/23/11	Choon James	email to Lee Sichter
124	9/24/11	Nancy and Mike McGovern	email to DPP
125	9/24/11	Kelly Viszolay	email to Lee Sichter
126	9/24/11	Brian Emmons	email to DPP
127	9/24/11	Nick Denzer	email to Lee Sichter
128	9/24/11	Joseph Grassadonia	email to DPP
129	9/25/11	Tinker Blomfield	email to Lee Sichter
130	9/26/11	Aukai Ferguson	email to DPP
131	9/26/11	James O'Shea	email to DPP
132	9/26/11	Russel Tsuji (DLNR)	email to DPP
133	9/26/11	Timothy Vandeveer	email to DPP
134	9/27/11	Henry Matson	email to DPP
135	9/29/11	Nick Marck	email to DPP
136	10/3/11	Bob Comeau	email to Drew Stotesbury
137	10/14/11	Gary Cabato (DPR)	letter to Drew Stotesbury
138	10/31/12	Andrea Anixt	email to Lee Sichter
	np= Not Provided		

C. Draft SEIS Distribution

Copies of the Draft SEIS were submitted to the following agencies, organizations for review, as required by the OEQC.

Federal Agencies

Department of the Interior, Geological Survey, Pacific Islands Water Science Center
Department of the Interior, Fish and Wildlife Service
Department of Commerce, National Marine Fisheries Service
Department of Interior, National Parks Service

Department of Agriculture, National Resources Conservation Service
Department of Transportation, Federal Aviation Administration
Department of Transportation, Federal Transit Administration
Commander, 14th Coast Guard District, U.S. Coast Guard

State Agencies

Office of Environmental Quality Control
Department of Agriculture
Department of Accounting and General Services
Department of Business, Economic Development and Tourism
DBEDT Research Division Library
DBEDT Strategic Industries Division
DBEDT Office of Planning
Department of Defense
Department of Education, Hawaii State Library, Hawaii Documents Center
Kaimuki Regional Library
Kane`ohe Regional Library
Pearl City Regional Library
Hawaii Kai Regional Library
Hilo Regional Library
Kahului Regional Library
Lihu`e Regional Library
Kahuku Public & School Library
Waialua Public Library
Waialua Public Library
Kaneohe Public Library
Department of Hawaiian Home Lands
Department of Health, Environmental Health Administration
Department of Land and Natural Resources
DLNR – Historic Preservation Division
Department of Transportation
Office of Hawaiian Affairs
University of Hawaii, Thomas H. Hamilton Library
University of Hawaii, Edwin H. Mo`okini Library
University of Hawaii, Maui College Library
University of Hawaii, Kaua`i Community College Library
University of Hawaii, West Oahu Library
University of Hawaii, Water Resources Research Center
University of Hawaii, Environmental Center
Legislative Reference Bureau

State Elected Officials

United States Senator Daniel K. Inouye
United States Senator Daniel Akaka

United States Representative Collene Hanabusa
United States Representative Mazie Hirono
Governor Neil Abercrombie
Senator Donovan Dela Cruz
Senator Clayton Hee
Representative Gil Riviere
Representative Jessica Wooley

City and County of Honolulu

Department of Planning and Permitting (Accepting Authority)
Board of Water Supply
Department of Customer Services
Department of Design and Construction
Department of Environmental Services
Department of Facility Maintenance
Department of Parks and Recreation
Department of Transportation Services

City and County of Honolulu Elected Officials

Council Chairman Ernest Martin
North Shore Neighborhood Board #27
Ko`olauloa Neighborhood Board #28

News Media

Honolulu Star Advertiser
Hawai`i Tribune Herald
West Hawai`i Today
The Garden Isle
Maui News
Moloka`i Dispatch

8/20/11

Keep the Country Country

This Island is being destroyed bit by bit.
The Department of Planning & Permitting has got to stop this uncontrolable growth.
& Turtle Bay developers have no conscious when it comes to taking care of the land.
Over building can never be undone & the country will eventually become over developed as Waikiki
Yes it is unacceptable.

D. Ward

LEE SICHTER LLC

45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

D. Ward
2428 Tusilala Street
Honolulu, HI 96815

Dear D. Ward:

I am writing in response to the letter you sent on August 20, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

We acknowledge your opposition to the proposed expansion of the Turtle Bay Resort. The Turtle Bay Resort property was reclassified to the State's Urban District in the mid-1980s and subsequently rezoned by the City for expansion as a visitor destination area. It is the policy of the City and County of Honolulu to encourage the continuing vitality of the visitor industry, in part, through the expansion of the Turtle Bay Resort.

The Draft SEIS will present in detail the resort owners' commitment to the long-term sustainability of the resort and improving its relationship with and connectivity to the surrounding community. We look forward to your comments on it.

The proposed expansion plan represents an approximate sixty-one percent reduction in the allowable density for the property. Implementation of this expansion plan will prevent the over-building that concerns you.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

The official review and comment period will last 45 calendar days from the date that the OEQC publishes the Notice of Availability in its *Environmental Notice*. You can find the *Environmental Notice* on-line at the OEQC website:

http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Print | Close Window

Subject: [Turtle Bay Resort SEIS] Please moderate: "Host Communities"
From: Turtle Bay Resort Development <info@turtlebayseis.com>
Date: Tue, Aug 23, 2011 7:14 am
To: info@turtlebayseis.com

A new comment on the post "Host Communities" is waiting for your approval
http://turtlebayseis.com/community/host-communities/

Submitted : Aug 23, 2011 @ 7:14
Author : banksy (IP: 70.95.163.236 , cpe-70-95-163-236.hawaii.res.rr.com)
E-mail : tvandeveer76@hotmail.com
URL :
Address : 59-080 Kamehameha Hwy. #B
City : Haleiwa
State : HI
Zip : 96712
Phone : 8083880660
Comment:
I was wondering why communities on the North Shore such as Sunset Beach, Haleiwa, and Waialua are not mentioned by name. Do you recognize that these communities will bear the brunt of adverse impacts created by this expansion and therefore pretend they don't exist? What happens at Turtle Bay doesn't stay at Turtle Bay. Next time you are sitting in traffic on the North Shore on the way to the Resort, please remember the name of the community that you are in and acknowledge that it is "hosting" you as well.

Approve it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=approve&c=53
Trash it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=trash&c=53
Spam it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=spam&c=53
Currently 4 comments are waiting for approval. Please visit the moderation panel:
http://turtlebayseis.com/tbr/wp-admin/edit-comments.php?comment_status=moderated

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PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Banksy @ tvandeveer76@hotmail.com

I am writing in response to the email you sent on Tuesday August 23, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

Because Turtle Bay Resort was required by a decision of the court to prepare a Supplemental EIS before its expansion plans can be implemented, the Preparation Notice was intended to provide a very generalized overview of the project for the purpose of informing agencies and the general public that a Supplemental EIS would be prepared. It was not intended to present a detailed description or analysis. We regret that you took offense with its limitations. Please be assured that the Draft SEIS that is now nearing completion will be much more robust in its content.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives. The official review and comment period will last 45 calendar days from the date that the OEQC publishes the Notice of Availability in its *Environmental Notice*. You can find the *Environmental Notice* on-line at the OEQC website:

http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

traffic & infrastructure

1 message

star harthern <starjacobsen@gmail.com> Tue, Aug 23, 2011 at 1:44 PM
To: snishiura@honolulu.gov, leesichter@gmail.com

Thank you for the opportunity to share my concerns.

The traffic on the North Shore has gotten much worse in the last 5 years. The impact of a major development at Turtle Bay would have on this fragile and already impassable roadway is difficult to consider.

Even the guests heading for Turtle BAy would have to content with the 30 minute crawl/wait just to get past Lanikea, then on to the stop light at Foodland, then to the 30 minute crawl/wait at Sunset.

There are many local business operating in the North Shore area, just to watch FedEX trucks sitting there in traffic, not to mention the independent business owners, all TRYING to make it work to live here and have a viable business.

Everything is not about Turtle Bays bottom line.

What if one or two of those independent business owners were your daughte'sr or son's? Would you still be willing to drive them into the ground, just because of a corporations bottom line?

Mahalo

LEE SICHTER LLC

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PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Star Harthern @ starjacobsen@gmail.com

I am writing in response to the email you sent on Tuesday, August 23, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

The owners of the Turtle Bay Resort share you concerns about existing and future traffic volumes on Kamehameha Highway. The resort is part of the North Shore and Ko`olau Loa communities and is committed to finding workable traffic solutions.

As a two-lane highway serving nearly half the island extending from Kahalu`u to Hale`iwa, Kamehameha Highway has to accommodate local and regional traffic. Extending along a relatively narrow plain between the coastline and the base of the mountains, the highway cannot easily be widened, even if this was what the community wanted. And selective widening along limited straightaways would only exacerbate traffic conditions; eventually the widened roadway segment would have to narrow back to two lanes. Thus, we all have to work together to find alternate solutions.

Limiting development on the North Shore is neither a practical nor realistic answer. Even if there was no further development between Kahalu`u and Hale`iwa, there would still be traffic congestion on the highway. So long as the famed beaches of the North Shore remain an attraction for O`ahu's residents and visitors, people from Honolulu, Hawaii Kai, Kailua, Kane`ohe, Aiea, Pearl City, Waipahu, Ewa, Kapolei, Waianae and Wahiawa will come. As a community, we each must do our part to help reduce traffic and work together to address transportation issues. That means driving smarter, consolidating trips, ride-sharing, and using transit alternatives when possible, to name a few.

To reduce the impacts of the proposed resort expansion, new left-turn lanes and traffic signals will be funded by Turtle Bay Resort where the roads that will access the resort intersect with Kamehameha Highway. This should help to mitigate the impact of vehicles entering and leaving the resort. According to our recently completed traffic study, on an annual average basis the proposed resort expansion will increase traffic on the highway by about 4.5% during the morning peak hour and 3.0% during the afternoon peak hour.

In addition, the resort will implement a number of measures designed to reduce resort-related traffic. These will include van shuttle service for employees and guests. The resort is also exploring ways to extend the successful bike path at Malaekahana all the way to Hoalua Street and beyond to Ke Nui Road.

The owners of the resort are also committed to paying their fair-share of the cost for regional traffic improvements to help reduce traffic congestion, as determined by the State Department of Transportation. ("Fair-share" is calculated by the State DOT as a developer's portion of the total cost of new improvements based upon the percentage of new traffic generated by the developer's project.)

The traffic study and mitigation measures mentioned above will be presented in the Draft Supplemental Environmental Impact Statement for the resort. Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

North Shore "Master" Plan

1 message

Steve Wolfe <wolfes003@hawaii.rr.com> **Tue, Aug 23, 2011 at 1:49 PM**
To: snishiura@honolulu.gov, leesichter@gmail.com

I hope you guys know that the only way Oaktree's plan will work will be to extend the H-2 freeway all the way from Wahiawa to Haleiwa, a quick right turn, and then additional four to six lane freeway from Haleiwa all the way to Kaneohe. Have you ever tried to get from Haleiwa to Kahuku (or Laie) on a weekend, or when there is a surf meet, or even on a busy weekday. Are they prepared to build this new superhighway? Because that's the only way it will work. Unless you're willing to shuttle all the tourists by helicopter.

Don't forget the new water, sewer, and electrical systems. Mmmmmmm!!! Money!!!!!

Maybe I shouldn't have mentioned this. Perhaps Oaktree is just desperate enough to do it! Even the helicopters!! ☹

Steve Wolfe

LEE SICHTER LLC

45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Steve Wolf @ wolfes003@hawaii.rr.com

I am writing in response to the email you sent on Tuesday, August 23, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

Please understand that Oaktree Capital no longer owns the property. The current owners are proposing that the scale of expansion at Turtle Bay Resort be reduced by about 60 percent from what was proposed by Oaktree.

The current owners of the Turtle Bay Resort share you concerns about existing and future traffic volumes on Kamehameha Highway. The resort is part of the North Shore and Ko`olau Loa communities and is committed to finding workable traffic solutions.

As a two-lane highway serving nearly half the island extending from Kahalu`u to Hale`iwa, Kamehameha Highway has to accommodate local and regional traffic. Extending along a relatively narrow plain between the coastline and the base of the mountains, the highway cannot easily be widened, even if this was what the community wanted. And selective widening along limited straightaways would only exacerbate traffic conditions; eventually the widened roadway segment would have to narrow back to two lanes. Thus, we all have to work together to find alternate solutions.

Limiting development on the North Shore is neither a practical nor realistic answer. Even if there was no further development between Kahalu`u and Hale`iwa, there would still be traffic congestion on the highway. So long as the famed beaches of the North Shore remain an attraction for O`ahu's residents and visitors, people from Honolulu, Hawaii Kai, Kailua, Kane`ohe, Aiea, Pearl City, Waipahu, Ewa, Kapolei, Waianae and Wahiawa will come. As a community, we each must do our part to help reduce traffic and work together to address transportation issues. That means driving smarter, consolidating trips, ride-sharing, and using transit alternatives when possible, to name a few.

To reduce the impacts of the proposed resort expansion, new left-turn lanes and traffic signals will be funded by Turtle Bay Resort where the roads that will access the resort intersect with Kamehameha Highway. This should help to mitigate the impact of vehicles entering and leaving the resort. According to our recently

completed traffic study, on an annual average basis the proposed resort expansion will increase traffic on the highway by about 4.5% during the morning peak hour and 3.0% during the afternoon peak hour.

In addition, the resort will implement a number of measures designed to reduce resort-related traffic. These will include van shuttle service for employees and guests. The resort is also exploring ways to extend the successful bike path at Malaekahana all the way to Hoalua Street and beyond to Ke Nui Road.

The owners of the resort are also committed to paying their fair-share of the cost for regional traffic improvements to help reduce traffic congestion, as determined by the State Department of Transportation. ("Fair-share" is calculated by the State DOT as a developer's portion of the total cost of new improvements based upon the percentage of new traffic generated by the developer's project.)

The traffic study and mitigation measures mentioned above will be presented in the Draft Supplemental Environmental Impact Statement for the resort. The SEIS will also include an analysis of the proposed project's impacts upon infrastructure including water, sewer, and electrical systems.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com.

However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

Turtle Bay Resort Development

1 message

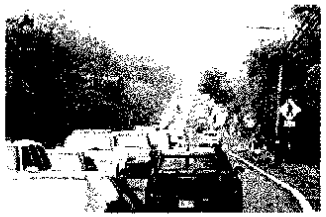
Amy Chiang <achiang1@yahoo.com> **Tue, Aug 23, 2011 at 2:03 PM**
Reply-To: Amy Chiang <achiang1@yahoo.com>
To: "snishiura@honolulu.gov" <snishiura@honolulu.gov>, "leesichter@gmail.com" <leesichter@gmail.com>
Cc: "info@GilRiviere.com" <info@gilriviere.com>

To Whom It May Concern,

Attached is a picture of typical traffic on the North Shore nowadays during a significant amount of the day. I live at Rocky Point and I commute to town almost daily. I usually commute during off hours to avoid traffic but nowadays that's getting increasingly difficult because the constant tourist traffic all along the Kam Highway from Sunset Beach to Haleiwa EVERYDAY, winter and summer! The Turtle Bay development has issues on many levels but for this email I want to specifically ask how the developers intend to deal with the increased traffic load that will come with the development when it is already unbearable for residents today. A bypass around Laniakea is not enough to fix the problem anymore.

Sincerely,

Amy P. Chiang



traffic.jpg
33K

LEE SICHTER LLC

45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Amy Chiang @ achiang1@yahoo.com

I am writing in response to the email you sent on Tuesday August 23, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

The owners of the Turtle Bay Resort share you concerns about existing and future traffic volumes on Kamehameha Highway. The resort is part of the North Shore and Ko`olau Loa communities and is committed to finding workable traffic solutions.

As a two-lane highway serving nearly half the island extending from Kahalu`u to Hale`iwa, Kamehameha Highway has to accommodate local and regional traffic. Extending along a relatively narrow plain between the coastline and the base of the mountains, the highway cannot easily be widened, even if this was what the community wanted. And selective widening along limited straightaways would only exacerbate traffic conditions; eventually the widened roadway segment would have to narrow back to two lanes. Thus, we all have to work together to find alternate solutions.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

Turtle bay development

1 message

Carl Jerry Vasconcellos <jvasco@hawaii.rr.com> **Tue, Aug 23, 2011 at 2:23 PM**
To: snishiura@honolulu.gov, leesichter@gmail.com

Dear Sirs:
I would be interested in understanding how the addition of all these rooms will not negatively impact the traffic along the two lane Kamehameha Hwy? You do realize that other than a heliport and the extra costs to the guests, this will impact them as well?
Respectfully yours,
Carl Vasconcellos
3148 Kailhi St.
Honolulu, Hawaii 96819
ph. 783-9577

LEE SICHTER LLC
45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Carl Jerry Vasconcellos @ jvasco@hawaii.rr.com

I am writing in response to the email you sent on Tuesday, August 23, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

The owners of the Turtle Bay Resort share you concerns about existing and future traffic volumes on Kamehameha Highway. The resort is part of the North Shore and Ko`olau Loa communities and its owners are committed to finding workable traffic solutions.

Traffic conditions on Kamehameha Highway will be impacted by the proposed expansion. At issue is what is the extent of the impact and what can the resort owners do to mitigate it. The traffic study presently being prepared as part of the SEIS to address this issue must be reviewed and approved by the State Department of Transportation. Once the project's impacts are quantified, the State DOT will determine the 'fair-share' cost of improvements that must be borne by the resort.

To reduce the impacts of the proposed resort expansion, new left-turn lanes and traffic signals will be funded by Turtle Bay Resort where the roads that will access the resort intersect with Kamehameha Highway. These improvements are required pursuant to a Unilateral Agreement attached to the property title. This should help to mitigate the impact of vehicles entering and leaving the resort. According to our recently completed traffic study, on an average annual basis the proposed resort expansion will increase traffic on the highway by about 4.5% during the morning peak hour and 3.0% during the afternoon peak hour.

In addition, the resort owners will implement a number of measures designed to reduce resort-related traffic. These will include van shuttle service for employees and guests. These actions are also required by the existing Unilateral Agreement. The resort owners are also exploring ways to extend the successful bike path at Malaekahana all the way to Hoalua Street and beyond to Ke Nui Road.

The owners of the resort are also committed to paying their fair-share of the cost for regional traffic improvements to help reduce traffic congestion, as determined by the State Department of Transportation. ("Fair-share" is calculated by the State DOT as a developer's portion of the total cost of new improvements based upon the percentage of new traffic generated by the developer's project.)

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

Turtle Bay Development

1 message

Karenturnr@aol.com <Karenturnr@aol.com> Tue, Aug 23, 2011 at 2:23 PM
To: snishiura@honolulu.gov, leesichter@gmail.com

The recent "downsized" plan submitted by TBR is absurd. It still includes the urbanization of the entire coast line from Kawela Bay to Kahuku Pt. Hawaiian Monk Seals frequently haul out on the now pristine beaches and for the third year out of 5 a pup was born in a cove on an the undeveloped stretch of TB beach.
Unless you are a developer with no ties to the rural character of the North Shore, you could not be in favor of turning it into another Ko Olina or Waikiki light.
It is criminal to keep selling off and intensely developing the best thing about the islands, beautiful, pristine oceanfront land.
Shame on the developers! Let them develop Vancouverr!
Karen Turner
Kahuku

LEE SICHTER LLC

45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Karen Turner @ karenturnr@aol.com

I am writing in response to the emails you sent on Tuesday, August 23, 2011 and on Wednesday, September 21, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

Please be advised that the SEIS includes a new alternative. The Conservation Partner alternative proposes that the development be centralized around the existing hotel and that much of the remaining coastline be preserved as open space. To be implemented, it will require the participation of a third party or parties who would provide economic consideration in lieu of the foregone development rights.

A marine resources study is being prepared for inclusion in the Draft SEIS. It will specifically address existing conditions pertaining to monk seals. The SEIS will address the expansion plan's potential impacts upon monk seals.

The resort owners share your concerns about protecting the seals. The resort's owners have already placed protocols in place that help to ensure that seals are not disturbed once they haul up. Volunteers immediately cordon off the area and maintain a presence (at a discrete distance) to intercept curious onlookers.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

The official review and comment period will last 45 calendar days from the date that the OEQC publishes the Notice of Availability in its *Environmental Notice*. You can find the *Environmental Notice* on-line at the OEQC website:

http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

Turtle Bay Hotel expansion

1 message

linda shea <klindama@yahoo.com> **Tue, Aug 23, 2011 at 3:18 PM**
To: snishiura@honolulu.gov, leesichter@gmail.com

Dear Sirs;
How does the state plan to resolve the gridlock traffic problems that will arise from the proposed Turtle Bay Hotel and Condo expansion?
At the current level of traffic we, as residents, have to time our trips accordingly. the 2 lane Hwy is ill equipped to handle traffic now, can the state in all good conscience allow TB a permit to further ensnare local North Shore residents in this manner.
Mahalo for your attention,
Linda Shea
59-423 Kawowo Pl,
Haleiwa 96712

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45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Linda Shea @ klindama@yahoo.com

I am writing in response to the emails you sent on Tuesday, August 23, 2011 and Wednesday, September 21, 2012 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

The owners of the Turtle Bay Resort share you concerns about existing and future traffic volumes on Kamehameha Highway. The resort is part of the North Shore and Ko`olau Loa communities and is committed to finding workable traffic solutions.

As a two-lane highway serving nearly half the island extending from Kahalu`u to Hale`iwa, Kamehameha Highway has to accommodate local and regional traffic. Extending along a relatively narrow plain between the coastline and the base of the mountains, the highway cannot easily be widened, even if this was what the community wanted. And selective widening along limited straightaways would only exacerbate traffic conditions; eventually the widened roadway segment would have to narrow back to two lanes. Thus, we all have to work together to find alternate solutions.

Limiting development on the North Shore is neither a practical nor realistic answer. Even if there was no further development between Kahalu`u and Hale`iwa, there would still be traffic congestion on the highway. So long as the famed beaches of the North Shore remain an attraction for O`ahu's residents and visitors, people from Honolulu, Hawaii Kai, Kailua, Kane`ohe, Aiea, Pearl City, Waipahu, Ewa, Kapolei, Waianae and Wahiawa will come. As a community, we each must do our part to help reduce traffic and work together to address transportation issues. That means driving smarter, consolidating trips, ride-sharing, and using transit alternatives when possible, to name a few.

To reduce the impacts of the proposed resort expansion, new left-turn lanes and traffic signals will be funded by Turtle Bay Resort where the roads that will access the resort intersect with Kamehameha Highway. This should help to mitigate the impact of vehicles entering and leaving the resort. According to our recently completed traffic study, on an annual average basis the proposed resort expansion will increase traffic on the highway by about 4.5% during the morning peak hour and 3.0% during the afternoon peak hour.

In addition, the resort will implement a number of measures designed to reduce resort-related traffic. These will include van shuttle service for employees and guests. The resort is also exploring ways to extend the successful bike path at Malaekahana all the way to Hoalua Street and beyond to Ke Nui Road.

The owners of the resort are also committed to paying their fair-share of the cost for regional traffic improvements to help reduce traffic congestion, as determined by the State Department of Transportation. ("Fair-share" is calculated by the State DOT as a developer's portion of the total cost of new improvements based upon the percentage of new traffic generated by the developer's project.)

The traffic study and mitigation measures mentioned above will be presented in the Draft Supplemental Environmental Impact Statement for the resort.

The current owners have carefully evaluated the existing zoning for the resort and have decided to proceed with a reduced scale of the original expansion plan. The impacts of this Proposed Action will be addressed in the SEIS.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://oeqc.hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

No on Turtle Bay!

1 message

OnFitness Magazine <onfitnessmag@hawaii.rr.com> **Tue, Aug 23, 2011 at 3:21 PM**
Reply-To: onfitnessmag@hawaii.rr.com
To: snishiura@honolulu.gov, leesichter@gmail.com

To whom it may concern,

No on Turtle Bay? Where do you plan on putting all the cars?

Don't let international banks and developers destroy Hawaii's great treasure, our land!

Joseph Grassadonia

OnFitness Magazine

onfitnessmag@hawaii.rr.com

www.onfitnessmag.com

Voice: 808-232-2082

Fax: 216-803-4528

Please consider the environment before printing this e-mail

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October 26, 2012

To Joseph Grassadonia @ onfitnessmag@hawaii.rr.com

I am writing in response to the emails you sent on Tuesday, August 23, 2011, and on Monday, September 24, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments.

1. We acknowledge your opposition to the proposed expansion of the Turtle Bay Resort. However, please note that the SEIS includes a new alternative called the Conservation Partner alternative that proposes that the development be centralized around the existing hotel and that much of the remaining coastline be preserved as open space. To be implemented, it will require the participation of a third party or parties who would provide economic consideration in lieu of the foregone development rights.
2. The resort owners share your concerns about the project's impacts on Kamehameha Highway. The project cannot prevent an increase in traffic. At issue is what the resort owners can do to mitigate the impacts of the traffic the resort generates.

   A traffic impact analysis report (TIAR) for the Turtle Bay Resort was approved by the State Department of Transportation in 2009. It is now being updated for the Draft SEIS and its findings and recommendations will be included in the document. The scope of the update extends from Kahalu'u to Hale`iwa. Measures to mitigate traffic impacts must focus on transportation demand management (TDM); how to better utilize existing resources. To that end, the resort owners have commissioned a TDM study. The TDM recommendations will be included in the Draft SEIS.
3. There are no special interest groups involved in the proposed expansion of the Turtle Bay Resort. The present owners purchased the property and after instituting a two-year long community outreach program to determine the wants and needs of the community and the region have decided to proceed with the expansion project, but at a significantly reduced scale. If maximizing their profits was there only goal, the Proposed Action would be the full build-out of the resort as allowed under existing zoning approvals.

4. The SEIS will include a detailed discussion on sustainability and how the project's resources, especially the coastal area, can be preserved for future generations.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

Turtle bay

1 message

Angela <advsurfsail@gmail.com> **Tue, Aug 23, 2011 at 5:22 PM**
To: "snishiura@honolulu.gov" <snishiura@honolulu.gov>, "leesichter@gmail.com" <leesichter@gmail.com>

How many loads of laundry? Dishes? And sewage are we talking about? Where is it supposed to go? Off Island developers are going to ruin this place.

LEE SICHTER LLC
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October 26, 2012

To Angela @ advsurfsail@gmail.com

I am writing in response to the email you sent on Tuesday August 23, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

The owners of the Turtle Bay Resort share you concerns about the collection and treatment of wastewater generated by the resort. The resort presently contains 500 visitor units (Turtle Bay Hotel, Ocean Villas, and Cottages) and 368 residential condominium units (Kuilima Estates East and Kuilima Estates West). It is not possible to estimate the number of laundry loads and dishes washed. However, we can assure you that all wastewater generated by the existing development is collected by the resort's wastewater transmission lines that deliver it to the resort's privately owned and operated wastewater treatment plant located just mauka of Kamehameha Highway, across for the resort.

The proposed expansion of the resort would add an additional 625 hotel rooms and 750 additional residential units. In effect, the number of hotel rooms would increase by 125 percent and the number of residential units would increase by about 200 percent. The existing wastewater treatment system has adequate capacity to accommodate to the proposed expansion. However, new transmission lines will need to be installed to link the new development sites to the existing wastewater collection system.

We are now preparing a Draft SEIS that will address all impacts of the proposed resort expansion, including wastewater.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

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Subject: [Turtle Bay Resort SEIS] Please moderate: "Infrastructure"
From: Turtle Bay Resort Development <info@turtlebayseis.com>
Date: Tue, Aug 23, 2011 11:23 am
To: info@turtlebayseis.com

A new comment on the post "Infrastructure" is waiting for your approval
http://turtlebayseis.com/seis/process/infrastructure/

Submitted : Aug 23, 2011 @ 11:23
Author : Bill Sager, Environmental Chair Kaneohe Neighborhood Board (IP: 66.8.218.99 , cpe-66-8-218-99.hawaii.res.rr.com)
E-mail : bsager42@gmail.com
URL : http://kaneoheneighborhoodboard.blogspot.com
Address :
City :
State :
Zip :
Phone :
Comment:
Much testimony to our board expresses concern about increased traffic through Kaneohe and on Kamehameha Hwy due to people commuting to and from the new resort and expansions in La'ie. The Resort expansion cannot be adequately addressed without also addressing the overall expansions planned for La'ie.

Bill Sager, 375-1114

Approve it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=approve&c=55
Trash it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=trash&c=55
Spam it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=spam&c=55
Currently 5 comments are waiting for approval. Please visit the moderation panel:
http://turtlebayseis.com/tbr/wp-admin/edit-comments.php?comment_status=moderated

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October 26, 2012

To Bill Sagar @ bsager42@gmail.com

I am writing in response to the email you sent on Tuesday, August 23, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

The owners of the Turtle Bay Resort share you concerns about existing and future traffic volumes on Kamehameha Highway. The resort is part of the North Shore and Ko`olau Loa communities and is committed to finding workable traffic solutions.

As a two-lane highway serving nearly half the island extending from Kahalu`u to Hale`iwa, Kamehameha Highway has to accommodate local and regional traffic. Extending along a relatively narrow plain between the coastline and the base of the mountains, the highway cannot easily be widened, even if this was what the community wanted. And selective widening along limited straightaways would only exacerbate traffic conditions; eventually the widened roadway segment would have to narrow back to two lanes. Thus, we all have to work together to find alternate solutions.

Limiting development on the North Shore is neither a practical nor realistic answer. Even if there was no further development between Kahalu`u and Hale`iwa, there would still be traffic congestion on the highway. So long as the famed beaches of the North Shore remain an attraction for O`ahu's residents and visitors, people from Honolulu, Hawaii Kai, Kailua, Kane`ohe, Aiea, Pearl City, Waipahu, Ewa, Kapolei, Waianae and Wahiawa will come. As a community, we each must do our part to help reduce traffic and work together to address transportation issues. That means driving smarter, consolidating trips, ride-sharing, and using transit alternatives when possible, to name a few.

To reduce the impacts of the proposed resort expansion, new left-turn lanes and traffic signals will be funded by Turtle Bay Resort where the roads that will access the resort intersect with Kamehameha Highway. This should help to mitigate the impact of vehicles entering and leaving the resort. According to our recently completed traffic study, on an average annual basis the proposed resort expansion will increase traffic on the highway by about 4.5% during the morning peak hour and 3.0% during the afternoon peak hour. The traffic study also takes into account the estimated traffic impacts that will result from the proposed development in Laie.

The resort will implement a number of measures designed to reduce resort-related traffic. These will include van shuttle service for employees and guests. The resort is also exploring ways to extend the successful bike path at Malaekahana all the way to Hoalua Street and beyond to Ke Nui Road.

The owners of the resort are also committed to paying their fair-share of the cost for regional traffic improvements to help reduce traffic congestion, as determined by the State Department of Transportation. ("Fair-share" is calculated by the State DOT as a developer's portion of the total cost of new improvements based upon the percentage of new traffic generated by the developer's project.)

The traffic study and mitigation measures mentioned above will be presented in the Draft Supplemental Environmental Impact Statement for the resort. Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

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Subject: [Turtle Bay Resort SEIS] Please moderate: "SEIS Preparation Notice"
From: Turtle Bay Resort Development <info@turtlebayseis.com>
Date: Wed, Aug 24, 2011 10:22 am
To: info@turtlebayseis.com

A new comment on the post "SEIS Preparation Notice" is waiting for your approval
http://turtlebayseis.com/seis/prep-notice/

Submitted : Aug 24, 2011 @ 10:22
Author : Bart Smith (IP: 72.234.68.22 , udp003079uds.hawaiiantel.net)
E-mail : gotonsbs@hawaiiantel.net
URL :
Address :
City :
State :
Zip :
Phone :
Comment:
I would like to see any further development at Turtle Bay denied. It is fine just the way it is. For anyone who lives or visits the North Shore, it is so obvious that the traffic situation is often in gridlock. It is not unusual for traffic to back up 6 miles either way from Weed Circle to Sunset Beach. It is not fair to the community or to potential hotel guests to have deal with this. The North Shore is supposed to be country and the only things supporting future development is greed and corruption. I think you will find that almost all North Shore residents share this view and will commit themselves financially and physically to see that this does not occur.

Approve it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=approve&c=57
Trash it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=trash&c=57
Spam it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=spam&c=57
Currently 7 comments are waiting for approval. Please visit the moderation panel:
http://turtlebayseis.com/tbr/wp-admin/edit-comments.php?comment_status=moderated

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October 26, 2012

To Bart Smith @ gotonsbs@hawaiiantel.net

I am writing in response to the email you sent on Wednesday, August 24, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

We acknowledge your opposition to the proposed expansion of the Turtle Bay Resort. The current plan to add 625 resort units and 750 residential units is approximately sixty percent of what has already been approved by the Honolulu City Council, the Mayor of the City and County of Honolulu, and the State Land Use Commission. While some minor zoning adjustments maybe needed, all discretionary permits have already been granted. As discussed in the SEIS Preparation Notice, the Hawaii State Supreme Court required a Supplemental EIS be prepared before the resort owners can apply for subdivision of the property. Subdivision is not a discretionary approval; if all the requirements are fulfilled, it is granted.

The owners of the Turtle Bay Resort share you concerns about existing and future traffic volumes on Kamehameha Highway. The resort is part of the North Shore and Ko`olau Loa communities and is committed to finding workable traffic solutions.

As a two-lane highway serving nearly half the island extending from Kahalu`u to Hale`iwa, Kamehameha Highway has to accommodate local and regional traffic. Extending along a relatively narrow plain between the coastline and the base of the mountains, the highway cannot easily be widened, even if this was what the community wanted. And selective widening along limited straightaways would only exacerbate traffic conditions; eventually the widened roadway segment would have to narrow back to two lanes. Thus, we all have to work together to find alternate solutions.

Limiting development on the North Shore is neither a practical nor realistic answer. Even if there was no further development between Kahalu`u and Hale`iwa, there would still be traffic congestion on the highway. So long as the famed beaches of the North Shore remain an attraction for O`ahu's residents and visitors, people from Honolulu, Hawaii Kai, Kailua, Kane`ohe, Aiea, Pearl City, Waipahu, Ewa, Kapolei, Waianae and Wahiawa will come. As a community, we each must do our part to help reduce traffic and work together to address transportation issues. That means driving smarter, consolidating trips, ride-sharing, and using transit alternatives when possible, to name a few.

To reduce the impacts of the proposed resort expansion, new left-turn lanes and traffic signals will be funded by Turtle Bay Resort where the roads that will access the resort intersect with Kamehameha Highway. This should help to mitigate the impact of vehicles entering and leaving the resort. According to our recently completed traffic study, on an average annual basis the proposed resort expansion will increase traffic on the highway by about 4.5% during the morning peak hour and 3.0% during the afternoon peak hour.

In addition, the resort will implement a number of measures designed to reduce resort-related traffic. These will include van shuttle service for employees and guests. The resort is also exploring ways to extend the successful bike path at Malaekahana all the way to Hoalua Street and beyond to Ke Nui Road.

The owners of the resort are also committed to paying their fair-share of the cost for regional traffic improvements to help reduce traffic congestion, as determined by the State Department of Transportation. ("Fair-share" is calculated by the State DOT as a developer's portion of the total cost of new improvements based upon the percentage of new traffic generated by the developer's project.)

The traffic study and mitigation measures mentioned above will be presented in the Draft Supplemental Environmental Impact Statement for the resort.

Finally, we regret your conclusion that the proposed expansion is the result of greed and corruption. As discussed above, the owners are proceeding with a scaled-down version of an expansion plan that has already been approved. Under our legal system, private property owners are permitted to develop their property to its highest and best use as allowable by law. The owners are seeking no special favors.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

Cannot Afford Development at Turtle Bay, an appeal to leadership

1 message

Pamela Sue <pamelasueinc@earthlink.net> **Wed, Aug 24, 2011 at 7:25 AM**
To: snishiura@honolulu.gov, leesichter@gmail.com

I have just returned from a economic summit in Orlando Florida with scholars from Austria, Russia and the United States. The economy will continue to grow worse as the national debt continues to rise and the dollar continues to be devalued. It is unwise to develop anything new anywhere, and a focus must be sustainability for all lands and peoples throughout the world. Sovereignty lawsuits against the Obama administration and the former governor continue to progress and this move will not be in the best interest of Hawaii in any way. As leaders we are counting on you to seek wisdom to act on behalf of Oahu and it's citizens and do what is right.

Pamela Sue
National Marketing Director/NSA
(352) 360-5982
voice com (404) 631-0309
home/office (808) 293-8385

0409kwo.pdf
144K

LEE SICHTER LLC

45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Pamela Sue @pamelasueinc@earthlink.net

I am writing in response to the email you sent on Wednesday, August 24, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. I understand that you oppose the proposed resort expansion plan.

We are pleased to note that global economic conditions have improved markedly since mid-2011. A market analysis conducted for the proposed project concludes that the proposed expansion plans are, indeed, supported by market trends. It's conclusions will be presented in the SEIS.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

The official review and comment period will last 45 calendar days from the date that the OEQC publishes the Notice of Availability in its *Environmental Notice*. You can find the *Environmental Notice* on-line at the OEQC website:

http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

Turtle Bay expansion

2 messages

Exsurferbabe <exsurferbabe@aol.com> **Wed, Aug 24, 2011 at 7:38 AM**
To: snishiura@honolulu.gov, leesichter@gmail.com

To whom it May Concern

Just wondering if you have looked into new emerging technology regarding sewer/garbage treatment. I have information on new technology for treatment of sewer waste and garbage. If you all would be interested in keeping your developments GREEN feel free to contact me.
Mary Bigler
exsurferbabe@aol.com
970-390-6867

Thank You

Mary Bigler

Lee Sichter <leesichter@gmail.com> **Wed, Aug 24, 2011 at 7:44 AM**
To: Drew Stotesbury <drew@replayresorts.com>, Cheryl Palesh <cpalesh@beltcollins.com>

Passing along a comment email that may be of interest....

Lee
[Quoted text hidden]

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October 26, 2012

To Mary Bilger @ exsurferbabe@aol.com

I am writing in response to the email you sent on Wednesday, August 24, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

We appreciate your offer to share information about new technology for the treatment of sewage and garbage. However, the resort already has a wastewater treatment plant with sufficient capacity to treat wastewater from the existing development and proposed expansion. The SEIS will include a detailed discussion of the resort owners plans to improve the sustainability of the resort's future operations.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party.

In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com.

However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the two-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Lee Sichter <leesichter@gmail.com>

Turtle Bay Development.

1 message

Nimboy44@aol.com <Nimboy44@aol.com> **Wed, Aug 24, 2011 at 8:23 AM**
To: snishiura@honolulu.gov, leesichter@gmail.com

Over the past 50 years I have watched Australia's Gold Coast area change from miles of beaches and a two lane road, to miles of condominiums and highways.

We must not let that happen to our North Shore.

The Turtle Bay development needs to be scaled way back from even the latest proposal, which takes away so much of our coastline.

Having said that, we still need to deal with issues that will arise from any additional development that is approved.

Traffic is just one concern, but it is certainly a significant factor.

EIS studies are estimates. Not written in stone. They have an equal chance of being right or wrong.

I am assuming that the EIS study will report that traffic will not be affected in a negative way. Hard to believe, but an EIS is an estimate.

What if the estimate is wrong and we need to build more roads to alleviate traffic problems? Who will pay for the roads? The taxpayers. The developers will have made their profits and left, and we will be saddled with the bill.

My suggestion is that the developers be required to fund a $100 million escrow account for 10 years after the development is completed. If the EIS estimate is correct and there is no need for road construction, the escrow funds would be returned to the developer.

If we do need to build more roads (a horrible thought) , at least we will have funds to pay for them.

The amount in escrow needs to be very significant. One way to "know" how much might be needed would be for the State to commission, and the developer to fund, a study as to what options we would have, at what cost, if we need more roads.

Alternatively, reducing the number of rooms would reduce traffic and reduce the likelihood of needing more roads. That should come out in the study.

The most likely outcome would be that the huge amount of $$ that would be needed in escrow if the current plan is approved would lead the developers to significantly reduce the number of rooms. That is where we need to get to.

I know my route is circuitous.

The simplest way to get to the correct decision is for the developers to make it themselves and change their plan.

If not, we need our government to protect us against huge future costs.

Thank you,

Bill Quinlan.
Velzyland.

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October 26, 2012

To Bill Quinlan @ Nimboy44@aol.com

I am writing in response to the email you sent on Wednesday, August 24, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice.

The Ko`olau Loa and North Shore regions have been designated by and preserved by the City and County of Honolulu as rural areas since the early 1980s. Urban Growth boundaries have been established to prevent urban expansion into rural areas. (The Turtle Bay Resort is surrounded by one of those boundaries.) In 1985, when the City approved the resort expansion plan, it was determined that the proposed development was consistent with the City's policy to preserve the region's rural character.

The Draft SEIS contains a scaled-back alternative for Turtle Bay Resort's expansion in an effort to preserve even more coastal areas than those preserved under the Proposed Action. We hope that once you have had an opportunity to review the project's Draft SEIS that discusses the project in detail, you might decide that the project is worthy of your support.

The owners of the Turtle Bay Resort share you concerns about existing and future traffic volumes on Kamehameha Highway. The resort is part of the North Shore and Ko`olau Loa communities and is committed to finding workable traffic solutions.

Pursuant to State law, an EIS is a disclosure document that must be accepted (approved) by a government agency; in this case the City and County of Honolulu's Department of Planning and Permitting. The analytical studies included in the EIS will present the facts in an objective manner and the City will ensure that the EIS complies with acceptable standards of practice.

Traffic conditions on Kamehameha Highway will be impacted by the proposed expansion. At issue is what is the extent of the impact and what can the resort owners do to mitigate it. The traffic study presently being prepared as part of the SEIS to address this issue must be reviewed and approved by the State Department of Transportation. It must be based on a methodology acceptable to the department or it will not be accepted. We hope that this rigorous process will alleviate some of your concerns about the quality of the traffic analysis.

Once the project's impacts are quantified, the State DOT will determine the 'fair-share' cost of improvements that must be borne by the resort. The subsequent issuing of building permits is then linked directly to the developer providing proof that the required improvements have been implemented. Under this process, there is no need for an escrow fund.

To reduce the impacts of the proposed resort expansion, new left-turn lanes and traffic signals will be funded by Turtle Bay Resort where the roads that will access the resort intersect with Kamehameha Highway. These improvements are required pursuant to a Unilateral Agreement attached to the property title. This should help to mitigate the impact of vehicles entering and leaving the resort. According to our recently completed traffic study, on an average annual basis the proposed resort expansion will increase traffic on the highway by about 4.5% during the morning peak hour and 3.0% during the afternoon peak hour.

In addition, the resort will implement a number of measures designed to reduce resort-related traffic. These will include van shuttle service for employees and guests. These actions are also required by the existing Unilateral Agreement. The resort owners are also exploring ways to extend the successful bike path at Malaekahana all the way to Hoalua Street and beyond to Ke Nui Road.

The owners of the resort are also committed to paying their fair-share of the cost for regional traffic improvements to help reduce traffic congestion, as determined by the State Department of Transportation. ("Fair-share" is calculated by the State DOT as a developer's portion of the total cost of new improvements based upon the percentage of new traffic generated by the developer's project.)

The traffic study and mitigation measures mentioned above will be presented in the Draft Supplemental Environmental Impact Statement for the resort. Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

Turtle Bay Expansion

1 message

scott langford <beachhousehawaii@hotmail.com> Wed, Aug 24, 2011 at 10:14 AM
To: snishiura@honolulu.gov, leesichter@gmail.com

Aloha,

I would just like to state that as a resident of the North Shore for 16 years, I have witnessed the progression of change out here without any additional housing and/or hotels. The traffic that we already experience is horrible and has continually gotten worse year by year. While I am in favor of creating jobs, the proposed plan would only exacerbate the already overwhelming problem. The North Shore is a very special place in Hawaii, unlike anywhere else in the world....lets keep it special and not turn it into a bigger mess than it already is.

Thank you for your time and consideration.

Scott Langford
Sunset Beach

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October 26, 2012

To Scott Langford @ beachhousehawaii@hotmail.com

I am writing in response to the emails you sent on Wednesday, August 24, 2011 and Friday, September 2, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

The owners of the Turtle Bay Resort acknowledge your opposition to the proposed expansion plan.

The owners share you concerns about existing and future traffic volumes on Kamehameha Highway. The resort is part of the North Shore and Ko`olau Loa communities and is committed to finding workable traffic solutions.

As a two-lane highway serving nearly half the island extending from Kahalu`u to Hale`iwa, Kamehameha Highway has to accommodate local and regional traffic. Extending along a relatively narrow plain between the coastline and the base of the mountains, the highway cannot easily be widened, even if this was what the community wanted. And selective widening along limited straightaways would only exacerbate traffic conditions; eventually the widened roadway segment would have to narrow back to two lanes. Thus, we all have to work together to find alternate solutions.

Limiting development on the North Shore is neither a practical nor realistic answer. Even if there was no further development between Kahalu`u and Hale`iwa, there would still be traffic congestion on the highway. So long as the famed beaches of the North Shore remain an attraction for O`ahu's residents and visitors, people from Honolulu, Hawaii Kai, Kailua, Kane`ohe, Aiea, Pearl City, Waipahu, Ewa, Kapolei, Waianae and Wahiawa will come. As a community, we each must do our part to help reduce traffic and work together to address transportation issues. That means driving smarter, consolidating trips, ride-sharing, and using transit alternatives when possible, to name a few.

To reduce the impacts of the proposed resort expansion, new left-turn lanes and traffic signals will be funded by Turtle Bay Resort where the roads that will access

the resort intersect with Kamehameha Highway. This should help to mitigate the impact of vehicles entering and leaving the resort. According to our recently completed traffic study, on an annual average basis the proposed resort expansion will increase traffic on the highway by about 4.5% during the morning peak hour and 3.0% during the afternoon peak hour.

In addition, the resort will implement a number of measures designed to reduce resort-related traffic. These will include van shuttle service for employees and guests. The resort is also exploring ways to extend the successful bike path at Malaekahana all the way to Hoalua Street and beyond to Ke Nui Road.

The owners of the resort are also committed to paying their fair-share of the cost for regional traffic improvements to help reduce traffic congestion, as determined by the State Department of Transportation. ("Fair-share" is calculated by the State DOT as a developer's portion of the total cost of new improvements based upon the percentage of new traffic generated by the developer's project.)

The traffic study and mitigation measures mentioned above will be presented in the Draft Supplemental Environmental Impact Statement for the resort.

The resort owners also share your concerns about protecting the coastal environment. The proposed plan is designed to ensure that the Turtle Bay Resort coastline is not adversely impacted.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

Why

1 message

Mark Mead <ffmead@verizon.net> **Wed, Aug 24, 2011 at 10:46 AM**
Reply-To: Mark Mead <ffmead@verizon.net>
To: snishiura@honolulu.gov, leesichter@gmail.com

As a long time visitor and surfer to the North Shore and with there being such an ecological push for land conservancy, why are you not taking this issue as a total assault on cultural Hawaii and the obvious rape and destruction of ancient Hawaii? This by now should be a non issue

Mark
California

LEE SICHTER LLC

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October 26, 2012

To Mark Mead @ ffmead@verizon.net

I am writing in response to the email you sent on Wednesday, August 24, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

The proposed plan embraces the core values of the Hawaiian culture and incorporates them into every aspect of the project. Please be assured that concern for and respect of the *iwi kupuna* are among the greatest concerns of the resort's owners. A Supplemental Archaeological Inventory Survey has now been completed for the entire resort area and its findings will be included in the Draft SEIS.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com.

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Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

No more hotels built in our beautiful country-side

1 message

Saralyn Padeken <kaokeala111@yahoo.com> **Wed, Aug 24, 2011 at 4:28 PM**
Reply-To: Saralyn Padeken <kaokeala111@yahoo.com>
To: "snishiura@honolulu.gov" <snishiura@honolulu.gov>, "leesichter@gmail.com" <leesichter@gmail.com>
Cc: Madeline Neely <madeline_neely@yahoo.com>, Kanoe Padeken <kanoelani07@yahoo.com>, Lu Kahapea <kilipohekapuaikawekiu@yahoo.com>, Puamana Paikai <puamanapaikai@gmail.com>, Thomas Hardy <hardyt001@hawaii.rr.com>

To Whom it may concern,
I have been a resident of K'a'a'awa since I was 2 yrs. old. My father was born & raised in K'a'a'awa, he is 82 yrs old today. He is the youngest and last remaining of 15 siblings. My mother is 76 yrs. old, she came to K'a'a'awa when she was 14 yrs. old. She is the eldest of nine. Four of her siblings were born in Hana, Maui and the younger four were born & raised in K'a'a'awa. I lived in Kahuku, where I raised my two children for 11 years until I returned to K'a'a'a'wa. Yes, The PCC buses do travel at night on their return o Honolulu and so do the tourists who've seen the show and return to Waikiki after the show. Its pretty obvious that no matter what time of the day it is, there will be a HUGE difference in traffic!

My concerns are:

1. Traffic conditions will definitely become a HUGE PROBLEM because it is a HUGE Problem already? No matter what anyone says....it will become an even LARGER PROBLEM! Its been said that the "tourists" who stay in Laie won't drive much because they'll remain at the hotel and Polynesian Cultural Center. That is not correct. The tourists will want to drive to the North Shore and watch the surf and look at the scenery. That's a fact because I've been caught in this traffic many, many times. REMEMBER: Kamehameha Hwy. is only a TWO LANE HWY.....How can the sponsors, builders say TRAFFIC WON"T BE A PROBLEM. There have also been many, many accidents along this HWY. We don't need to RAISE the POSSIBILITY that there will be a TEN-FOLD INCREASE of VEHICULAR ACCIDENTS.

2. Flooding conditions, what willl be done to SOLVE these conditions. Yes, it's been said accomidations for new SEWR SYSTEM will be built to satisfy this issue. HOW? Flooding in Laie is a HUGE PROBLEM because the land , including PCC and the area where the new hotel is supposed to be built is BELOW SEA LEVEL!

3. EMPLOYMENT OPPORTUNITIES? Yes, many, many people of POLYNESIAN ethnicity willbe hired, many students from BYU, that's great except their pay will either go to the church, student housing, and I tried to get a job at the PCC years ago but was told by the Human Resources Department that Church members(Morman) and PCC students have first preference. THAT's PRACTICE IS AGAINST THE LAW!

4. Where will the people who are hired, if they're not residing in Laie or in close proximitiy of the proposed hotel and PCC reside if they are new to the islands?

5. The hotel will be a Marriott hotel, right? Well does the Morman church own Marriott? Will the monies made by the hotel remain in Hawaii or will the proceeds be sent to Utah like the PCC monies? Will the hotel be paying state and federal taxes in order to maintain Kamehameha Hwy, the newly built sewer systems, who will maintain that system? Will they be employees of the Morman Church or will the state or city have to hire employeesto maintain the sewer systems?

6. Cultural issues, what will be done to preserve our ancestors remains that have already been found and will continue to be dug up fro their places of burial? Yes, remove the remains and put them elsewherel, That is WRONG!

7. We all know that more crime will definitely will definitely become more of an issue as crime is already a HUGE issue!

Gmail

Lee Sichter <leesichter@gmail.com>

(no subject)

1 message

Saralyn Padeken <kaokeala111@yahoo.com> **Wed, Aug 24, 2011 at 4:32 PM**
Reply-To: Saralyn Padeken <kaokeala111@yahoo.com>
To: "snishiura@honolulu.gov" <snishiura@honolulu.gov>, "leesichter@gmail.com" <leesichter@gmail.com>
Cc: Madeline Neely <madeline_neely@yahoo.com>, Kanoe Padeken <kanoelani07@yahoo.com>, Lu Kahapea <kilipohekapuaikawekiu@yahoo.com>, Puamana Paikai <puamanapaikai@gmail.com>

I previouly sent an email regarding the hotel in Laie, well I feel the same as the one that is proposed to be built on the North Shore (Kahuku),

Everything I said in the previous letter are concerns regarding the cintinued building of t"tourist traps) on the North Shore!

LEE SICHTER LLC

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October 26, 2012

To Saralyn Padeden @ kaokeala111@yahoo.com

I am writing in response to the two emails you sent on Wednesday, August 24, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. We understand that your first email focused on the proposed development at Laie and that your second email states that the same concerns apply to the proposed development at Turtle Bay Resort. Following are our responses to your comments in the order they were presented in your email.

1. The resort's owners share your concerns about traffic. The SEIS will include a traffic study that evaluates the impacts of the proposed project on Kamehameha Highway.
2. The proposed development plan must, by law, take into account the flood designations for the area and follow the federal government's rules and regulations pertaining to flood control. The wastewater treatment plant at the Turtle Bay Resort is situated on the mauka side of Kamehameha Highway outside of a flood plain.
3. Your concerns about possible discriminatory hiring practices at the Polynesian Cultural Center are not relevant to the Turtle Bay Resort.
4. The intent of the Turtle Bay Resort expansion plan, originally approved by the City and County of Honolulu, was to provide new job opportunities for the residents of surrounding communities. It is anticipated that most of the new jobs created at the resort will be filled by local residents. However, we are unable to say how far they might be willing to commute if they do not live in a nearby community. We can say, however, that most of the resort's current employees commute from the North Shore and Ko`olau Loa areas, but that a very few do commute from Leeward O`ahu.
5. Most of your questions pertaining to the new Marriott Hotel in Laie are not relevant to Turtle Bay Resort. However, Turtle Bay Resort operates its own wastewater collection and treatment system and will be obligated to fund any roadway improvements required.
6. An archaeological inventory survey was recently completed at Turtle Bay Resort to ensure that *iwi kupuna* will not be disturbed as the result of the proposed development.
7. The Turtle Bay Resort maintains it's own private security personnel to deter criminal activity.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

HECK NO to turtle bay expansion plan

1 message

Milica Barjaktarovic <milicahi@gmail.com> **Wed, Aug 24, 2011 at 10:14 PM**
To: snishiura@honolulu.gov, leesichter@gmail.com

turtle bay expansion plan is *completely* unacceptable. It is an urban sprawl. STOP IT ASAP.

North SHore is already used beyond its capacity. so our beaches and ocean are trashed.

Also, visitors to N Shore come here because it is quiet and natural. If you kill it, locals will lose the last nice place on Oahu AND visitors will go elsewhere. Surfers already come here less. They used to come in October, now they show up in late November. It is too expensive and too crowded and trashed.

So the tourists will go to Indonesia and other islands and will skip N Shore.

LEE SICHTER LLC
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PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Milica Barjaktarovic @ milicahi@gmail.com

I am writing in response to the email you sent on Wednesday, August 24, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. I understand that you oppose the proposed resort expansion plan.

In 1977, an amendment to the Oahu General Plan, voted on by the residents of the City and County of Honolulu, designated the Kuilima Hotel property to be reclassified as a Visitor Destination Area. Several years later, the Ko`olauloa Development Plan was adopted by the City as a means of implementing the General Plan. It depicted the Kuilima property as a resort. In 1986, the City Council approved an expansion plan for the resort that allows the development of five new hotels. It was decided at that time, that the development was needed to create new jobs in the region and to support the continuing health of the visitor industry.

In 1999, the Ko`olauloa Development Plan was replaced with Ko`olau Loa Sustainable Communities Plan. The principal difference between the two plans is that the latter established an urban growth boundary that was intended to limit development and protect the rural character of the region. Because the Turtle Bay Resort property was reclassified to the Urban district about 14 earlier, it is fully contained within the Urban Growth Boundary.

Together, these plans and policies are intended to ensure that the rural character of the North Shore is preserved for future generations.

The SEIS will present a comprehensive evaluation of the environmental impacts of the proposed project.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

The official review and comment period will last 45 calendar days from the date that the OEQC publishes the Notice of Availability in its *Environmental Notice*. You can find the *Environmental Notice* on-line at the OEQC website:

http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Print | Close Window

Subject: [Turtle Bay Resort SEIS] Please moderate: "SEIS Preparation Notice"
From: Turtle Bay Resort Development <info@turtlebayseis.com>
Date: Wed, Aug 24, 2011 12:57 pm
To: info@turtlebayseis.com

A new comment on the post "SEIS Preparation Notice" is waiting for your approval
http://turtlebayseis.com/seis/prep-notice/

Submitted : Aug 24, 2011 @ 12:57
Author : edward j jones (IP: 67.49.129.183 , cpe-67-49-129-183.hawaii.res.rr.com)
E-mail : jonese002@hawaii.rr.com
URL :
Address :
City :
State :
Zip :
Phone :
Comment:
I would like to say there is no room for any deveolpment on the north shore as our infrastructure simply will not support it. the traffic is already horrible without more construction activity and additional hotel, condo or residential units. i would suggest anyone considering additional housing of any kind should live and work here as we do and the problems will become obvious

Approve it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=approve&c=58
Trash it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=trash&c=58
Spam it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=spam&c=58
Currently 8 comments are waiting for approval. Please visit the moderation panel:
http://turtlebayseis.com/tbr/wp-admin/edit-comments.php?comment_status=moderated

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October 26, 2012

To Edward J. Jones @ jonese002@hawaii.rr.com

I am writing in response to the emails you sent on Wednesday, August 24, and Wednesday, September 14, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

We acknowledge your opposition to the proposed expansion plan.

The owners of the Turtle Bay Resort share you concerns about existing and future traffic volumes on Kamehameha Highway. The resort is part of the North Shore and Ko`olau Loa communities and is committed to finding workable traffic solutions.

As a two-lane highway serving nearly half the island extending from Kahalu`u to Hale`iwa, Kamehameha Highway has to accommodate local and regional traffic. Extending along a relatively narrow plain between the coastline and the base of the mountains, the highway cannot easily be widened, even if this was what the community wanted. And selective widening along limited straightaways would only exacerbate traffic conditions; eventually the widened roadway segment would have to narrow back to two lanes. Thus, we all have to work together to find alternate solutions.

Limiting development on the North Shore is neither a practical nor realistic answer. Even if there was no further development between Kahalu`u and Hale`iwa, there would still be traffic congestion on the highway. So long as the famed beaches of the North Shore remain an attraction for O`ahu's residents and visitors, people from Honolulu, Hawaii Kai, Kailua, Kane`ohe, Aiea, Pearl City, Waipahu, Ewa, Kapolei, Waianae and Wahiawa will come. As a community, we each must do our part to help reduce traffic and work together to address transportation issues. That means driving smarter, consolidating trips, ride-sharing, and using transit alternatives when possible, to name a few.

To reduce the impacts of the proposed resort expansion, new left-turn lanes and traffic signals will be funded by Turtle Bay Resort where the roads that will access the resort intersect with Kamehameha Highway. This should help to mitigate the impact of vehicles entering and leaving the resort. According to our recently completed traffic study, on an average annual basis the proposed resort expansion will increase traffic on the highway by about 4.5% during the morning peak hour and 3.0% during the afternoon peak hour.

In addition, the resort will implement a number of measures designed to reduce resort-related traffic. These will include van shuttle service for employees and guests. The resort is also exploring ways to extend the successful bike path at Malaekahana all the way to Hoalua Street and beyond to Ke Nui Road.

The owners of the resort are also committed to paying their fair-share of the cost for regional traffic improvements to help reduce traffic congestion, as determined by the State Department of Transportation. ("Fair-share" is calculated by the State DOT as a developer's portion of the total cost of new improvements based upon the percentage of new traffic generated by the developer's project.)

In 1977, the O`ahu General Plan was amended to establish population goals for the various areas around the island. The population goal for Ko`olau Loa was set at 1.8 percent of the island's population. In the late 1990s, several years after the Turtle Bay expansion plan was approved by the City Council, that population goal was lowered to 1.4 percent and it remains today. The population goal takes into account all the developable land, including the Turtle Bay Resort. Because the expansion plan now proposed reduces the residential component of the plan by 25 percent, implementation of the proposed project will ensure that the project remains consistent with the City's population policies. We provide this explanation because while it may seem intuitive that the project will exacerbate conditions on the roadway, the City anticipated those impacts when it approved the project in 1986.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

The official review and comment period will last 45 calendar days from the date that the OEQC publishes the Notice of Availability in its *Environmental Notice*. You can find the *Environmental Notice* on-line at the OEQC website:

http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

re: Oppose Marriott Hotel

1 message

Madeline Neely <madeline_neely@yahoo.com> Thu, Aug 25, 2011 at 8:39 AM
Reply-To: Madeline Neely <madeline_neely@yahoo.com>
To: "snishiura@honolulu.gov" <snishiura@honolulu.gov>, "leesichter@gmail.com" <leesichter@gmail.com>
Cc: "emartin@honolulu.gov" <emartin@honolulu.gov>

Aloha! My name is Madeline McCabe Neely, I have been a life long resident of Kaaawa. I am Native Hawaiian and live on the property my great-great grandparents once lived and whom along with other past 'ohana, are buried. Widening the Kamehameha Highway is not an option because it will destroy our 'ohana ancestral burial site.

I am in strong opposition to the development of the proposed, two-hundred-twenty-two room hotel, within Laie, by the partnership of HRI,Inc. and the Mormon Church. The enormity of this hotel, along with the further and additional proposed developments, which has been planned for that community, will definitely have an overwhelming negative impact and effect on the surrounding rural communities by its obvious urban type of cement sprawl , if allowed.

I believe this proposed development in a rural setting, is an obscene proposal based on greed, and is in total disregard to the connecting rural communities, which historically, has proven to lack as benefit to anyone other than to those, in a particular religious affiliation, relating to a suggestion by this affiliation, for future employment consideration for the general public.

The environment of our ocean is of great concern, the current over population on this island, depleted the sustainability for Hawaiians, whom respect and depended on it for our well being. Traffic on a two lane highway, one way in and one way out, commonly during winter months, sea wave's "break" onto the highway, all along the narrow winding coastline, this should be a critical concern for government and the safety of its citizens. During rainy seasons, is government prepared for the mudslides and flooding, and police roadblocks because of bridges being overun with water and debris, which we have all experience, several times during the year. These are not an uncommon occurrence.

Besides the inadequate infrastructure of our rural highway, there is insufficient safety personnel, fire, police as well as, ambulance service, and water. I believe the Kahuku Hospital is not large enough to handle a catastrophe, should one occur, such as a hurricane or tsunami, the additional population on the Windward side with limited space, needs to be seriously addressed, before the City Council allows such enormous proposed development as requested by HRI, Inc and the LDS.
One last question, being a religious affiliation, are these development projects exempt from paying their fare share in taxes?

Respectfully submitted,

August 24, 2011

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October 26, 2012

To Madeline Neely @ madeline_neely@yahoo.com

I am writing in response to the email you sent on Thursday, August 25, 2011 commenting on the Marriot Hotel proposed at Laie. While we appreciate your taking the time to send your email, your comments appear to pertain only to the Marriott development proposal.

Please contact the Turtle Bay Resort at 447-4953 if you wish to review a copy of the Turtle Bay Supplemental Environmental Impact Statement.

Very truly yours

Lee Sichter

Print | Close Window

Subject: Re: TBR SEIS
From: drjant@aol.com
Date: Fri, Aug 26, 2011 1:28 pm
To: info@turtlebayseis.com

Keep in mind that in the real world one person's pragmatism is another person's poison. In so far as 'implementability' is concerned with that,too, we have a problem--it depends on what end of the stick you ar holding --what you as applicants consider to e implementable and what we, as stakeholders consider to be implementable, may be two different things. Ultimately, a judge/s may have to decide.

JA

-----Original Message-----
From: info <info@turtlebayseis.com>
To: drjant <drjant@aol.com>
Sent: Fri, Aug 26, 2011 1:02 pm
Subject: TBR SEIS

Comment:
But, we must keep in mind, that this is but a beginning, just some words on paper. Mere words on paper do not alone make a plan. Plans that do not have action items, time lines and money commitments that are enforceable at law and binding on successors,
ought not to be accepted as the real thing. First people on the mainland learned this the hard way when it came to water rights..They won many court battles and had fancy judicial decisions about Indian water rights but they never actually got much in the way of "wet water", the real thing.

We'll have to wait and see how this plan develops, whether it is going to be merely smoke and mirrors or the 'real thing'.

Response:
Thank you for this important reminder. We understand the sentiment. In creating our plan we attempted to find a balance of interests, as we've stated. But we also attempted to be pragmatic and design a plan that is implementable.That is our goal.

Disclaimer: Your name & comment along with our response will be posted to the website unless we hear otherwise from you.

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October 26, 2012

To Jim Anthony @ drjant@aol.com

I am writing in response to the email you sent on Friday, August 26, 2011 at 1:28pm commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

Mahalo for your important reminder. We understand the sentiment. In creating our plan, we attempted to find a balance of interests, as we have stated. Be we also attempted to be pragmatic and design a plan that can be implemented. That is our goal.

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

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Subject: Re: TBR SEIS
From: drjant@aol.com
Date: Fri, Aug 26, 2011 1:29 pm
To: info@turtlebayseis.com

You will be hearing from me in great detail. The Prep Notice is wide open to lots and lts of questions,

-----Original Message-----
From: info <info@turtlebayseis.com>
To: drjant <drjant@aol.com>
Sent: Fri, Aug 26, 2011 1:12 pm
Subject: TBR SEIS

Comment:
Will look at it as it makes it way off your production line.

Response:
We will look forward to your comments in due course.

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October 26, 2012

To Jim Anthony @ drjant@aol.com

I am writing in response to the email you sent on Friday, August 26, 2011 at 1:29pm commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. We look forward to your comments in due course. Mahalo for your participation in the environmental review process.

Very truly yours

Lee Sichter

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Subject: Re: TBR SEIS
From: drjant@aol.com
Date: Fri, Aug 26, 2011 6:13 pm
To: info@turtlebayseis.com

Undrstood. Thanks.

JA

-----Original Message-----
From: info <info@turtlebayseis.com>
To: drjant <drjant@aol.com>
Sent: Fri, Aug 26, 2011 2:10 pm
Subject: TBR SEIS

Comment: You will be hearing from me in great detail. The Prep Notice is wide open to lots and lts of questions,

Response: We look forward to your participation and any resulting clarity.

Disclaimer: Your name & comment along with our response will be posted to the website unless we hear otherwise from you.

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October 26, 2012

To Jim Anthony @ drjant@aol.com

I am writing in response to the email you sent on Friday, August 26, 2011 at 6:13pm commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice.

You are welcome.

Mahalo for your participation in the environmental review process.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

tbay reproposal

1 message

Macbook Owner <fraserhawaii@gmail.com> **Fri, Aug 26, 2011 at 11:41 AM**
To: snishiura@honolulu.gov, leesichter@gmail.com

Will a developer come up with a plan that addresses community concerns? The new plan differs little from the old. Traffic: water: schools: sewerage: homes for workers and numerous other issues have not been addressed. I am looking but see no answers only the same problem: Overloaded systems that need relief. Clearly infrastructure comes before expansion. Investors must pay for these before they can reap rewards Only long term investors can be considered. These are not, so far, forthcoming. Can we please devise a workable plan that addresses current issues mention. Unless these concerns are addressed how can any expansion be considered? It is all just pipe dreams or a horrible disaster is all we get. I don't see the North Shore community budging an inch. Why waste time and money like this? Let's get real or forget it.
I am sorry the planning committee must waste time on the unworkable vision of uninformed designers. Why not give these dreamers the facts then let them go to work. Masking problems is no solution. Thank you, F. Black. Laie

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October 26, 2012

To F. Black @ fraserhawaii@gmail.com

I am writing in response to the emails you sent on Friday, August 26, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

We acknowledge your concerns about the project addressing community concerns. The resort owners' representative, Replay Resorts, has spend the past two years meeting with hundreds of community members and groups in Ko`olau Loa and the North Shore, and as a result of these meetings, has revised the project to better address the needs of the community. Once you have viewed the Draft SEIS we would hope that view of the proposed expansion plans might change.

With regard to infrastructure, the resort owners are obligated to fulfill the requirements of the Unilateral Agreement adopted as part of the Kuilima rezoning in 1986. That agreement requires the project developer to make roadway improvements on Kamehameha Highway to mitigate the impacts of the resort's traffic. A socio-economic impact analysis will be included in the Draft SEIS to determine the impacts the proposed expansion will have on public facilities and services.

Finally, with regard to utilities such as water and wastewater collection and treatment, the resort has water wells that will not only supply the required drinking water, but also contribute water to the Board of Water Supply system. The resort also has its own wastewater treatment plant with enough capacity to accommodate the proposed expansion. Thus, most, if not all, the infrastructure issues you raise have already been addressed or will be as the project moves forward.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

The official review and comment period will last 45 calendar days from the date that the OEQC publishes the Notice of Availability in its *Environmental Notice*. You can find the *Environmental Notice* on-line at the OEQC website:

http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

Turtle bay expansion

1 message

Jill Voeks <naluea@yahoo.com> **Fri, Aug 26, 2011 at 3:21 PM**
To: snishiura@honolulu.gov, leesichter@gmail.com

To Whom it may concern, 8-25-11
I am against the turtle bay plan to expand. They have no answer to the question of how they will prevent an increase in the already awful traffic problem. They have no answer to the question of how they will replace the wild life habitat that will be affected. Please let me know, have these questions been answered ?
thank you for your time
Jill Voeks
94-658 Iakekeiaka Pl
Mililani Hi 96789

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PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Jill Voeks @ naluea@yahoo.com

I am writing in response to the email you sent on Friday, August 26, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

1. We acknowledge your opposition to the proposed expansion of the Turtle Bay Resort.
2. The resort owners share your concerns about the project's impacts on Kamehameha Highway. The project cannot prevent an increase in traffic. At issue is what the resort owners can do to mitigate the impacts of the traffic the resort generates.

   A traffic impact analysis report (TIAR) for the Turtle Bay Resort was approved by the State Department of Transportation in 2009. It is now being updated for the Draft SEIS and its findings and recommendations will be included in the document. The scope of the update extends from Kahalu'u to Hale'iwa. Measures to mitigate traffic impacts must focus on transportation demand management (TDM); how to better utilize existing resources. To that end, the resort owners have commissioned a TDM study. The TDM recommendations will be included in the Draft SEIS.
3. A marine resources report has been prepared to identify the anticipated impacts the resort expansion will have upon endangered species. A flora and fauna impact analysis has also been prepared to address environmental impacts. These reports will be included in the Draft SEIS. Wildlife habitat cannot be replaced. It must be preserved and protected. The resort owners share your concerns and are committed to supporting the biologists' recommendations on how best to minimize impacts.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and

an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

The official review and comment period will last 45 calendar days from the date that the OEQC publishes the Notice of Availability in its *Environmental Notice.* You can find the *Environmental Notice* on-line at the OEQC website:

http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

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Subject: [Turtle Bay Resort SEIS] Please moderate: "Resort Master Plan"
From: Turtle Bay Resort Development <info@turtlebayseis.com>
Date: Sat, Aug 27, 2011 6:03 pm
To: info@turtlebayseis.com

A new comment on the post "Resort Master Plan" is waiting for your approval
http://turtlebayseis.com/the-plan/resort-plan/

Submitted : Aug 27, 2011 @ 18:03
Author : Bea Coffee (IP: 72.234.74.154 , udp197539uds.hawaiiantel.net)
E-mail : savefoxy@gmail.com
URL :
Address :
City :
State :
Zip :
Phone :
Comment:
When will Hawaii leaders get it? Enough already with the Haole developers...check our how many haole employees Disney has hired.....jobs, what construction? check out the high end salary folks:ie archetects, management....enough already...got the; tee shirt from the 70s: NO can eat golf balls"

Approve it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=approve&c=62
Trash it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=trash&c=62
Spam it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=spam&c=62
Currently 11 comments are waiting for approval. Please visit the moderation panel:
http://turtlebayseis.com/tbr/wp-admin/edit-comments.php?comment_status=moderated

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October 26, 2012

To Bea Coffee @ savefoxy@gmail.com

I am writing in response to the email you sent on Saturday, August 27, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. I understand that you oppose the proposed resort expansion plan and we regret that you choose to view it in racial terms. Nevertheless, we hope that once you have had an opportunity to review the project's Draft SEIS that discusses the project in detail, you might decide that the project is worthy of your support. Please note that the Turtle Bay Resort presently includes two eighteen-hole golf courses, but that the proposed expansion plan actually reduces one of these courses to nine-holes.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives. The official review and comment period will last 45 calendar days from the date that the OEQC publishes the Notice of Availability in its *Environmental Notice*. You can find the *Environmental Notice* on-line at the OEQC website:

http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

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Subject: [Turtle Bay Resort SEIS] Please moderate: "SEIS Preparation Notice"
From: Turtle Bay Resort Development <info@turtlebayseis.com>
Date: Sat, Aug 27, 2011 3:33 pm
To: info@turtlebayseis.com

A new comment on the post "SEIS Preparation Notice" is waiting for your approval
http://turtlebayseis.com/seis/prep-notice/

Submitted : Aug 27, 2011 @ 15:33
Author : Bruce & Patricia Bila (IP: 69.105.90.103 , adsl-69-105-90-103.dsl.scrm01.pacbell.net)
E-mail : bbila@sbcglobal.net
URL :
Address :
City :
State :
Zip :
Phone :
Comment:
This proposal is still way too much development for the Turtle Bay/North Shore areas. We wish to keep the North Shore one of the last areas on Oahu to have a real Hawaii feel. The current roads and infrastructure cannot handle the extra load both during construction and after with gridlock happening daily. Once this type of development happens these areas are lost and never to be regained for future generations.

Approve it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=approve&c=60
Trash it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=trash&c=60
Spam it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=spam&c=60
Currently 9 comments are waiting for approval. Please visit the moderation panel:
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PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Bruce and Patricia Bila @ bbila@sbcglobal.net

I am writing in response to the email you sent on Saturday, August 27, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. Following are responses to your comments in the order they were presented in your letter.

1. In 1977, an amendment to the Oahu General Plan, voted on by the residents of the City and County of Honolulu, designated the Kuilima Hotel property to be reclassified as a Visitor Destination Area. Several years later, the Ko`olauloa Development Plan was adopted by the City as a means of implementing the General Plan. It depicted the Kuilima property as a resort. In 1986, the City Council approved an expansion plan for the resort that allows the development of five new hotels. It was decided at that time, that the development was needed to create new jobs in the region and to support the continuing health of the visitor industry.
2. Very little has changed in Ko`olau Loa and on the North Shore since those planning decisions were made. The population is still about the same and the infrastructure is still about the same. Thus, the determination then that region could support a resort still holds true today.
3. The resort is responsible for providing its own infrastructure to support the proposed expansion. A wastewater treatment plant and all the necessary water wells are already constructed.
4. Limiting development on the North Shore is neither a practical nor realistic answer. Even if there was no further development between Kahalu`u and Hale`iwa, there would still be traffic congestion on the highway. So long as the famed beaches of the North Shore remain an attraction for O`ahu's residents and visitors, people from Honolulu, Hawaii Kai, Kailua, Kane`ohe, Aiea, Pearl City, Waipahu, Ewa, Kapolei, Waianae and Wahiawa will come. As a community, we each must do our part to help reduce traffic and work together to address transportation issues. That means driving smarter, consolidating trips, ride-sharing, and using transit alternatives when possible, to name a few.

   To reduce the impacts of the proposed resort expansion, new left-turn lanes and traffic signals will be funded by Turtle Bay Resort where the roads that will access the resort intersect with Kamehameha Highway. This should help to mitigate the impact of vehicles entering and leaving the resort. According to our recently completed traffic study, on an annual average basis the proposed resort expansion will increase traffic on the highway by about 4.5% during the morning peak hour and 3.0% during the afternoon peak hour.

   In addition, the resort will implement a number of measures designed to reduce resort-related traffic. These will include van shuttle service for employees and guests. The resort is also exploring ways to extend the successful bike path at Malaekahana all the way to Hoalua Street and beyond to Ke Nui Road.

   The owners of the resort are also committed to paying their fair-share of the cost for regional traffic improvements to help reduce traffic congestion, as determined by the State Department of Transportation. ("Fair-share" is calculated by the State DOT as a developer's portion of the total cost of new improvements based upon the percentage of new traffic generated by the developer's project.)

   The traffic study and mitigation measures mentioned above will be presented in the Draft Supplemental Environmental Impact Statement for the resort.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

The official review and comment period will last 45 calendar days from the date that the OEQC publishes the Notice of Availability in its *Environmental Notice.* You can find the *Environmental Notice* on-line at the OEQC website:

http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

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Subject: [Turtle Bay Resort SEIS] Please moderate: "Submitting an SEIS Comment"
From: Turtle Bay Resort Development <info@turtlebayseis.com>
Date: Sat, Aug 27, 2011 6:57 pm
To: comments@turtlebayseis.com

A new comment on the post "Submitting an SEIS Comment" is waiting for your approval
http://turtlebayseis.com/seis/submitting-an-seis-comment/

Submitted : Aug 27, 2011 @ 15:57
Author : bbila (IP: 69.105.90.103 , adsl-69-105-90-103.dsl.scrm01.pacbell.net)
E-mail : bbila@sbcglobal.net
URL :
Address : 57-101 Kuilima Lp #14
City : Kahuku
State : Hawaii
Zip : 96731
Phone : 530-391-2934
Comment:
The new proposal for the Turtle Bay expansion is still way too large for the Turtle Bay/North Shore area. The current infrastructure cannot handle the extra load both during construction or after and we are often in gridlock on a daily basis. We wish to keep the North Shore one of the last areas on Oahu to still have a true feel of Hawaii and once this type of development happens it would be lost for all future generetions. Help us keep some of Hawaii, Hawaii. Mahalo Bruce & Trisha Bila

Approve it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=approve&c=61
Trash it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=trash&c=61
Spam it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=spam&c=61
Currently 10 comments are waiting for approval. Please visit the moderation panel:
http://turtlebayseis.com/tbr/wp-admin/edit-comments.php?comment_status=moderated

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PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Bruce and Patricia Bila @ bbila@sbcglobal.net

I am writing in response to the email you sent on Saturday, August 27, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. Following are responses to your comments in the order they were presented in your letter.

1. The scale of the proposed project, when compared to other resort areas, is appropriate for the region. The existing property is larger than Waikiki and is larger than Ko `Olina Resort. And yet, when the expansion plan is implemented, it will only have three hotels.
2. The resort is responsible for providing its own infrastructure to support the proposed expansion. A wastewater treatment plant and all the necessary water wells are already constructed.
3. The owners of the resort share your concerns about the project's impacts upon Kamehameha Highway and are committed to paying their fair-share of mitigation costs.
4. Contrary to your assertion, the owners believe that implementation of the Tomorrow's Ahupua`a concept as will be described in the Draft SEIS will provide all who visit the resort a genuine cultural experience. In so doing, the resort will participate in the long-term preservation of the Hawaiian cultural, its practices, and its traditions.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

-----Original Message----- From: drjant <drjant@aol.com> To: drew <drow@replayresorts.com>; info <info@turtlebayseis.com> Sent: Sun, Aug 28, 2011 12:37 pm Subject: PREP NOTICE; SEIS

ATTENTION Mr. Drew Stotesbury:

I would be grateful if you would provide me with the following information additional to that which you provide in the SEIS Preparation Notice:

1. e-Mail contact information for your Consultant, Lee Sichter LLC.

2. A complete, authenticated copy of the 2010 Hawaii Supreme decision which required you to complete an SEIS.

3. You mention ***"strengthened*** relationships with the military" [emphasis added], 5.4.1, p. 7, Prep Notice. This implies that you have had discussions with the military. Since both an EIS and a Prep Notice are instruments of disclosure would you please disclose what contacts either you or anyone representing Turtle Bay Resort, LLC, have had with the military and on what subjects besides stream and watersheds? Name and rank of military personnel with whom you and/or any other representative of Turtle Bay Resort. LLC has had discussions on any matter related to this project.

4. You do not mention Hawaiian rights to hunt and gather and neither do you mention PASH rights. Admittedly the Prep Notice is just a Prep Notice and not the SEIS itself but the omission of PASH and hunting and gathering rights seem to be a bit strange. Some disclosure on this, even at this stage, would be important if one is to do a careful and comprehensive review of the Prep Notice.

5. Since the TBR/SEIS lands are geographically located in Ko'olauloa and you are therefore covered by the terms of the Ko'olauloa Watershed Protection Plan, I am surprised by the fact that you do not mention this Plan. If you are aware of its recommendations you will know that the costs of watershed protection will amount to some $30 million (low side estimate in 2009 dollars) for the first ten year planning horizon. Would Turtle Bay Resort LLC be prepared to pay its fair share of watershed protection expenditures since it takes potable water from groundwater sources and pays not a penny for it?

6. You do not say a word about the Public Trust Doctrine although there is a lot of vague language built around the 'olelo no'eau quote on p. 6. Is there a reason for this omission?

7. You say, on p. 40: "The Proposed Action" is expected to increase vehicular traffic on Kamehameha Hightway." In your traffic analysis for the Draft SEIS I seek an assurance from you that full consideration will be given to a detailed regional traffic impact study of the whole area from Kane'ohe to Haleiwa be undertaken I also seek from you full disclosure on the critical issue of whether you accept the principle that the traffic impact study be paid for by the Mormon Church entities and by TBR, LLC. And until the comprehensive detailed regional traffic impact study is completed the entire permitting process for both projects be put on hold which will be an early warning indication of your commitment to civil responsibility--a real test of your commitment to the larger community of which you are a part--the community to which you make scant reference in your Prep Notice--the people who live in the Ko'olauloa/Ko'olaupoko corridor, now threatened, so it seems to me with the virus of creeping urbanization with enormous fiscal implications for this and future generations of taxpayers. There isn't even passing reference to this in your Prep Notice. From where I sit this is unnerving and one of many signs of sloppy thinking.

8. **One of the great shortcomings of your Prep Notice** is that you have lapsed into the comfortable pretense that the SEIS lands at one end of Kahuku are a part of an island unto itself. That is an illusion. You are merely 4 miles away from the Gunstock and La'ie lands owned by the Mormon Church entities. Your proposed mega development ($1.2 billion worth) and that of the Mormon Church entities' (close to $400 million worth) feed off of each other systemically: water, traffic pressure on the near shore marine ecosystem, sub terranean flow of fresh water into the *muliwai*, multiple effects on habitat and species and so on. You have separated your project from that of those of the Mormon Church entities with whom, reports show, you have been in active contact--which I invite you to confirm or deny. Since an EIS is primarily an instrument of disclosure I do not see how you can completely ignore, as you have in the Prep Notice, all that is proposed just 4 miles south of you. I seek an explanation of this now.

9. The Prep Notice says not a word about climate change. Stunning. And not a word about ocean acidification. You just walk by and ignore a whole body of literature on ocean acidifcation, including a modest paper of mine on the subject that is yet to be published. Even more stunning.

10. I should warn you in advance--and all of this is advance warning-- thatyour list of references, your bibliography, is appailing for what it leaves out. It is as if your consultant has never read a word of some of the great works of the sons and daughters of our nation on protecting the environment broadly construed: Aldo Leopold, John Muir, David Brower, David Orr, Wes Jackson and all th efine minds which have labored long and hard at the Land Institute. Not the slightest indication that your consultant has either read or is familiar with the proceedings of the 1961 Pacific Science Congress on Island Ecosystems. There is much more in the professional and anecdotal literature on the environment that you have obviously not drawn on. You may have had discussion with people who call themselves 'environmenalists' and who live on the North Shore. They're all well meaning, I am sure but a bit short on quality information, even more short on environmental literacy. Green t-shirts, blue t-shirts and bumper stickers do not make quality arguments which are either persuasive, defensible or plausible. You have, to your detriment fallen for no small part of the prattle with which you have been served. Under the glare of careful scrutiny, hostile even, much of what you disclose in your Prep Notice will be found wanting by those who are better than your consultant seems to be.

11. There is more. I shall be copying this to the Accepting Agency as required by law. It will be marked as the FIRST of several formal commentaries. on the Prep Notice.At a first, cursory glance, the Prep Notice looks 'impressive' but on closer examination by the practised eye, it is hollow in many parts, clumsy in some and falls far short of what one would expect from those seeking to invest $1.2 billion in a project that starts off with what I see as an obscenity: "TOMORROW'S AHUPUA'A." If you had proposed anything remotely resembling that in Aotearoa you would have immediately become a bad, out of place, obscene joke and you would immediatel become eligible to be asked to leave.

You may have made many friends but far too few frank ones sufficiently smart to tell you the awful truth: you have a hell of a lot of work cut out for you

I have teased out here some of the sentiments expressed by Mr. Logan at the last meeting of our Neighborhood Board which you and your colleague attended. It is important that you get this message: Just because you have a local carver carve you some full size tikis representing various Polynesian gods that does not make whatever project design you adopt as being "Polynesian"--particularly with their penises and balls cut off. Please, Mr. Stotesbury, with all the money you have for this project, you can do better than you have so far: ***the downsizing from 3,500 raw units to 1,375 with some extra affordable units thrown in is but a small part of the much larger problem. The best case that can be made to do anything is to do nothing more--your do nothing more alternative.***

And remember, its not a matter of how many people you have had discussions with that counts but the quality of the minds with whom you have consulted. So far, so it seems to me, you have not done all that well on the "quality of minds" front. You are just going to have to do better. Building further on the epistemological foundations laid so far if I were you, I would find some place else to invest your $1.2 billion. I am sure that the two Trusts for Public Land will graciously accept the care, custody and control of the 600 or so acres of ag land you have offered them.

Jim Anthony, Ph.D.

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October 26, 2012

To Jim Anthony @ drjant@aol.com

I am writing in response to the email you sent on Sunday, August 28, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

1. I can be contacted at leesichter@gmail.com.
2. You can review the decision of the Supreme Court at: http://turtlebayseis.com/seis/intentions/
3. Dawn Chang of Kuiwalu has served as the Applicant's consultant and the point of contact with the military. The subjects discussed include a presentation of the Proposed Action and the possibility of scheduling a follow up meeting to discuss and issues or synergies.
4. We regret the oversight.
5. The project's compliance with the recommendations of the Ko`olauloa Watershed Plan will be discussed in the SEIS.
6. No.
7. The 2009 Traffic Impact Analysis Report (TIAR) that has been approved by the State Department of Transportation (DOT) is presently being updated at the request of DOT. It will be included in the SEIS. As roadway improvements are required pursuant to the Unilateral Agreement and approval of an Implementation Plan for those improvements must be approved by both the City and DOT prior to subdivision, the TIAR update must be approved by DOT before building permits can be issued.

   Please understand that the portions of the property proposed for resort expansion were reclassified to the State Urban district in the mid-1980s. No further land use reclassifications are being sought. Thus, there is no "creeping urbanization".
8. The SEIS will discuss the interrelationship of the resort property to the surrounding region. Its regional impacts will be disclosed, as will the cumulative impacts of the Proposed Action and other development in the region include that proposed by the major land owners in Laie.
9. The SEIS will address climate change and ocean acidification to the extent practicable.
10. Section 11-200, Hawaii Administrative Rules, offer no guidance regarding the content of a List of References or a Bibliography for an EIS. Therefore, the

standard practice is to list the documents and sources that were relied upon for the preparation of the document at hand. Background documents of a general educational nature are generally not included. We regret that the List of References did not comply with your personal standards.

11. The SEIS will include a much more robust discussion of our development of Tomorrow's Ahupua`a concept.
12. We acknowledge your preference for the No Action alternative.
13. The rules governing the environmental assessment process require public consultation but are silent on the subject of "quality of minds". Your inclination to pass judgment on others is noted.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

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Subject: [Turtle Bay Resort SEIS] Please moderate: "Intentions"
From: Turtle Bay Resort Development <info@turtlebayseis.com>
Date: Mon, Aug 29, 2011 2:12 pm
To: info@turtlebayseis.com

A new comment on the post "Intentions" is waiting for your approval
http://turtlebayseis.com/seis/intentions/

Submitted : Aug 29, 2011 @ 14:12
Author : sara (IP: 67.52.71.52 , mcs-67-52-71-52.west.biz.rr.com)
E-mail : sicadlz@hawaiiantel.net
URL :
Address :
City :
State :
Zip :
Phone :
Comment:
This down scaling of the OakTree original plan is definitely an improvement. Keeping open communication with the host community with respect to construction job opportunities and keeping the work local has my support.

Approve it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=approve&c=68
Trash it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=trash&c=68
Spam it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=spam&c=68
Currently 15 comments are waiting for approval. Please visit the moderation panel:
http://turtlebayseis.com/tbr/wp-admin/edit-comments.php?comment_status=moderated

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October 26, 2012

To Sara Cadiz @ sicadiz@hawaiiantel.net

I am writing in response to the email you sent on Monday, August 29, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

We appreciate your support for the project. The Proposed Action represents the result of a two-year long public outreach program (that continues today) to open a dialog with the community about the future of the Turtle Bay Resort.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

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Subject: More Info on SEIS
From: Friends Hauula <friendsofhauula@gmail.com>
Date: Mon, Aug 29, 2011 10:40 am
To: info@turtlebayseis.com

Anyone can participate in the process, and we encourage you to do so. You will have two opportunities to participate. You can provide written comments during the 30-calendar day period following the publication of the SEISPN in the Environmental Notice, and during the 45-calendar day comment period following the publication of the Draft SEIS. If the DPP accepts the Final SEIS, that decision may also be challenged in court.

Can you tell us more specifics? What are the specific dates? When is the publication of the DRAFT SEIS?

Where are the links? Where is the Environmental Notice?

Mahalo!

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October 26, 2012

To Friends of Hau'ula @ friendsofhauula@gmail.com

I am writing in response to the emails you sent on Monday, August 29, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

The SEIS Preparation Notice was intended to announce the preparation of the SEIS. The Draft SEIS will contain much more detailed information about the project.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

RE: Turtle Bay Development

1 message

ccComments <ccComments@honolulu.gov> **Mon, Aug 29, 2011 at 8:31 AM**
To: Joan Koff <joankoff@yahoo.com>
Cc: "leesichter@gmail.com" <leesichter@gmail.com>, "drew@replayresorts.com" <drew@replayresorts.com>

Your comments for the Supplemental Environmental Impact Statement Preparation Notice for Turtle Bay resort have been received by the Department of Planning and Permitting. Please note that any further email comments to the department should be directed to ccComments@honolulu.gov.

Your comments were also sent to the Consultant and Applicant. Their contact information is:

Consultant:

Lee Sichter LLC

45024 Malulani Street #1

Kaneohe, Hawaii 96744

Contact – Lee Sichter, (808) 382-3836

leesichter@gmail.com

Applicant:

Turtle Bay Resort, LLC

57-091 Kamehameha Highway

Kahuku, Hawaii 96731

Contact – Drew Stotesbury, (808) 447-6951

drew@replayresorts.com

From: Joan Koff [mailto:joankoff@yahoo.com]
Sent: Friday, August 19, 2011 9:32 AM
To: Nishiura, Sharon N.
Subject: Turtle Bay Development

As a part time resident of Kuilima Estates West and almost 40 years of residence and work in the Kolauloa area, I strongly object to the fasttrack approval process that is in line of the Turtle Bay expansion. As you well know, the environmental impact of this development has not at all be fully disclosed or discussed publicly. One public forum proposed is not sufficient. There are many stakeholders in this development/for and against. I am against.

I believe that first, we have little enough country or open space on rather densely populated Oahu. Without considering the overall context of our current era: lack of sustainable energy for our remote islands; lack of consideration of available water; lack of consideration of sustainable agriculture for our islands; lack of consideration of ocean protection for our endangered species; lack of consideration for the rights of native Hawaiians to respect their fishing and gathering and burial rights; lack of consideration of the great impact of traffic on the north shore roads; lack of planning for emergency in case of tsunami in this area of one lane out and one lane in; lack of consideration of the cumulative development of Laie, Kahuku, Malekahana, and it's collatoral damage to the environment; lack of drainage plan; lack of environmental impact statement research; etc., I believe that the prompt passage of zoning change is a betrayal of the public trust in our government to work for all and not just the vocal few. The vocal few of envison Laie actually present a very selfish development plan, they are not at all considerate of the other interests in their community which deserve attention: the farmers; the fisherman; the surfers; the ecofriendly tourist; the wildlife; the plants; the ocean. Some of these other interests have no voice, e.g. the native monk seals. Others have little voice because of their poverty and lack of expression skills. The ability of the Laie community to have coopted our neighborhood boards and even City Council by busing in folks with little awareness of the facts, but overall loyalty to their elders and leaders, does not satisfy the requirement for popular approval.

Please do not approve the wholesale development of Turtle Bay and the Laie Hotel and the Gunstock ranch destruction.

Please accept this testimony.

Joan Koff, Ph.D.

LEE SICHTER LLC

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PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Joan Koff @ joankoff@yahoo.com

I am writing in response to the email you sent on Monday, August 29, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

1. There is no "fast-track approval process" involved with the proposed expansion of the Turtle Bay Resort. The Turtle Bay Resort property was reclassified to the State's Urban District in the mid-1980s and subsequently rezoned by the City for expansion as a visitor destination area. In 2010, the Hawaii Supreme Court ruled that a Supplemental EIS must be prepared before the resort can proceed with subdivision of the property to implement the expansion plan. The purpose of the SEIS is to disclose the anticipated environmental impacts of the project.
2. The representatives of the resort owners have engaged in over two years of community meetings to seek input on the future of the resort.
3. We acknowledge your opposition to the proposed expansion of the Turtle Bay Resort.
4. As presented in the SEIS Preparation Notice, under the proposed expansion plan, approximately 77 percent of the approximate 840 acres that constitute the resort property will be retained in open space.
5. The SEIS will specifically address sustainability; energy; water availability; agriculture; marine resource protection; native Hawaiian rights including fishing, gathering, and burials; traffic impacts; emergency planning; cumulative impacts; drainage; and environmental impacts.
6. The proposed project is not related to land use development proposals being discussed for Laie.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume

document, but we respectfully encourage you to consider the paper-saving alternatives.

The official review and comment period will last 45 calendar days from the date that the OEQC publishes the Notice of Availability in its *Environmental Notice*. You can find the *Environmental Notice* on-line at the OEQC website:

http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

RE: Agricultural Land

1 message

ccComments <ccComments@honolulu.gov> Mon, Aug 29, 2011 at 8:33 AM
To: Kyle Kennedy <kylekenne@gmail.com>
Cc: "leesichter@gmail.com" <leesichter@gmail.com>, "drew@replayresorts.com" <drew@replayresorts.com>

Your comments for the Supplemental Environmental Impact Statement Preparation Notice for Turtle Bay resort have been received by the Department of Planning and Permitting. Please note that any further email comments to the department should be directed to ccComments@honolulu.gov.

Your comments were also sent to the Consultant and Applicant. Their contact information is:

Consultant:

Lee Sichter LLC

45024 Maluiani Street #1

Kaneohe, Hawaii 96744

Contact – Lee Sichter, (808) 382-3836

leesichter@gmail.com

Applicant:

Turtle Bay Resort, LLC

57-091 Kamehameha Highway

Kahuku, Hawaii 96731

Contact – Drew Stotesbury, (808) 447-6951

drew@replayresorts.com

From: Kyle Kennedy [mailto:kylekenne@gmail.com]
Sent: Thursday, August 18, 2011 12:28 PM
To: Nishiura, Sharon N.
Subject: Agricultural Land

I want to start off by saying that as soon as you build a structure on Ag Land, park land, or any open space, that land is pretty much gone forever. Do not turn Oahu's agricultural land into development sites. You are making a enormous mistake if you allow more development projects to crowd Oahu. We already have enough residents here, what are the developers thinking?! Most of them probably don't live in Hawai'i, so why should they care? Just like Hawai'i's tourism industry, most of the money from development goes to mainland companies and interests. The majority of the money from tourism goes to international companies, NOT to Hawai'i residents. Most people do not know this dirty secret about the tourism industry. What happens if the barges carrying all our food are unable to come here do to a disease epidemic or something else? We will wish we had more fields planted then. You need to provide incentives for people to invest and start working in the organic agriculture industry. You want to provide more jobs right? How about jobs in the organic food industry on Ag lands that the state already possesses? If we keep putting our security off, we will continue to harm the environment, waste money, put ourselves in danger. Remember, as the population increases the quality of life decreases.

LEE SICHTER LLC

45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Kyle Kennedy @ kylekenne@gmail.com

I am writing in response to the email you sent on Monday, August 29, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

The Turtle Bay Resort property was reclassified from the State Agricultural District to the State Urban District in the mid-1980s, following it designation by the City and County of Honolulu as a visitor destination area. No agriculturally designated land will be impacted by the proposed resort expansion plan.

The resort owns agricultural land on the mauka side of Kamehameha Highway, but this land is not part of the proposed expansion plan. The resort's owners intend to preserve this mauka land for agricultural use and are presently working with the Trust for Public Land to preserve it with a conservation easement.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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Very truly yours

Lee Sichter

From: drjant@aol.com
Date: Mon, August 29, 2011 1:22 pm
To: info@turtlebayseis.com

Noted,

I agree with Fonoimoana and Vanderveer. You convened a meeting in May, came, took pictures, but did not get the message. There are several possible reasons for this: 1. You were never interested in whatever the message was going to be; 2. you just didn't listen; you were never interested in listening--the whole show was a charade, *shibai*,window dressing. You had to go through the motions of consultation with the community but your mind was already made up. You made token, syrupy concessions to Hawaiian culture, borrowed a name from here, another from there, used a few Hawaiian words. Of course you will deny all of this in order to maintain the facade of your "genuine concern" --not worth much more than what Australians call "a fart in a blue bottle." Dumb way to try and do business in the 21st century. With a $1.2 billion kitty you can do more. What you really need is a new consultant and I do not mean someone like the screw balls in Group 70, Give David Orr a call.

Jim Anthony

-----Original Message-----
From: info <info@turtlebayseis.com>
To: drjant <drjant@aol.com>
Sent: Mon, Aug 29, 2011 8:15 am
Subject: RE: TBR SEIS (TurtleBay)

Comment:
You will, as you have alredy, get both. An EIS is, above all else, an instrument of disclosure. You disclose and if you do not disclose enough we seek to open the door wider and will vigorously do that. We have the right of hostile scrutiny, that lies at the heart of our system of transparency. This is one of the things deeply embedded in the anglo/american system of jurisprudence. We have the right--and the obligation--as citizen public interest activists to look closely at the epistemological foundations of the arguments that you make. I find it somewhat askew when, on the one hand, you acknowledge the sacred nature of the TB/SEIS lands, on no insignificant part of which there are ***'Iwi kupuna*** you still insist on more building on these lands albeit down from the size of the footprint embedded in the Unilateral Agreement 30 years ago. You introduce a new idea: "Tomorrow's ahupua'a" -- a very troublesome, bordering on an obscenity, attempt to reinven/ reconstruct the DNA of Hawaiian culture. Take this, for example, you go to London and tell the English that you want to reinvent/ recreate Stonehenge--you want to create Tomorrow's Stonehenge. I do not think you would be received with open arms. Closer to home, lets say you want to create Tomorrow's Nuuanu Cemetery. You would be laughed out of town, possibly beaten with wet noodles and confined to a corner somewhere where red ants would nibble at you.

What would be truly rspectful is if you would acknowledge that you have invaded and desecrated sacred space enough. There will be no more building where you

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PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Jim Anthony @ drjant@aol.com

I am writing in response to the email you sent on Monday, August 29, 2011 at 1:22pm commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

We wish to assure you that the May 2011 meeting was part of a larger community outreach process to which the resort owners are committed. Engaging the community is vital to the successful implementation of the proposed action.

We regret to inform you that Mr. David Orr was contacted, but was not available.

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

From: drjant@aol.com
Date: Mon, August 29, 2011 1:22 pm
To: info@turtlebayseis.com

Noted,

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Jim Anthony

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From: info <info@turtlebayseis.com>
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Sent: Mon, Aug 29, 2011 8:15 am
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Comment:
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What would be truly rspectful is if you would acknowledge that you have invaded and desecrated sacred space enough. There will be no more building where you

are already not supposed to be in the first place. What you have now is the rough equivalent of the Mormon Church's 49 rooms in La'ie. They ought to be satisfied with what they had. There's a ton of affordable accomodation within a half mile of Laie--Friends of Malaekahana offers very affordable accomodation for local people. There were 40,000 people on average every year for the past 8 years using that facility. The Mormon hierarchy applicants never did a needs suvey and never told the truth in their SMA application.

I thnk the time has come to look at this entire region from Kahuku to La'ie and beyond holistically. And stop all development applications being processed until we have a handle on the entire region. Chapter 25 and 205A require this broad overview, overarching, systemically related approach.

You will be hearing a lot more about this.

But TOMORROW'S AHUPUA'A has a basic obscenity about it. Any attempt to rewrite, redesign, recompose the script of another culture is fraught with problems. The old British saying comes to mind: If it isn't broken, don't try to fix it. Developers have destroyed enough ahupua'a. The ahupua'a that remain to us nned one thing: to be left alone. Those ahupua'a whose integrity has been damaged, like those that make up your SEIS lands: 'Opana, Kawela, Hanakane. O'io, Ulupehupehu, Punala'u and Kahuku are crying out to the winds. Their messge: enough is enough. "You have demeaned and diminished us far beyond the point of ordinary desecration. Leave us alone.".

Listen to the wind. Think not of Tomorow's Ahupua'a. Who are you to create Tomorrow's Ahupua'a? Think of something far more creative: Leave the rest of the SEIS lands as they are. Declare them to be a wahipana, sacred space. Go back and read Aldo Leopold and David Orr and of more recent vintage, Wes Jackson. They're American classics. You have already eaten out of the pol bowl of the host culture. Time to put something back Listen to the wind. There's a message there for you.

Response:
Mahalo for your comments and suggestions. Our plan is rooted in the deepest respect for the host Hawaiian culture and is not intended to cause any offense. We apologize if this was the case with you.

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LEE SICHTER LLC
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PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Jim Anthony @ drjant@aol.com

I am writing in response to the email you sent on Monday, August 29, 2011 at 8:15am commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are responses to your comments in the order they were presented.

1. We agree that an EIS is an instrument of disclosure.
2. We agree that a reviewing party can be as hostile as they wish.
3. We do not agree that hostile scrutiny is the heart of our system of transparency and anglo/American jurisprudence. We believe that diligent scrutiny is usually sufficient.
4. A supplemental archaeological inventory survey has been recently completed to resolve the issue of whether or not the proposed project will disturb *iwi kupuna*. Its findings and recommendations will be included in the SEIS.
5. The concept of Tomorrow's Ahupua`a is not intended to reinvent or recreate culture. Rather, it utilizes what is known about the culture of the region to inform the implementation of a sustainability plan for the project.
6. In 1977, an amendment to the Oahu General Plan, voted on by the residents of the City and County of Honolulu, designated the Kuilima Hotel property to be reclassified as a Visitor Destination Area. Several years later, the Ko`olauloa Development Plan was adopted by the City as a means of implementing the General Plan. It depicted the Kuilima property as a resort. In 1986, the City Council approved an expansion plan for the resort that allows the development of five new hotels. It was decided at that time, that the development was needed to create new jobs in the region and to support the continuing health of the visitor industry.

   In 1999, the Ko`olualoa Development Plan was replaced with Ko`olau Loa Sustainable Communities Plan. The principal difference between the two plans is that the latter established an urban growth boundary that was intended to limit development and protect the rural character of the region. Because the Turtle Bay Resort property was reclassified to the Urban district about 14 earlier, it is fully contained within the Urban Growth Boundary.

Together, these plans and policies are intended to ensure that the rural character of the North Shore is preserved for future generations. The Proposed Action is consistent with these policies.

7. The socio-economic impact analysis that will be included in the SEIS addresses the entire region surrounding the Turtle Bay Resort property. It, together with the Tomorrow's Ahupua`a concept, strive to achieve the holistic approach you recommend.
8. We agree that it is ill-advised to attempt to rewrite the script of another culture. That is not the purpose of the Tomorrow's Ahupua`a concept. Please see the response in #5 above. Please allow me to repeat our previous response to your email: "Mahalo for your comments and suggestions." Our plan is rooted in the deepest respect for the host Hawaiian culture and is not intended to cause any offense. We apologize is this was the case with you.

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Print | Close Window

Subject: [FWD: Re: TBR SEIS (TurtleBay)]
From: info@turtlebayseis.com
Date: Mon, Aug 29, 2011 5:40 pm
To: comments@turtlebayseis.com

-------- Original Message --------
Subject: Re: TBR SEIS (TurtleBay)
From: drjant@aol.com
Date: Mon, August 29, 2011 2:23 pm
To: info@turtlebayseis.com

My last message was intended to be a formal SEIS Preparation Notice Comment. I now confirm that and ask you to include it as formal comment.

I am, again:

Jim Anthony, Ph.D.
P.O. Box 629
Ka'a'awa, HAWAII 96730

drjant@aol.com

-----Original Message-----
From: info <info@turtlebayseis.com>
To: drjant <drjant@aol.com>
Sent: Mon, Aug 29, 2011 2:06 pm
Subject: RE: TBR SEIS (TurtleBay)

Mahalo for your interest in the future of Turtle Bay Resort. We sincerely appreciate your mana'o. By this email, we acknowledge receipt of your comments. We take all questions, comments and suggestions seriously and will incorporate them into our future considerations. And although you did not submit this as a formal SEIS Preparation Notice comment (see http://turtlebayseis.com/seis/submitting-an-seis-comment/) we would be pleased to include it, if that is your desire, provided that you confirm your name, address and contact information. With this information, we will be able to send you a formal response to your comments after the official comment period on the SEIS Preparation Notice has ended

-------- Original Message --------
Subject: Re: TBR SEIS (TurtleBay)

LEE SICHTER LLC

45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Jim Anthony @ drjant@aol.com

I am writing in response to the email you sent on Monday, August 29, 2011 at 5:40pm commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

All of your comments on August 29, 2012 are accepted as formal comments on the SEIS Preparation Notice.

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

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Subject: [FWD: Re: SEIS Preparation Notice]
From: info@turtlebayseis.com
Date: Tue, Aug 30, 2011 9:48 am
To: comments@turtlebayseis.com

-------- Original Message --------
Subject: Re: SEIS Preparation Notice
From: Marilyn Cole <marilyncole@hawaii.rr.com>
Date: Mon, August 29, 2011 6:31 pm
To: "<info@turtlebayseis.com>" <info@turtlebayseis.com>

In case you didn't receive my info, my address is 59-229CKe Nui Rd. Haleiwa,Hi 96712. Email/ Marilyncole@Hawaii.rr.com
I have registered on your website.
Aloha, Marilyn Cole. Any ?s call 638-7289

Sent from my iPhone

On Aug 29, 2011, at 1:45 PM, <info@turtlebayseis.com> wrote:

Comment:

No mention made of endangered Hawaiian monk seals using property regularly to give birth to and rear pups, including one there right now with pup.
Need to see numbers as to actual maximum rentable units when time share or lockout possibilities are considered. To avoid this issue is a gross ommission of the total potential impact.
Any final plan should leave the R3 to points east shoreline untouched.this includes the Hawaiian monk seal birthing area.
There is no way proposed project could occur without widening Kam Hwy. To Windward and Haleiwa directions. This would involve massive condemnation of private property and a massive budget at taxpayer's expense. This should be specifically addressed in seis.

Response:

Mahalo for your interest in the future of Turtle Bay Resort. We sincerely appreciate your mana'o. By this email, we acknowledge receipt of your comments. We take all questions, comments and suggestions seriously and will incorporate them into our future considerations. And although you did not submit this as a formal SEIS Preparation Notice comment (see http://turtlebayseis.com/seis/submitting-an-seis-comment/) we would be pleased to include it, if that is your desire, provided that you confirm your name, address and contact information. With this information, we will be able to send you a formal response to your comments after the official comment

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October 26, 2012

To Marilyn Cole @ marilyncole@hawaii.rr.com

I am writing in response to the email you sent on Tuesday, August 29, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

1. A marine resources analysis is being prepared for the SEIS and will include a detailed discussion of the proposed project's impacts on monk seals.
2. The SEIS will evaluate the Proposed Action that includes 625 resort units and 750 residential units. The 625 resort units may include as many as 375 lock-off units, bringing the total base number of proposed rentable units to 1000.
3. In its Alternatives Analysis, the Draft SEIS includes a Conservation Partner Alternative that proposes to withdraw development from much of the coastline and centralize it around the existing hotel as you recommend. The implementation of the Conservation Partner Alternative is subject to the participation of a third party or parties who would provide economic consideration in lieu of the foregone development rights.
4. The traffic analysis being conducted for the SEIS addresses the region from Kahalu`u to Hale`iwa. The study will be included in the SEIS.

   The owners of the Turtle Bay Resort share you concerns about existing and future traffic volumes on Kamehameha Highway. The resort is part of the North Shore and Ko`olau Loa communities and is committed to finding workable traffic solutions.

   As a two-lane highway serving nearly half the island extending from Kahalu`u to Hale`iwa, Kamehameha Highway has to accommodate local and regional traffic. Extending along a relatively narrow plain between the coastline and the base of the mountains, the highway cannot easily be widened, even if this was what the community wanted. And selective widening along limited straightaways would only exacerbate traffic conditions; eventually the widened roadway segment would have to narrow back to two lanes. Thus, we all have to work together to find alternate solutions.

   Limiting development on the North Shore is neither a practical nor realistic answer. Even if there was no further development between Kahalu`u and Hale`iwa, there would still be traffic congestion on the highway. So long as the famed beaches of the North Shore remain an attraction for O`ahu's residents and visitors, people from Honolulu, Hawaii Kai, Kailua, Kane`ohe, Aiea, Pearl City, Waipahu, Ewa, Kapolei, Waianae and Wahiawa will come. As a community, we each must do our part to help reduce traffic and work together to address transportation issues. That means driving smarter, consolidating trips, ride-sharing, and using transit alternatives when possible, to name a few.

   To reduce the impacts of the proposed resort expansion, new left-turn lanes and traffic signals will be funded by Turtle Bay Resort where the roads that will access the resort intersect with Kamehameha Highway. This should help to mitigate the impact of vehicles entering and leaving the resort. According to our recently completed traffic study, on an annual average basis the proposed resort expansion will increase traffic on the highway by about 4.5% during the morning peak hour and 3.0% during the afternoon peak hour.

   In addition, the resort will implement a number of measures designed to reduce resort-related traffic. These will include van shuttle service for employees and guests. The resort is also exploring ways to extend the successful bike path at Malaekahana all the way to Hoalua Street and beyond to Ke Nui Road.

   The owners of the resort are also committed to paying their fair-share of the cost for regional traffic improvements to help reduce traffic congestion, as determined by the State Department of Transportation. ("Fair-share" is calculated by the State DOT as a developer's portion of the total cost of new improvements based upon the percentage of new traffic generated by the developer's project.)

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

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Subject: [Turtle Bay Resort SEIS] Please moderate: "SEIS Preparation Notice"
From: Turtle Bay Resort Development <info@turtlebayseis.com>
Date: Mon, Aug 29, 2011 9:55 am
To: info@turtlebayseis.com

A new comment on the post "SEIS Preparation Notice" is waiting for your approval
http://turtlebayseis.com/seis/prep-notice/

Submitted : Aug 29, 2011 @ 9:55
Author : Ken Rubenstein (IP: 70.95.98.134 , cpe-70-95-98-134.hawaii.res.rr.com)
E-mail : rubenstein.k@gmail.com
URL :
Address :
City :
State :
Zip :
Phone :
Comment:
The Draft SEIS appears to deal only with traffic in the vicinity of Turtle Bay Resort. There are broader concerns dealing with traffic congestion in other places on the North Shore and windward coast, especially between Sunset Beach and Haleiwa. At various times, delays are severe, and further development will inevitably impact this situation. Without a broader plan to alleviate congestion on our only through road, we cannot support development in Laie or Turtle Bay.

Approve it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=approve&c=64
Trash it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=trash&c=64
Spam it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=spam&c=64
Currently 13 comments are waiting for approval. Please visit the moderation panel:
http://turtlebayseis.com/tbr/wp-admin/edit-comments.php?comment_status=moderated

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PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Ken Rubenstein @ rubenstein.k@gmail.com

I am writing in response to the email you sent on Monday, August 29, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

The owners of the Turtle Bay Resort share you concerns about existing and future traffic volumes on Kamehameha Highway. The resort is part of the North Shore and Ko`olau Loa communities and is committed to finding workable traffic solutions.

As a two-lane highway serving nearly half the island extending from Kahalu`u to Hale`iwa, Kamehameha Highway has to accommodate local and regional traffic. Extending along a relatively narrow plain between the coastline and the base of the mountains, the highway cannot easily be widened, even if this was what the community wanted. And selective widening along limited straightaways would only exacerbate traffic conditions; eventually the widened roadway segment would have to narrow back to two lanes. Thus, we all have to work together to find alternate solutions.

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In addition, the resort will implement a number of measures designed to reduce resort-related traffic. These will include van shuttle service for employees and guests. The resort is also exploring ways to extend the successful bike path at Malackahana all the way to Hoalua Street and beyond to Ke Nui Road.

The owners of the resort are also committed to paying their fair-share of the cost for regional traffic improvements to help reduce traffic congestion, as determined by the State Department of Transportation. ("Fair-share" is calculated by the State DOT as a developer's portion of the total cost of new improvements based upon the percentage of new traffic generated by the developer's project.)

The traffic study and mitigation measures mentioned above will be presented in the Draft Supplemental Environmental Impact Statement for the resort. Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

The official review and comment period will last 45 calendar days from the date that the OEQC publishes the Notice of Availability in its *Environmental Notice*. You can find the *Environmental Notice* on-line at the OEQC website:

http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Print | Close Window

Subject: [Turtle Bay Resort SEIS] Please moderate: "Submitting an SEIS Comment"
From: Turtle Bay Resort Development <info@turtlebayseis.com>
Date: Tue, Aug 30, 2011 6:28 pm
To: comments@turtlebayseis.com

A new comment on the post "Submitting an SEIS Comment" is waiting for your approval
http://turtlebayseis.com/seis/submitting-an-seis-comment/

Submitted : Aug 30, 2011 @ 15:28

Comment:
It is my understanding that to be considered an "A2" property, a conforming vacation rental property, one has to be part of the SEIS or Master Plan of a Resort that is 50 acres or larger and 3500 ft (approx. can't remember exact # in the 3 thousand field) from the Resort. Are the Kuilima EAST/WEST part of the Resorts Master Plan or SEIS because as such I would think the condo owners could legally rent their condos as vacation rentals. It is no longer possible to get a NON-conforming Transient license. Also since it is my understanding that as part of the FEE conversion, Kuilima EAST/WEST and Turtle Bay current and proposed units would be part of a common association, this suggests "part of the Master Plan or SEIS". Could someone respond who knows?

Approve it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=approve&c=68
Trash it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=trash&c=68
Spam it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=spam&c=68
Currently 17 comments are waiting for approval. Please visit the moderation panel:
http://turtlebayseis.com/tbr/wp-admin/edit-comments.php?comment_status=moderated

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PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

I am writing in response to the email you sent on Tuesday, August 30, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

Neither the existing hotel, nor the Kuilima Estates were part of the original EIS approved in 1985 and are not a part of the current SEIS. No permits, approvals, or redevelopment is proposed for the existing hotel or Kuilima Estates pursuant to the proposed resort expansion plan. Therefore, the Supplemental EIS excludes the existing hotel and Kuilima Estates from the study. Whether the owners of the individual units within the Kuilima Estates can legally rent their units as vacation rentals is beyond the scope of the SEIS.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com.

However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

Turtle Bay Development

1 message

Carl Jerry Vasconcellos <jvasco@hawaii.rr.com> **Thu, Sep 1, 2011 at 11:46 PM**
To: ccComments@honolulu.gov, leesichter@gmail.com

Dear sir or Madam,

I would like to know what sort of impact the decreased size of the Turtle Bay Development Plan will have on the traffic along the two laned Kamehameha Hwy.both along the east shore from Kaneohe to Kawela Bay and the North shore from Wahiawa to Kawela Bay. Are you aware that the starting point of the traffic situation now is beyond what should ever be "acceptable". The north shore can take hours to drive and the increased traffic along the east side has become urban in a country area. This is where we live and commute. Please understand that we have to give up a lot in order that you make your money. Please do that where there is no impact on those that live there.

Mahalo,
Jerry Vasconcellos
783-9577

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PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Carl Jerry Vasconcellos @ jvasco@hawaii.rr.com

I am writing in response to the email you sent on Thursday, September 1, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

The owners of the Turtle Bay Resort share you concerns about existing and future traffic volumes on Kamehameha Highway. The resort is part of the North Shore and Ko`olau Loa communities and is committed to finding workable traffic solutions.

As a two-lane highway serving nearly half the island extending from Kahalu`u to Hale`iwa, Kamehameha Highway has to accommodate local and regional traffic. Extending along a relatively narrow plain between the coastline and the base of the mountains, the highway cannot easily be widened, even if this was what the community wanted. And selective widening along limited straightaways would only exacerbate traffic conditions; eventually the widened roadway segment would have to narrow back to two lanes. Thus, we all have to work together to find alternate solutions.

Limiting development on the North Shore is neither a practical nor realistic answer. Even if there was no further development between Kahalu`u and Hale`iwa, there would still be traffic congestion on the highway. So long as the famed beaches of the North Shore remain an attraction for O`ahu's residents and visitors, people from Honolulu, Hawaii Kai, Kailua, Kane`ohe, Aiea, Pearl City, Waipahu, Ewa, Kapolei, Waianae and Wahiawa will come. As a community, we each must do our part to help reduce traffic and work together to address transportation issues. That means driving smarter, consolidating trips, ride-sharing, and using transit alternatives when possible, to name a few.

To reduce the impacts of the proposed resort expansion, new left-turn lanes and traffic signals will be funded by Turtle Bay Resort where the roads that will access the resort intersect with Kamehameha Highway. This should help to mitigate the impact of vehicles entering and leaving the resort. According to our recently completed traffic study, on an average annual basis the proposed resort expansion will increase traffic on the highway by about 4.5% during the morning peak hour and 3.0% during the afternoon peak hour. The traffic study analyzes the length of Kamehameha Highway from the Hygenic Store in Kahalu`u to Kamehameha Highway's intersection with Joseph P. Leong Highway near Haleiwa.

In addition, the resort owners will implement a number of measures designed to reduce resort-related traffic. These will include van shuttle service for employees and guests. The resort owners are also exploring ways to extend the successful bike path at Malaekahana all the way to Hoalua Street and beyond to Ke Nui Road.

The owners of the resort are also committed to paying their fair-share of the cost for regional traffic improvements to help reduce traffic congestion, as determined by the State Department of Transportation. ("Fair-share" is calculated by the State DOT as a developer's portion of the total cost of new improvements based upon the percentage of new traffic generated by the developer's project.)

The traffic study and mitigation measures mentioned above will be presented in the Draft Supplemental Environmental Impact Statement for the resort. Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

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Subject: [Turtle Bay Resort SEIS] Please moderate: "Turtle Bay owners scale back expansion"
From: Turtle Bay Resort Development <info@turtlebayseis.com>
Date: Thu, Sep 01, 2011 2:57 pm
To: comments@turtlebayseis.com

A new comment on the post "Turtle Bay owners scale back expansion" is waiting for your approval
http://turtlebayseis.com/turtle-bay-owners-scale-back-expansion/

Submitted : Sep 1, 2011 @ 11:57
Author : neil freeman (IP: 174.7.120.154 , S0106001124ed546a.vn.shawcable.net)
E-mail : gtd@interchange.ubc.ca
URL :
Address :
City :
State :
Zip :
Phone :
Comment:
As a devout believer in the importance of maintaing rural and community life and as a worker and resident of laie for more than 20 years I am horrified by the plan to expand Turtle Bay, amended or no

the current infrastructure cannot support the # of Turtle Bay units proposed, even without the appalling plans to expend BYUH by 4,000 units and creating a 250 unit Marriott hotel: and if you do expand the infrastructure, especially the road system, you destroy the rural nature so much a part of the Laie/Kuhuku area

Think of what you want to leave your children and grandchildren, and call a halt to the greedy plans for expansion

Approve it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=approve&c=69
Trash it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=trash&c=69
Spam it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=spam&c=69
Currently 18 comments are waiting for approval. Please visit the moderation panel:
http://turtlebayseis.com/tbr/wp-admin/edit-comments.php?comment_status=moderated

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October 26, 2012

To Neil Freeman @ gct@interchange.ubc.ca

I am writing in response to the email you sent on Thursday, September 1, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

The owners of the Turtle Bay Resort acknowledge your opposition to the proposed plan for resort expansion.

The owners share you concerns about existing and future traffic volumes on Kamehameha Highway. The resort is part of the North Shore and Ko`olau Loa communities and is committed to finding workable traffic solutions.

As a two-lane highway serving nearly half the island extending from Kahalu`u to Hale`iwa, Kamehameha Highway has to accommodate local and regional traffic. Extending along a relatively narrow plain between the coastline and the base of the mountains, the highway cannot easily be widened, even if this was what the community wanted. And selective widening along limited straightaways would only exacerbate traffic conditions; eventually the widened roadway segment would have to narrow back to two lanes. Thus, we all have to work together to find alternate solutions.

Limiting development on the North Shore is neither a practical nor realistic answer. Even if there was no further development between Kahalu`u and Hale`iwa, there would still be traffic congestion on the highway. So long as the famed beaches of the North Shore remain an attraction for O`ahu's residents and visitors, people from Honolulu, Hawaii Kai, Kailua, Kane`ohe, Aiea, Pearl City, Waipahu, Ewa, Kapolei, Waianae and Wahiawa will come. As a community, we each must do our part to help reduce traffic and work together to address transportation issues. That means driving smarter, consolidating trips, ride-sharing, and using transit alternatives when possible, to name a few.

To reduce the impacts of the proposed resort expansion, new left-turn lanes and traffic signals will be funded by Turtle Bay Resort where the roads that will access

the resort intersect with Kamehameha Highway. This should help to mitigate the impact of vehicles entering and leaving the resort.
According to our recently completed traffic study, on an annual average basis the proposed resort expansion will increase traffic on the highway by about 4.5% during the morning peak hour and 3.0% during the afternoon peak hour.

In addition, the resort will implement a number of measures designed to reduce resort-related traffic. These will include van shuttle service for employees and guests. The resort is also exploring ways to extend the successful bike path at Malaekahana all the way to Hoalua Street and beyond to Ke Nui Road.

The owners of the resort are also committed to paying their fair-share of the cost for regional traffic improvements to help reduce traffic congestion, as determined by the State Department of Transportation. ("Fair-share" is calculated by the State DOT as a developer's portion of the total cost of new improvements based upon the percentage of new traffic generated by the developer's project.)

The traffic study and mitigation measures mentioned above will be presented in the Draft Supplemental Environmental Impact Statement for the resort.

The cumulative impacts of the proposed Laie development will be presented in the SEIS. The SEIS will also evaluate the adequacy of the Turtle Bay Resort's infrastructure to accommodate the proposed expansion plan.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

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Subject: [Turtle Bay Resort SEIS] Please moderate: "SEIS Preparation Notice"
From: Turtle Bay Resort Development <info@turtlebayseis.com>
Date: Fri, Sep 02, 2011 9:58 am
To: info@turtlebayseis.com

A new comment on the post "SEIS Preparation Notice" is waiting for your approval
http://turtlebayseis.com/seis/prep-notice/

Submitted : Sep 2, 2011 @ 9:58
Author : Joy Silver (IP: 70.95.151.114 , cpe-70-95-151-114.hawaii.res.rr.com)
E-mail : joyofpilates@mac.com
URL :
Address :
City :
State :
Zip :
Phone :
Comment:
I still don't see the need... the present hotel is rarely at capacity. The reason people come to the North Shore and Turtle Bay is to escape. If they wanted a built up resort experience, they would have stayed on the westside or Waikiki. There is a whole community that will be impacted by your plan as well as endangered species and burial sites. The same monk seal has given birth as the same spot 2 years in a row, very rare. With construction and more people in the area another pupping beach will be gone, not what a critically endangered species needs. Your focus should be on improving what is already there not expanding. You can still make money if you use what you already have to it's fullest potential.

Approve it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=approve&c=71
Trash it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=trash&c=71
Spam it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=spam&c=71
Currently 20 comments are waiting for approval. Please visit the moderation panel:
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October 26, 2012

To Joy Silver @ joyofpilates@mac.com

I am writing in response to the email you sent on Friday, September 2, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

We acknowledge your opposition to the proposed expansion of the Turtle Bay Resort and your preference for improving what is already there. However, once you have viewed the Draft SEIS we would hope that your view of the proposed expansion plans might change.

Contrary to your experience, the existing hotel operates at near full occupancy much of the year and visitors seeking reservations are turned away regularly. The proposed expansion plan responds to this demand.

The resort owners share your concern about preserving the rural character of the resort. They recognize that it is a particular attraction to the resort's visitors. Please be assured that the proposed expansion plan focuses on the preservation of this valued coastal resource.

The purpose of preparing the SEIS is to disclose the anticipated impacts that project will have. The SEIS will include an evaluation of marine resources and the impact of the project upon monk seals will be addressed in the SEIS. But, we must respectfully disagree with your assertion that as a result of the project, "...another pupping beach will be gone." There is no evidence to suggest that hauling out of monk seals on O`ahu's beaches is affected by the presence of humans. If that were the case, we would not see monk seals haul out on Waikiki Beach or Kailua Beach in windwind O`ahu.

The SEIS will also include an evaluation of the impacts that the project will have on cultural resources, including burial sites.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

Turtle Bay Resort Expansion

1 message

DDRUZ@aol.com <ddruz@aol.com> **Fri, Sep 2, 2011 at 12:16 AM**
To: ccComments@honolulu.gov, leesichter@gmail.com

Aloha DPP and Lee Sichter,

Please add my vote to those unequivocally opposed to ANY expansion of Turtle Bay Resort. Please do not allow ANY more expansion of Turtle Bay.

Mahalo,
David Druz
59-417 Waka Rd
PO Box 976
Haleiwa, HI 96712

LEE SICHTER LLC

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PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To David Druz @ ddruz@aol.com

I am writing in response to the letter you sent on Friday, September 2, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

We acknowledge your opposition to the proposed expansion of the Turtle Bay Resort. Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

Sincerely & Honestly

1 message

Jeffrey Mironov <jmironov@nyc.rr.com> **Fri, Sep 2, 2011 at 2:40 AM**
To: ccComments@honolulu.gov, leesichter@gmail.com

Offered in utmost respect and consideration for essential change:

We live in a time and corresponding condition that clearly indicates our resistance and failure to learn and change our ways. All throughout our beleaguered country and civilization we are witnessing the deteriorating effects of mindless speculation and profiteering. We are sick as a society and all of our crumbling institutions and infrastructure are indicating this. Yet, still the momentum of our past and thoughtless ways and practices is still dictating and influencing our struggling attempts at necessary, essential, and substantive change. Our thoughtlessness is represented in a general unwillingness and disregard for caring for ourselves and each other. Hence, we have become weak and sick, relying more and more on a system of 'health care' that has nothing to do with Health and is ineffective and unsustainable. And from this compromising and impoverished state of mind, feeling, and behavior we inflict further and ongoing insult and injury to our families, communities, and surrounding environment. And as if this weren't already painfully obvious, this Turtle Bay expansion idea clearly represents the attempt to continue on with our past agendas for 'growth' no matter the cost to ourselves, our neighbors, and beloved homelands.

Our greatest need at this time is for sobriety and the necessary willingness to cease and desist immediately from our destructive and intrusive practices. Just because our existing models for 'progress' suggest continual growth and development does not mean that we should continue to blindly follow these historic dictates. As a global civilization, as a nation, and as an island community and eco-system we must sober up and stop 'doing' what we always do. Spending more money and resources on desperate profiteering schemes is clearly not going to bring about anything but a superficial short term blip of employment and income, while inflicting deeper damage and loss to an already hurt and injured society and environment.

The hand writing is on the wall... everywhere you look. And it is time for us to wake up, sober up, and humble up to the occasion and opportunity that these times and circumstances require and ask of us... every one of us. There is a way forward but it is very different from our established and less than effective habits and historical traditions. The best way I know to proceed is to first stop inflicting and intruding the past on the present. We need a Substantial Pause in order to take stock of the situation we are actually in. Only by first coming to terms with the situation as it is can we find the resources of Spirit, mind, and body to introduce true and effective change that can lead us out of our predatory insensitivities. It is in God, in Life, and in ourselves and each other that we must come to trust... and not in the desperate practices of thoughtless profiteering that has rendered our world, financial system, government, communities, work places, and families sick and impotent. Take Heart, Have Heart, and lets stop this madness!

Peace,

Jeffrey Mironov
59-533 Akanoho Place
Haleiwa, Hi. 96712
212-595-0723 or 917-856-8701

LEE SICHTER LLC

45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Jeffrey Mironov @ jmironov@nyc.rr.com

I am writing in response to the mail you sent on Friday, September 2, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

The resort owners understand your concerns about the failings of the economic-growth paradigm. Consistent with your recommendation, the owner's have paused and taken careful stock of the situation. The owner's representatives have been meeting with the community for over two years in attempt to discover a new vision for Turtle Bay Resort. Proceeding with development as allowed under the current zoning would be consistent with that old model.

As a result of this introspection, the owners are now proposing something quite different. As you will see in the SEIS, they are proposing an entirely new concept for the resort; one founded on the principles of sustainability. Using the experiences and traditions of our host-culture, the development is being scaled back in a manner that is consistent with the Hawaiian concept and practice associated with the ahupua`a. Called Tomorrow's Ahupua`a, this approach is intended to manage development, construction and operations in a sustainable manner sensitive to the environment and respectful to the host Hawaiian culture.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

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Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

Turtle Bay development

1 message

Ev <emagnuson@earthlink.net> Fri, Sep 2, 2011 at 4:59 AM
To: "ccComments@honolulu.gov" <ccComments@honolulu.gov>, "leesichter@gmail.com" <leesichter@gmail.com>

To whom it may concern,

As a condominium owner and frequent visitor to the Turtle Bay area I believe the revised plan for developing the area is still far too large in scale. The addition of two "hotels" straddling the current hotel and the proposed roadway through the property will forever destroy the natural beauty of the area at Turtle Bay.

Secondly, the additional traffic burden that would be placed on the Kamehameha Highway and all of the communities on or near the north shore would be enormous. The infrastructure on the north side of Oahu just can't sustain this added level of traffic.

Respectfully,

Everett Magnuson
Kuilima Estates East

LEE SICHTER LLC

45024 MALULANI STREET #I, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Everett Magnuson @ emagnuson@earthlink.net

I am writing in response to the emails you sent on Friday, September 2, and Wednesday, September 21, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

We acknowledge your opposition to the scale of the proposed expansion plan. The location of the two new hotels in proximity to the Turtle Bay Hotel is intended to minimize development impacts on the remainder of the resort property.

Please note that the SEIS will include the discussion of an alternative development plan that specifically addresses your concerns about the lateral road. The Conservation Partner alternative proposed the preservation of most of the resort's coastal areas. By eliminating development in the outlying areas, the need for the lateral road extending to those areas is reduced. To be implemented, the alternative will require the participation of a third party or parties who would provide economic consideration in lieu of the foregone development rights.

The owners of the Turtle Bay Resort share you concerns about existing and future traffic volumes on Kamehameha Highway. The resort is part of the North Shore and Ko`olau Loa communities and is committed to finding workable traffic solutions.

As a two-lane highway serving nearly half the island extending from Kahalu`u to Hale`iwa, Kamehameha Highway has to accommodate local and regional traffic. Extending along a relatively narrow plain between the coastline and the base of the mountains, the highway cannot easily be widened, even if this was what the community wanted. And selective widening along limited straightaways would only exacerbate traffic conditions; eventually the widened roadway segment would have to narrow back to two lanes. Thus, we all have to work together to find alternate solutions. As a community, we each must do our part to help reduce traffic and work together to address transportation issues. That means driving smarter, consolidating trips, ride-sharing, and using transit alternatives when possible, to name a few.

To reduce the impacts of the proposed resort expansion, new left-turn lanes and traffic signals will be funded by Turtle Bay Resort where the roads that will access the resort intersect with Kamehameha Highway. This should help to mitigate the impact of vehicles entering and leaving the resort. According to our recently

completed traffic study, on an average annual basis the proposed resort expansion will increase traffic on the highway by about 4.5% during the morning peak hour and 3.0% during the afternoon peak hour.

In addition, the resort will implement a number of measures designed to reduce resort-related traffic. These will include van shuttle service for employees and guests. The resort is also exploring ways to extend the successful bike path at Malaekahana all the way to Hoalua Street and beyond to Ke Nui Road.

The owners of the resort are also committed to paying their fair-share of the cost for regional traffic improvements to help reduce traffic congestion, as determined by the State Department of Transportation. ("Fair-share" is calculated by the State DOT as a developer's portion of the total cost of new improvements based upon the percentage of new traffic generated by the developer's project.)

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

Turtle Bay Expansion

1 message

Maria Pacheco <pachecom003@hawaii.rr.com> Fri, Sep 2, 2011 at 8:40 AM
To: ccComments@honolulu.gov, leesichter@gmail.com

I would not like to see Turtle Bay developed. There is no infrastructure to support such a development. Traffic is not only an issue - it is the issue! I'm sorry the developers who keep buying into this money pit want to make money at Turtle Bay. That appears to be their problem. The roads cannot accommodate the traffic we presently have let alone more traffic that a development of this size will bring. More jobs also bring more people and more traffic. We do not want our lands over developed, especially places like Kawel Bay destroyed forever. I would, as a 35 year resident, like to be able to go out on weekends without backed up traffic no matter what way you go. Those of us who live here have to plan our shopping, appointments and time off as it is. We can no longer go to Haleiwa as we were able to do in the past to restaurants or the beach without traffic, traffic, traffic. What about us? Candidates were elected to take care of the people who live here not developers who will come and go and leave the mess for future generations.

Maria Pacheco

LEE SICHTER LLC

45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Maria Pacheco @ pachecom003@hawaii.rr.com

I am writing in response to the email you sent on Friday, September 2, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

The owners of the Turtle Bay Resort share you concerns about existing and future traffic volumes on Kamehameha Highway. The resort is part of the North Shore and Ko`olau Loa communities and is committed to finding workable traffic solutions.

As a two-lane highway serving nearly half the island extending from Kahalu`u to Hale`iwa, Kamehameha Highway has to accommodate local and regional traffic. Extending along a relatively narrow plain between the coastline and the base of the mountains, the highway cannot easily be widened, even if this was what the community wanted. And selective widening along limited straightaways would only exacerbate traffic conditions; eventually the widened roadway segment would have to narrow back to two lanes. Thus, we all have to work together to find alternate solutions.

Limiting development on the North Shore is neither a practical nor realistic answer. Even if there was no further development between Kahalu`u and Hale`iwa, there would still be traffic congestion on the highway. So long as the famed beaches of the North Shore remain an attraction for O`ahu's residents and visitors, people from Honolulu, Hawaii Kai, Kailua, Kane`ohe, Aiea, Pearl City, Waipahu, Ewa, Kapolei, Waianae and Wahiawa will come. As a community, we each must do our part to help reduce traffic and work together to address transportation issues. That means driving smarter, consolidating trips, ride-sharing, and using transit alternatives when possible, to name a few.

To reduce the impacts of the proposed resort expansion, new left-turn lanes and traffic signals will be funded by Turtle Bay Resort where the roads that will access the resort intersect with Kamehameha Highway. This should help to mitigate the impact of vehicles entering and leaving the resort. According to our recently completed traffic study, on an annual average basis the proposed resort expansion will increase traffic on the highway by about 4.5% during the morning peak hour and 3.0% during the afternoon peak hour.

In addition, the resort will implement a number of measures designed to reduce resort-related traffic. These will include van shuttle service for employees and guests. The resort is also exploring ways to extend the successful bike path at Malaekahana all the way to Hoalua Street and beyond to Ke Nui Road.

The owners of the resort are also committed to paying their fair-share of the cost for regional traffic improvements to help reduce traffic congestion, as determined by the State Department of Transportation. ("Fair-share" is calculated by the State DOT as a developer's portion of the total cost of new improvements based upon the percentage of new traffic generated by the developer's project.)

The traffic study and mitigation measures mentioned above will be presented in the Draft Supplemental Environmental Impact Statement for the resort. Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

Turtle Bay Expansion

1 message

scott langford <beachhousehawaii@hotmail.com> Fri, Sep 2, 2011 at 8:54 AM
To: cccomments@honolulu.gov, leesichter@gmail.com

1. As a resident of the North Shore for 16 years, I would like to express my concern over ANY new development at Turtle Bay. The traffic out here is so horrendous already without any new development and has gotten progressively worse year after year. One of the main reasons for the North Shore's beauty is the scenic surroundings without hotel's and major condominium projects. It will be a sad day for Hawaii if the North Shore changes any more than it already has. Please DO NOT allow any more construction at Turtle Bay, enough is enough already….
Mahalo and Aloha,
Scott Langford

LEE SICHTER LLC
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PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Scott Langford @ beachhousehawaii@hotmail.com

I am writing in response to the emails you sent on Wednesday, August 24, 2011 and Friday, September 2, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

The owners of the Turtle Bay Resort acknowledge your opposition to the proposed expansion plan.

The owners share you concerns about existing and future traffic volumes on Kamehameha Highway. The resort is part of the North Shore and Ko`olau Loa communities and is committed to finding workable traffic solutions.

As a two-lane highway serving nearly half the island extending from Kahalu`u to Hale`iwa, Kamehameha Highway has to accommodate local and regional traffic. Extending along a relatively narrow plain between the coastline and the base of the mountains, the highway cannot easily be widened, even if this was what the community wanted. And selective widening along limited straightaways would only exacerbate traffic conditions; eventually the widened roadway segment would have to narrow back to two lanes. Thus, we all have to work together to find alternate solutions.

Limiting development on the North Shore is neither a practical nor realistic answer. Even if there was no further development between Kahalu`u and Hale`iwa, there would still be traffic congestion on the highway. So long as the famed beaches of the North Shore remain an attraction for O`ahu's residents and visitors, people from Honolulu, Hawaii Kai, Kailua, Kane`ohe, Aiea, Pearl City, Waipahu, Ewa, Kapolei, Waianae and Wahiawa will come. As a community, we each must do our part to help reduce traffic and work together to address transportation issues. That means driving smarter, consolidating trips, ride-sharing, and using transit alternatives when possible, to name a few.

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the resort intersect with Kamehameha Highway. This should help to mitigate the impact of vehicles entering and leaving the resort. According to our recently completed traffic study, on an annual average basis the proposed resort expansion will increase traffic on the highway by about 4.5% during the morning peak hour and 3.0% during the afternoon peak hour.

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The traffic study and mitigation measures mentioned above will be presented in the Draft Supplemental Environmental Impact Statement for the resort.

The resort owners also share your concerns about protecting the coastal environment. The proposed plan is designed to ensure that the Turtle Bay Resort coastline is not adversely impacted.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

development on the north shore

1 message

Kekai Paulsen <kekaip@yahoo.com> **Fri, Sep 2, 2011 at 9:06 AM**
To: ccComments@honolulu.gov, leesichter@gmail.com

The North Shore is already congested with traffic on a regular basis- this is only going to make things worse- The developers do not care about our way of life- enjoying the ocean with our families and getting away from the city- The situation with traffic is already ridiculous- adding hotels and condos will only increase the volume of people and cars. The developers and people behind this DO NOT CARE about OUR way of life- please help to preserve the north shore for our children.

Thank You-
Kekai Paulsen

LEE SICHTER LLC

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PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Kekai Paulsen @ kekaip@yahoo.com

I am writing in response to the email you sent on Friday, September 2, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

The owners of the Turtle Bay Resort share you concerns about existing and future traffic volumes on Kamehameha Highway. The resort is part of the North Shore and Ko`olau Loa communities and is committed to finding workable traffic solutions.

As a two-lane highway serving nearly half the island extending from Kahalu`u to Hale`iwa, Kamehameha Highway has to accommodate local and regional traffic. Extending along a relatively narrow plain between the coastline and the base of the mountains, the highway cannot easily be widened, even if this was what the community wanted. And selective widening along limited straightaways would only exacerbate traffic conditions; eventually the widened roadway segment would have to narrow back to two lanes. Thus, we all have to work together to find alternate solutions.

Limiting development on the North Shore is neither a practical nor realistic answer. Even if there was no further development between Kahalu`u and Hale`iwa, there would still be traffic congestion on the highway. So long as the famed beaches of the North Shore remain an attraction for O`ahu's residents and visitors, people from Honolulu, Hawaii Kai, Kailua, Kane`ohe, Aiea, Pearl City, Waipahu, Ewa, Kapolei, Waianae and Wahiawa will come. As a community, we each must do our part to help reduce traffic and work together to address transportation issues. That means driving smarter, consolidating trips, ride-sharing, and using transit alternatives when possible, to name a few.

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Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

north shore

1 message

lizettevb@aol.com <lizettevb@aol.com> **Fri, Sep 2, 2011 at 5:19 PM**
To: ccComments@honolulu.gov, leesichter@gmail.com

With the economy the way it is, I feel until the roads get better, we do not need another addition to hotels on the North Shore. The majority of the jobs the tourist industry on the NS generates are not for the locals but for the transient young folks that follow the surf.

LEE SICHTER LLC
45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Lizette @ lizettevh@aol.com

I am writing in response to the email you sent on Friday, September 2, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

The owners of the Turtle Bay Resort share you concerns about existing and future traffic volumes on Kamehameha Highway. The resort is part of the North Shore and Ko`olau Loa communities and is committed to finding workable traffic solutions.

As a two-lane highway serving nearly half the island extending from Kahalu`u to Hale`iwa, Kamehameha Highway has to accommodate local and regional traffic. Extending along a relatively narrow plain between the coastline and the base of the mountains, the highway cannot easily be widened, even if this was what the community wanted. And selective widening along limited straightaways would only exacerbate traffic conditions; eventually the widened roadway segment would have to narrow back to two lanes. Thus, we all have to work together to find alternate solutions.

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The traffic study and mitigation measures mentioned above will be presented in the Draft Supplemental Environmental Impact Statement for the resort.

With regard to your comment about who the resort's current employees tend to be, although some of its employees surf, for clarification the vast majority of the approximately 518 employees are long term employees who make a solid living for their families with good wages and benefits. Also, more than 85% of the employees live in North Shore communities, are from families who been on the North Shore for generations and are a diversified representation of all walks of life in the local community.

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Very truly yours

Lee Sichter

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Subject: [Turtle Bay Resort SEIS] Please moderate: "SEIS Preparation Notice"
From: Turtle Bay Resort Development <info@turtlebayseis.com>
Date: Fri, Sep 02, 2011 10:01 pm
To: info@turtlebayseis.com

A new comment on the post "SEIS Preparation Notice" is waiting for your approval
http://turtlebayseis.com/seis/prep-notice/

Submitted : Sep 2, 2011 @ 22:01
Author : William Barrera (IP: 66.91.174.234 , cpe-66-91-174-234.hawaii.res.rr.com)
E-mail : cuchillo@live.com
URL :
Address :
City :
State :
Zip :
Phone :
Comment:
As a North Shore resident and home owner I think it is so irresponsible to seriously consider this plan. This side of the island is already so congested with traffic and over developed. The country is no more country and that is a shame, ten years ago the North shore was half as crowded as it is now. I work on the south shore and it really takes me more time to get to Haleiwa from Sunset than it takes me to reach town from Haleiwa. Weekends are a totally different story, we joke that we are prisoners of the point, but thats not a funny joke. This is our beautiful home not an open market for big money to make more money, our community and families are ready to fight this like we always have. Please don't ruin our special place, learn from the past and help conserve this already over developed paradise. Mahalo

Approve it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=approve&c=72
Trash it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=trash&c=72
Spam it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=spam&c=72
Currently 21 comments are waiting for approval. Please visit the moderation panel:
http://turtlebayseis.com/tbr/wp-admin/edit-comments.php?comment_status=moderated

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PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To William Barrera @ cuchillo@live.com

I am writing in response to the email you sent on Friday, September 2, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

The owners of the Turtle Bay Resort share you concerns about existing and future traffic volumes on Kamehameha Highway. The resort is part of the North Shore and Ko`olau Loa communities and is committed to finding workable traffic solutions.

As a two-lane highway serving nearly half the island extending from Kahalu`u to Hale`iwa, Kamehameha Highway has to accommodate local and regional traffic. Extending along a relatively narrow plain between the coastline and the base of the mountains, the highway cannot easily be widened, even if this was what the community wanted. And selective widening along limited straightaways would only exacerbate traffic conditions; eventually the widened roadway segment would have to narrow back to two lanes. Thus, we all have to work together to find alternate solutions.

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In 1977, an amendment to the Oahu General Plan, voted on by the residents of the City and County of Honolulu, designated the Kuilima Hotel property to be reclassified as a Visitor Destination Area. Several years later, the Ko`olauloa Development Plan was adopted by the City as a means of implementing the General Plan. It depicted the Kuilima property as a resort. In 1986, the City Council approved an expansion plan for the resort that allows the development of five new hotels. It was decided at that time, that the development was needed to create new jobs in the region and to support the continuing health of the visitor industry.

In 1999, the Ko`olualoa Development Plan was replaced with Ko`olau Loa Sustainable Communities Plan. The principal difference between the two plans is that the latter established an urban growth boundary that was intended to limit development and protect the rural character of the region. Because the Turtle Bay Resort property was reclassified to the Urban district about 14 earlier, it is fully contained within the Growth Boundary.

Together, these plans and policies are intended to ensure that the rural character of the North Shore is preserved for future generations.

The resort property, as zoned for expansion, is included in the City's population guidelines for the Ko`olau Loa District, which in the late 1990's reduced Ko`olau Loa's islandwide share of population from 1.8 percent to 1.4 percent.

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Very truly yours

Lee Sichter

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Subject: **[Turtle Bay Resort SEIS] Please moderate: "History"**
From: **Turtle Bay Resort Development <info@turtlebayseis.com>**
Date: **Sat, Sep 03, 2011 9:07 am**
To: **info@turtlebayseis.com**

A new comment on the post "History" is waiting for your approval
http://turtlebayseis.com/community/history/

Submitted : Sep 3, 2011 @ 9:07
Author : Paul Nelson (IP: 68.91.0.170 , cpe-66-91-0-170.hawaii.res.rr.com)
E-mail : sightpacific@hawaii.rr.com
URL :
Address :
City :
State :
Zip :
Phone :
Comment:
Your plans will eventuate the emotional displacement of a longterm culture, laid back,
slow, and brown, in favor of a mainland-minded,
entrepreneurial caste of investors and travelling
strangers. It will bring a four lane highway and
mainlaind "upscale" values. This is similar to
the takeover of Hawaii in the 1890's from the existing, local population. Profit is a religion that obscuresand diffuses cultures
that live differently,
quietly, with less damage to the land and access
to the shore. Perhaps it is in our species nature
now to define progress by profit. Damn shame.
Your motives bring Waikiki to the North Shore,
because the local culture is not aggressive and
hasn't the political clout that big money brings.
We have enough hotels, condos, etc on the islands. Water sources are threatened and
neghborhoods can be lost to highways. I doubt
you wish to hear this thinking and are perhaps
locked into your abstract deals.

Approve it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=approve&c=73
Trash it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=trash&c=73
Spam it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=spam&c=73
Currently 22 comments are waiting for approval. Please visit the moderation panel:
http://turtlebayseis.com/tbr/wp-admin/edit-comments.php?comment_status=moderated

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PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Paul Nelson @ sightpacific@hawaii.rr.com

I am writing in response to the email you sent on Saturday, September 3, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

1. We respectfully disagree with your conclusion that the proposed expansion plan will "eventuate the emotional displacement of a longterm culture..." As expressed in the SEIS, the overall goal of the project is *to manage design, development, construction and operations in a sustainable manner sensitive to the environment and respectful to the host Hawaiian culture.*
2. The resort's owners share your concerns about traffic. The SEIS will include a traffic study that evaluates the impacts of the proposed project on Kamehameha Highway.
3. Unlike the actions of the Committee for Public Safety in 1895 that resulted in overthrowing the Hawaiian Kingdom, the proposed project represents the culmination of the public will and the planning process. In 1977, an amendment to the Oahu General Plan, voted on by the residents of the City and County of Honolulu, designated the Kuilima Hotel property to be reclassified as a Visitor Destination Area. Several years later, the Ko`olauloa Development Plan was adopted by the City as a means of implementing the General Plan. It depicted the Kuilima property as a resort. In 1986, the City Council approved an expansion plan for the resort that allows the development of five new hotels. It was decided at that time, that the development was needed to create new jobs in the region and to support the continuing health of the visitor industry.

   In 1999, the Ko`olualoa Development Plan was replaced with Ko`olau Loa Sustainable Communities Plan. The principal difference between the two plans is that the latter established a growth boundary that was intended to limit development and protect the rural character of the region. Because the Turtle Bay Resort property was reclassified to the Urban district about 14 earlier, it is fully contained within the Growth Boundary.

   Together, these plans and policies are intended to ensure that the rural character of the North Shore is preserved for future generations.
4. The SEIS will evaluate the proposed project's impacts on water resources.
5. Although the project is obligated to provide new left-turn lanes on Kamehameha Highway, no neighborhoods will be lost to highway widening or the construction of new highways.
6. We very much appreciate you sharing your ideas about the impacts of capitalism on culture.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

The official review and comment period will last 45 calendar days from the date that the OEQC publishes the Notice of Availability in its *Environmental Notice.* You can find the *Environmental Notice* on-line at the OEQC website:

http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

Turtle Bay project

1 message

Beth Hyams <bhyams@gmail.com> **Sat, Sep 3, 2011 at 4:25 AM**
To: ccComments@honolulu.gov, leesichter@gmail.com

Dear Mr. Sichter:

As a homeowner on the North Shore, I am deeply distressed over the Turtle Bay proposal -- even as it's been revised.

My family has enjoyed, and invested in, the North Shore community for almost 40 years. We love the ocean, the clean air, and the overall beauty of the place. We're happy to share with visitors, but don't want to see the unspoiled natural wonders diminished by traffic and over-development.

As you know, traffic is already a big problem on the North Shore. The solution is not to build developments that will worsen the problem. The solution is to decide that Hawaii's rural areas are worth protecting, and that there's a limit to what an area can take.

Please reject this proposal, and preserve the qualities that attract people to Hawaii to begin with.

Thank you for your consideration.
Sincerely,
Beth Hyams
Owner, 59-329-A Ke Nui Rd, Hale'iwa, HI

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October 26, 2012

To Beth Hyams @ bhyams@gmail.com

I am writing in response to the email you sent on Saturday, September 3, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. I understand that you oppose the proposed resort expansion plan. However, we hope that once you have had an opportunity to review the project's Draft SEIS that discusses the project in detail, you might decide that the project is worthy of your support.

In 1977, an amendment to the Oahu General Plan, voted on by the residents of the City and County of Honolulu, designated the Kuilima Hotel property to be reclassified as a Visitor Destination Area. Several years later, the Ko`olauloa Development Plan was adopted by the City as a means of implementing the General Plan. It depicted the Kuilima property as a resort. In 1986, the City Council approved an expansion plan for the resort that allows the development of five new hotels. It was decided at that time, that the development was needed to create new jobs in the region and to support the continuing health of the visitor industry.

In 1999, the Ko`olualoa Development Plan was replaced with Ko`olau Loa Sustainable Communities Plan. The principal difference between the two plans is that the latter established an Urban Growth Boundary that was intended to limit development and protect the rural character of the region. Because the Turtle Bay Resort property was reclassified to the Urban district about 14 earlier, it is fully contained within the Urban Growth Boundary.

Very little has changed in Ko`olau Loa and on the North Shore since those planning decisions were made. The population is still about the same and the infrastructure is still about the same. Thus, the determination then that region could support a resort still holds true today.

Limiting development on the North Shore is neither a practical nor realistic answer. Even if there was no further development between Kahalu`u and Hale`iwa, there would still be traffic congestion on the two-lane highway. So long as the famed beaches of the North Shore remain an attraction for O`ahu's residents and visitors, people from Honolulu, Hawaii Kai, Kailua, Kane`ohe, Aiea, Pearl City, Waipahu, Ewa, Kapolei, Waianae and Wahiawa will come. As a community, we each must do our part to help reduce traffic and work together to address transportation issues. That

means driving smarter, consolidating trips, ride-sharing, and using transit alternatives when possible, to name a few.

To reduce the impacts of the proposed resort expansion, new left-turn lanes and traffic signals will be funded by Turtle Bay Resort where the roads that will access the resort intersect with Kamehameha Highway. This should help to mitigate the impact of vehicles entering and leaving the resort. According to our recently completed traffic study, on an average annual basis the proposed resort expansion will increase traffic on the highway by about 4.5% during the morning peak hour and 3.0% during the afternoon peak hour.

In addition, the resort will implement a number of measures designed to reduce resort-related traffic. These will include van shuttle service for employees and guests. The resort is also exploring ways to extend the successful bike path at Malaekahana all the way to Hoalua Street and beyond to Ke Nui Road.
The owners of the resort are also committed to paying their fair-share of the cost for regional traffic improvements to help reduce traffic congestion, as determined by the State Department of Transportation. ("Fair-share" is calculated by the State DOT as a developer's portion of the total cost of new improvements based upon the percentage of new traffic generated by the developer's project.)

The traffic study and mitigation measures mentioned above will be presented in the Draft Supplemental Environmental Impact Statement for the resort.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

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Subject: [Turtle Bay Resort SEIS] Please moderate: "SEIS Preparation Notice"
From: Turtle Bay Resort Development <info@turtlebayseis.com>
Date: Sat, Sep 03, 2011 1:03 pm
To: info@turtlebayseis.com

A new comment on the post "SEIS Preparation Notice" is waiting for your approval
http://turtlebayseis.com/seis/prep-notice/

Submitted : Sep 3, 2011 @ 13:03
Author : Adrian Izweriw (IP: 64.134.234.215 , 64.134.234.215)
E-mail : scrapion@hotmail.com
URL :
Address :
City :
State :
Zip :
Phone :
Comment:
I am relatively new resident on the North Shore and notice there is already way too much traffic volume for the current road. Before any further development that should be addressed and if that is not resolved there should NO new development on the North Shore at all.

Adrian Izweriw

Approve it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=approve&c=74
Trash it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=trash&c=74
Spam it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=spam&c=74
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October 26, 2012

To Adrian Izweriw @ scrapion@hotmail.com

I am writing in response to the email you sent on Saturday, September 3, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

The owners of the Turtle Bay Resort share you concerns about existing and future traffic volumes on Kamehameha Highway. The resort is part of the North Shore and Ko`olau Loa communities and is committed to finding workable traffic solutions.

As a two-lane highway serving nearly half the island extending from Kahalu`u to Hale`iwa, Kamehameha Highway has to accommodate local and regional traffic. Extending along a relatively narrow plain between the coastline, existing development and the base of the mountains, the highway cannot easily be widened. And selective widening along limited straightaways would likely only exacerbate traffic conditions; eventually the roadway would have to narrow back to two lanes. Thus, we all have to work together to find innovative alternate solutions.

Limiting development on the North Shore is neither a practical or realistic answer. Even if there was no further development between Kahalu`u and Hale`iwa, there would still be traffic congestion on the highway. So long as the famed beaches and special communities of the North Shore remain an attraction for O`ahu's residents and visitors from around the world, people will come. As a community, we each must do our part to help reduce traffic and work together to address transportation issues. That means driving smarter, consolidating trips, ride-sharing, and using transit alternatives when possible, to name a few.

To reduce the impacts of the proposed resort expansion, new left-turn lanes and traffic signals will be funded by Turtle Bay where the roads that will access the resort intersect with Kamehameha Highway. This should help to mitigate the impact of vehicles entering and leaving the resort. According to our recently completed traffic study, on an annual average basis the proposed resort expansion will increase traffic on the highway by about 4.5% during the morning peak hour and 3.0% during the afternoon peak hour.

In addition, the resort will implement a number of measures designed to reduce resort-related traffic. These will include van shuttle service for employees and guests. The owners of the resort are also committed to paying their fair-share of the

cost for regional traffic improvements to help reduce traffic congestion, as determined by the State Department of Transportation. The resort is also exploring ways to extend the successful bike path at Malaekahana all the way to Hoalua Street and beyond to Ke Nui Road.

The traffic study and mitigation measures mentioned above will be presented in the Draft Supplemental Environmental Impact Statement for the resort. Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

Proposed Turtle Bay Resort development

1 message

Mary Jo Buell <alohamjb@hotmail.com> **Sat, Sep 3, 2011 at 2:16 PM**
To: cccomments@honolulu.gov, leesichter@gmail.com

Dear Sir,
I am a home owner at Sunset Beach and have lived in this area since 1972. My children attended Kahuku High School and I worked there for 25 yrs. This area could remain greener and less built up as others if you would help. Your proposal is still too large. Think about it, the traffic alone will add to our nightmare situation. Yes, we have turtles and too many vacation rentals ,however, you are adding to the problem with too many rooms. I would like to ask you to build on a much smaller scale for that reason alone. The endangered animals could be protected better by less building as well as be an asset to Hawaii as a venue to promote animal welfare the green initiative, and tourism. The farmers are unique; where can you go to buy fruit or shrimp from the farmer himself. That is an attraction, at least I think so and they are becoming destinations for tourists driving around the island. The North Shore has the best beaches by far and they are used by visitors daily, we should protect them with less building and disruption. We don't want to be larger and built up like other island destination resort areas. Stay small and special. That's the attraction, anyone can go to fancy hotels on this island, but they all have the same feeling.....cookie cutter niceness with a splash of Hawaiiana.

The North Shore is so great in many ways which will give all of us lasting memories when we visit but more hotels are just more hotels. Do we need them? I don't think so.

Sincerely,
Mary Jo Buell
59-236 Kam. Hwy.
Haleiwa, Hi. 96712

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PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Mary Jo Buell @ alohamjb@hotmail.com

I am writing in response to the email you sent on Saturday, September 3, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

The current plan proposed the addition of two new hotels, one with 375 units and the other with 250 units. This is far fewer than the 2,500 hotel units allowable under the current zoning for the property. The resort owners have also included a new alternative in the SEIS that would further reduce to the number of proposed hotel units. The Conservation Partner alternative proposes that the development be centralized around the existing hotel and that much of the remaining coastline be preserved as open space. To be implemented, it will require the participation of a third party or parties who would provide economic consideration in lieu of the foregone development rights.

A marine resources study is being prepared for inclusion in the Draft SEIS. It will specifically address existing conditions pertaining to monk seals and turtles. The resort owners share your concerns about protecting both species.

The resort's owners have already placed protocols in place that help to ensure that Hawaiian monk seals are not disturbed once they haul up. Volunteers immediately cordon off the area and maintain a presence (at a discrete distance) to intercept curious onlookers.

With regard to farming, the resort owners have been working with the Trust for Public Lands to establish a conservation easement over all the agricultural land the resort owns mauka of Kamehameha Highway. This action will ensure that the land is preserved for farming. The proposed plan for the resort now includes a Farmers' Market and the SEIS will discuss how the resort can become more sustainable.

Finally, the revised master plan upon which the expansion plan is based embraces the preservation of Hawaiian culture and incorporates its core values into the proposed development. We hope that once you have reviewed the SEIS, your opinions about the proposed development may change.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Lee Sichter <leesichter@gmail.com>

To ALL "The GREEDY Fat Cat's"!!!

1 message

Emilia Perry <emiliadas@aol.com> **Sat, Sep 3, 2011 at 11:36 PM**
To: ccComments@honolulu.gov, leesichter@gmail.com, emiliadas@aol.com

To ANYONE TRULY Listening,

This 'Aina is sacred and most critically special!
I just DON"T understand why Greedy, Mainland Corporations have sooo much power and control over our Hawaii based Law Makers.
Aren't our Politicians STILL supposed to be, "FOR THE PEOPLE BY THE PEOPLE!"!!?
The Larger majority of the Hawaii population BOLDLY PROCLAIMS, "WE DON'T WANT YOUR EXPANSION AND EXPLOITATION!!!",
but yet our politicians keep insisting on having meeting after exhausting meeting between the community and the so called corporate spokes people...
These meetings I might add, are nearly always on a bizarre time frame that is NOT user friendly to our LOCAL, HARD WORKING COMMUNITY!
Of course the corporate representatives who have nothing but their agenda to push, can make all the time in the world to be at these meetings.

It's beginning to appear to me that our Hawaii State Law Makers are lining their pockets with DIRTY PERSUASION MONEY?!!!
What are 'The PEOPLE Of HAWAII' even going to get back as a reward for dealing with such a long term, life changing, horrific burden?
WEEEE!!!! The Corporations offer a few more low, Minimum Wage paying jobs for the community.
How generous of them???

If Hawaii's vital economy keeps getting siphoned out (STOLEN) through Mainland Corporate interests, there will be nothing left for 'The People of Hawaii'!!!
In Hawaiian custom, a person who takes away a grain of 'Aina from sacred Hawaii is accursed.
When we siphon away our Hawaiian economy is it any different????

Let's not think as greedy individuals but let's us truly think on what's best for the entire population of 'TRUE HAWAII' and for the long term!!!

We already have 1 Waikiki!!!
Let's "KEEP THE COUNTRY, COUNTRY!"!!!!!!!!
NO MORE GREEDY DEVELOPMENT!!!!!!!!!

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October 26, 2012

To Emilia Perry @ emiliadas@aol.com

I am writing in response to the letter you sent on Saturday, September 3, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

We acknowledge your opposition to the proposed expansion of the Turtle Bay Resort. However, once you have viewed the Draft SEIS we would hope that view of the proposed expansion plans might change. The SEIS is intended to disclose the impacts resulting from the development of a project that was approved over 25 years ago but has been delayed due to changes in ownership and economic challenges. The current owners are not seeking any new discretionary permits or approvals. The owners are not trying to persuade anyone. Rather, their representatives have been meeting with the community for nearly two years to gain insight about how best to proceed with the long-stalled development.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

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Subject: [Turtle Bay Resort SEIS] Please moderate: "SEIS Preparation Notice"
From: Turtle Bay Resort Development <info@turtlebayseis.com>
Date: Sat, Sep 03, 2011 8:59 pm
To: info@turtlebayseis.com

A new comment on the post "SEIS Preparation Notice" is waiting for your approval
http://turtlebayseis.com/seis/prep-notice/

Submitted : Sep 3, 2011 @ 20:59
Author : Tait Duryea (IP: 50.113.6.8 , 50.113.6.8)
E-mail : taitduryea@gmail.com
URL :
Address :
City :
State :
Zip :
Phone :
Comment:
The North Shore of Oahu is a pristine and sacred place that should be preserved. I speak for myself and the people of Hawaii when I say that we adamantly oppose this development.
Keep the country country.

Approve it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=approve&c=75
Trash it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=trash&c=75
Spam it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=spam&c=75
Currently 24 comments are waiting for approval. Please visit the moderation panel:
http://turtlebayseis.com/tbr/wp-admin/edit-comments.php?comment_status=moderated

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PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Tait Duyrea @ taitduryea@gmail.com

I am writing in response to the email you sent on Saturday, September 3, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

The owners of the Turtle Bay Resort acknowledge your opposition to the proposed expansion plan.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

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Subject: [Turtle Bay Resort SEIS] Please moderate: "SEIS Preparation Notice"
From: Turtle Bay Resort Development <info@turtlebayseis.com>
Date: Sun, Sep 04, 2011 7:27 am
To: info@turtlebayseis.com

A new comment on the post "SEIS Preparation Notice" is waiting for your approval
http://turtlebayseis.com/seis/prep-notice/

Submitted : Sep 4, 2011 @ 7:27
Author : Edie Claire (IP: 74.98.226.218 , pool-74-98-226-218.pitbpa.fios.verizon.net)
E-mail : ediecaire@juno.com
URL :
Address :
City :
State :
Zip :
Phone :
Comment:
I live on the mainland; Oahu is my favorite vacation destination in the world. I have stayed at the Turtle Bay Resort on multiple occasions and thoroughly enjoy its uniqueness, including its placement along such a beautiful, wild strip of coastline and its stunning proximity to the water. I have recommended it to everyone I know. If this expansion proceeds, I will never stay there again.

The wild, unspoiled nature of the North Shore IS what makes Turtle Bay. Your expansion would make the resort no different from any of hundreds of others on beaches all over the world that offer little more than sand, water, and other people. At Turtle Bay, you can take a stroll to Kawela, see wild turtles, ride a horse on the beach, and watch humpbacks frolicking in the waves. You can take a birding walk and see species not in existence on the mainland. You can snorkel in an amazing protected cove that is never overcrowded and is always rife with interesting sea life. THIS is why people come to Turtle Bay!

People who want to say they've been to Hawaii, when all they really want to do is sun themselves on a beach and drink and shop, will find more than enough hotels to accommodate them in Waikiki--or now, Ko Olina. The people who find their way to Turtle Bay, on the other hand, do so because they LIKE IT THE WAY IT IS. Build on that concept. Advertise the wildnemess, the wildness. Remodel some of the older rooms. Charge more for them--I don't care. But please...do NOT turn Turtle Bay into ONE MORE GENERIC beach resort--forever ruining a precious cultural and natural resource of Hawaii in the process.

I have never heard a single person say they cancelled a vacation to Hawaii because there weren't enough hotel rooms or condominiums available. Scores go empty every night, all year round. Scores would go empty at Turtle Bay if this expansion plan proceeds, because it would not have the appeal you seem to believe it would. And in the meantime, you will have destroyed something--taken something not just from the residents of Oahu, but from all of us--that can never, ever be recovered.

Thank you for your consideration,
Edie Claire

Approve it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=approve&c=76
Trash it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=trash&c=76
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PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Edie Claire @ edieclaire@juno.com

I am writing in response to the letter you sent on Sunday, September 4, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

We acknowledge your opposition to the proposed expansion of the Turtle Bay Resort. However, once you have viewed the Draft SEIS we would hope that view of the proposed expansion plans might change. We believe that the natural character of the coastline is preserved and protected by the proposed plan.

Contrary to your experience, the existing hotel operates at full occupancy much of the year and visitors seeking reservations are turned away regularly. The proposed expansion plan responds to this demand.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

The official review and comment period will last 45 calendar days from the date that the OEQC publishes the Notice of Availability in its *Environmental Notice*. You can find the *Environmental Notice* on-line at the OEQC website:

http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

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Subject: [Turtle Bay Resort SEIS] Please moderate: "Submitting an SEIS Comment"
From: Turtle Bay Resort Development <info@turtlebayseis.com>
Date: Mon, Sep 05, 2011 8:15 pm
To: comments@turtlebayseis.com

A new comment on the post "Submitting an SEIS Comment" is waiting for your approval
http://turtlebayseis.com/seis/submitting-an-seis-comment/

Submitted : Sep 5, 2011 @ 17:16
Author : kpahinui (IP: 66.75.107.235 , cpe-66-75-107-235.hawaii.res.rr.com)
E-mail : pahinuik001@hawaii.rr.com
URL :
Address : 67-237 Kaui St
City : Waialua
State : HI
Zip : 96791
Phone : 808-637-8545
Comment:
Aloha -

Mahalo for the time that Replay and Turtle Bay Resort have given to the community in the development of the SEIS prep notice. I have a few comments for further review in the SEIS:

1) Iwi - Very critical that areas are well studied and despite the comment that the areas near the shore and in the Kawela area have been disturbed in the past so there are no iwi there - past development has shown that iwi are not necessarily near the surface and can be several feet down. Take into consideration what happened at the Keeaumoku Wal-Mart and the former Whole Foods site at the Ward Complex in town. Any development near the shoreline should be reconsidered and all shoreline put into conservation in perpetuity.

2) Monk Seal and Green Turtle Habitats - Another reason that the shoreline setback should be as deep as possible. Monk Seals are highly endangered and we must protect this unique and special species. In fact the State wants to bring Monk Seal pups from the Northwestern islands to the Main islands so they have a chance to thrive. Turtle Bay could become a world class "nursery" for Monk Seal pups.

3) Open Coastline - One alternative not studied was to place all development in the current footprint. Spreading it out along the shore does not preserve the precious coastline for future generations.

4) Number of Hotels - It is really 3 hotels with 2 connected by a walkway / outdoor area. Saying it is 2 hotels when it is not, is a bit of sophistry not worthy of maintaining. Let's call it as it really is.

5) Cultural Guidelines - This will only be meaningful if it is a requirement that all future parcel owners must follow as part of the deed of sale otherwise it is just window dressing. Since Replay is only the master planner, most likely not the developer, there is absolutely no guarantee that future developers will even listen to our concerns and honor the Hawaiian culture in appropriate ways. In addition, the use of certain Hawaiian words such as "piko" in an inappropriate way, is culturally insensitive and should not be done.

Mahalo for your time and consideration. I look forward to the Draft SEIS.

Kathleen M. Pahinui

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Trash it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=trash&c=79
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October 26, 2012

To Kathleen Pahinui @ pahinuik001@hawaii.rr.com

I am writing in response to the email you sent on Monday, September 5, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

1. Please be assured that the concern for the potential disturbance of cultural sites and burials is of the highest importance to the resort owners. To that end, an entirely new archaeological inventory survey has been conducted on the property voluntarily by the Owner and is presented in its entirety in the Draft SEIS. The study was conducted in direct response to the recommendations made by the SHPO but was not required and has been carefully coordinated with that office. A plan for the study's implementation was submitted to and approved by SHPO before any fieldwork commenced.
2. The marine resources analysis being conducted for the SEIS will include an evaluation of the proposed project's impacts upon monk seals and green sea turtles. The report and its findings will be included in the SEIS.
3. In its Alternatives Analysis, the Draft SEIS includes and evaluates the feasibility of a Conservation Partner Alternative that proposes to withdraw development from much of the coastline and centralize it around the existing hotel as you recommend. The implementation of the Conservation Partner Alternative is subject to the participation of a third party or parties who would provide significant economic consideration in lieu of the foregone development rights.
4. The Proposed Action contains two hotels on two parcels; one with 375 rooms and the other with 250 rooms. The larger is proposed to be contained in at least two structures with the Gathering Place between them, which not unsimilar to other resort hotels with commercial and entertainment retail support space.
5. The owners' representative has stated publically that Covenants, Conditions and Restrictions (CC&Rs), or project documents will be formulated to make sure that the cultural guidelines are part of the recorded documents and will run with title for the property. This will allow for proper management and enforcement of these commitments in perpetuity.
6. The term "piko" has been removed from the SEIS.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

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Subject: [Turtle Bay Resort SEIS] Please moderate: "SEIS Preparation Notice"
From: Turtle Bay Resort Development <info@turtlebayseis.com>
Date: Mon, Sep 05, 2011 7:56 am
To: info@turtlebayseis.com

A new comment on the post "SEIS Preparation Notice" is waiting for your approval
http://turtlebayseis.com/seis/prep-notice/

Submitted : Sep 5, 2011 @ 7:56
Author : Maxwell Brick (IP: 75.80.212.60 , cpe-75-80-212-60.hawaii.res.rr.com)
E-mail : maxwellbrick@gmail.com
URL :
Address :
City :
State :
Zip :
Phone :
Comment:
There seems to be no plan to support the increase of "Pedestrian and VEHICULAR Circulation". There is one main "arterial" road that most residents and visitors use: Kamehameha Hwy. There is no plan to address the necessary modification to this singular artery over rest of the long stretch of pavement through Haleiwa and south to Wahiawa. There is a plan to accommodate more people at the resort and community, but there is no feasible plan to address the additional traffic these people are sure to create. As they arrive and depart, and when they transit the existing road infrastructure to destinations across the island, there will be more traffic on existing roads. There is no adequate plan for traffic infrastructure improvement. No new development should begin without solving the problem of "vehicular circulation" first.

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Trash it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=trash&c=78
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October 26, 2012

To Maxwell Brick @ maxwellbrick@gmail.com

I am writing in response to the email you sent on Monday, September 5, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

The owners of the Turtle Bay Resort share you concerns about existing and future traffic volumes on Kamehameha Highway. The resort is part of the North Shore and Ko`olau Loa communities and is committed to finding workable traffic solutions.

As a two-lane highway serving nearly half the island extending from Kahalu`u to Hale`iwa, Kamehameha Highway has to accommodate local and regional traffic. Extending along a relatively narrow plain between the coastline and the base of the mountains, the highway cannot easily be widened, even if this was what the community wanted. And selective widening along limited straightaways would only exacerbate traffic conditions; eventually the widened roadway segment would have to narrow back to two lanes. Thus, we all have to work together to find alternate solutions.

Limiting development on the North Shore is neither a practical nor realistic answer. Even if there was no further development between Kahalu`u and Hale`iwa, there would still be traffic congestion on the highway. So long as the famed beaches of the North Shore remain an attraction for O`ahu's residents and visitors, people from Honolulu, Hawaii Kai, Kailua, Kane`ohe, Aiea, Pearl City, Waipahu, Ewa, Kapolei, Waianae and Wahiawa will come. As a community, we each must do our part to help reduce traffic and work together to address transportation issues. That means driving smarter, consolidating trips, ride-sharing, and using transit alternatives when possible, to name a few.

To reduce the impacts of the proposed resort expansion, new left-turn lanes and traffic signals will be funded by Turtle Bay Resort where the roads that will access the resort intersect with Kamehameha Highway. This should help to mitigate the impact of vehicles entering and leaving the resort. According to our recently completed traffic study, on an annual average basis the proposed resort expansion will increase traffic on the highway by about 4.5% during the morning peak hour and 3.0% during the afternoon peak hour.

In addition, the resort will implement a number of measures designed to reduce resort-related traffic. These will include van shuttle service for employees and guests. The resort is also exploring ways to extend the successful bike path at Malaekahana all the way to Hoalua Street and beyond to Ke Nui Road.

The owners of the resort are also committed to paying their fair-share of the cost for regional traffic improvements to help reduce traffic congestion, as determined by the State Department of Transportation. ("Fair-share" is calculated by the State DOT as a developer's portion of the total cost of new improvements based upon the percentage of new traffic generated by the developer's project.)

The traffic study and mitigation measures mentioned above will be presented in the Draft Supplemental Environmental Impact Statement for the resort. Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

Turtle Bay expansion

1 message

Kainalu Hecomovich <kainalu008@yahoo.com> **Tue, Sep 6, 2011 at 9:47 AM**
To: ccComments@honolulu.gov, leesichter@gmail.com

Aloha,
As a frequent recreational user of the North Shore, as well as a native Hawaiian, I am very concerned with the proposed Turtle Bay expansion plans with regards to traffic. If you are not aware, the traffic for north shore locals, visiting residents, and tourists alike is completely gridlocked daily from 10am to 4pm at the junction between Haleiwa and Laniakea beach. This is largely due to over-publicization of the sea turtles that congregate at Laniakea beach in the last 5 years. Because of tourist entities using the turtles as an attraction, there are now tour buses making daily stops, causing large ammounts of foot traffic across the highway. It now takes a half hour to get from Haleiwa past Laniakea beach, which is a distance of less than a mile. This is unacceptable and detrimental to business in Haleiwa. This is also after the bypass highway of Haleiwa, which had the intention of easing traffic. This is largely due to lack of proper management by the city and county. There is actually a footpath behind the parking lot at Laniakea that leads under the road and onto the sand. If the city would make it illegal to cross the road (jaywalking, which it technically is, as it is a highway with no crosswalk), this would make it safe for pedestrians to cross and solve the traffic problem as motorists would not have to watch and slow for constantly crossing pedestrians while looking at the ocean.
This is just an example of how a small mis-management and over-population of a North Shore beach can lead to debilitating traffic for locals and tourists alike, discouraging and / or hindering the visiting and appreciation of our natural resources. Tourists come here to live our relaxing pace of life as well as to appreciate our island in its pure natural form, not to sit in traffic or take pictures of buildings. Please be wise and protect our last wild reserve. Research other island resort destinations and learn from their mistakes and successes. There is a balance and if we go over that critical mass, it is a nightmare for all.
Kainalu Hecomovich

LEE SICHTER LLC

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PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Kainalu Hecomovich @ kainalu008@yahoo.com

I am writing in response to the email you sent on Tuesday, September 6, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

The owners of the Turtle Bay Resort share you concerns about existing and future traffic volumes on Kamehameha Highway. The resort is part of the North Shore and Ko`olau Loa communities and is committed to finding workable traffic solutions.

As a two-lane highway serving nearly half the island extending from Kahalu`u to Hale`iwa, Kamehameha Highway has to accommodate local and regional traffic. Extending along a relatively narrow plain between the coastline and the base of the mountains, the highway cannot easily be widened, even if this was what the community wanted. And selective widening along limited straightaways would only exacerbate traffic conditions; eventually the widened roadway segment would have to narrow back to two lanes. Thus, we all have to work together to find alternate solutions.

Limiting development on the North Shore is neither a practical nor realistic answer. Even if there was no further development between Kahalu`u and Hale`iwa, there would still be traffic congestion on the highway. So long as the famed beaches of the North Shore remain an attraction for O`ahu's residents and visitors, people from Honolulu, Hawaii Kai, Kailua, Kane`ohe, Aiea, Pearl City, Waipahu, Ewa, Kapolei, Waianae and Wahiawa will come. As a community, we each must do our part to help reduce traffic and work together to address transportation issues. That means driving smarter, consolidating trips, ride-sharing, and using transit alternatives when possible, to name a few.

To reduce the impacts of the proposed resort expansion, new left-turn lanes and traffic signals will be funded by Turtle Bay Resort where the roads that will access the resort intersect with Kamehameha Highway. This should help to mitigate the impact of vehicles entering and leaving the resort. According to our recently completed traffic study, on an annual average basis the proposed resort expansion will increase traffic on the highway by about 4.5% during the morning peak hour and 3.0% during the afternoon peak hour.

In addition, the resort will implement a number of measures designed to reduce resort-related traffic. These will include van shuttle service for employees and guests. The resort is also exploring ways to extend the successful bike path at Malaekahana all the way to Hoalua Street and beyond to Ke Nui Road.

The owners of the resort are also committed to paying their fair-share of the cost for regional traffic improvements to help reduce traffic congestion, as determined by the State Department of Transportation. ("Fair-share" is calculated by the State DOT as a developer's portion of the total cost of new improvements based upon the percentage of new traffic generated by the developer's project.)

The owners agree with your concerns about the traffic congestion at Laniakea beach. The concept of Transportation Demand Management is a means of trying to tackle this type of soft issue that doesn't involve physical improvements. As part of the SEIS, the owners have commissioned a TDM study for the resort.

The traffic study and mitigation measures mentioned above will be presented in the Draft Supplemental Environmental Impact Statement for the resort. Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

FW: helipad and SEIS

1 message

Ralph Makalau <RMakalau@tbrdevelopment.com> **Tue, Sep 6, 2011 at 7:47 AM**
To: Lee Sichter <leesichter@gmail.com>
Cc: "Calvin G. Dorn (Calvin@turquoise.net)" <Calvin@turquoise.net>, "sarah@paradisecopters.com" <sarah@paradisecopters.com>

Sarah,

By way of this e-mail, I am forwarding a copy of your questions to Lee Sichter who is compiling comments that may or may not be other than environmental issues. This way we can be assured that when we do design the final master plan as a result of the SEIS comment process, we have all the comments. As I have shared in the past the existing location of the helipad is grandfathered with the facilities that it has today. Today we do not have enough information to address your questions.

Mahalo

Ralph

From: Sarah Restle [mailto:sarah@paradisecopters.com]
Sent: Sunday, September 04, 2011 10:46 AM
To: Ralph Makaiau
Cc: calvin@paradisecopters.com
Subject: helipad and SEIS

Ralph,

Good morning, I see that the SEIS in moving forward and will be open to the public comments. I just wanted to inquire about the status of the helipad: is it included in the SEIS and or has it been grandfathered in? Does the revised master-plan still include the helipad in its current location? Would we be able to create a more permanent building on this site and be able to tie into the waste water system? Thank you for your assistance is this matter.

Mahalo

Sarah Restle

Turtle Bay Base Manager

808-293-2570 office

808-756-2565 cell

808-293-7588 fax

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October 26, 2012

To Sarah Restle @ sarah@paradischelicopters.com

I am writing in response to the email you sent on Sunday, September 4, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

The Applicant intends to preserve their rights for a resort helipad within the Proposed Action project. At this point in time the specific land plan for the site that constitutes the current approved helipad is not complete. Therefore, when this plan is detailed in the future the Applicant will evaluate the need and demands for the helipad and will make decisions at that point in time as to whether the existing pad will remain the same or expand.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com.

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Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

PHONE (808) 594-1888

FAX (808) 594-

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STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAI'I 96813

HRD11/2446E

September 7, 2011

Drew Stotesbury
Replay Resorts, Inc.
c/o Turtle Bay Resort, LLC
57-091 Kamehameha Highway
Kahuku, Hawai'i 96731

Re: Supplemental Environmental Impact Statement Preparation Notice
Turtle Bay Resort Expansion
Ko'olauloa, Island of O'ahu

Aloha e Drew Stotesbury,

The Office of Hawaiian Affairs (OHA) is in receipt of an August 19, 2011 request for comments on a supplemental environmental impact statement preparation notice (notice) for the proposed Turtle Bay Resort Expansion (the project). The forthcoming draft supplemental environmental impact statement (DSEIS) will be prepared pursuant to Chapter 343, Hawaii Revised Statutes (HRS) and is a requirement of an April 2010 Hawai'i Supreme Court ruling. The final supplemental environmental impact statement (FSEIS) will be a primary support document for a subdivision application (application) submitted to the City and County of Honolulu-Department of Permitting and Planning (DPP). Approval of the application by the DPP will facilitate the project which is proposed by Turtle Bay Resort, LLC. The DPP is the accepting authority for the FEIS.

Thank you for taking the time to meet with my staffers on August 24, 2011 to discuss the notice and conceptual project plans. Mr. Doug Ogilvy (Replay Resorts, Inc.), Mr. Ralph Makaiau (Turtle Bay Resort Development), Ms. Dawn Chang (Kuiwalu) and Mr. Rob Iopa (WICT Architects) were also in attendance at this meeting.

The development of final project design and concepts will be guided by a Comprehensive Plan which seeks to:

> *develop and manage the Turtle Bay Lands in a holistic manner drawing inspiration from the traditional ahupua'a model of sustainability and respect for the environmental, cultural, social, and economic elements*

This is certainly a laudable goal and it is our understanding that Turtle Bay Resort, LLC's consideration of the thoughts and concerns shared during the approximately 140 meetings held

with interested community groups and/or individuals since June 2010 have contributed to the development of the Comprehensive Plan and the selection of the "Reduced Density Alternative" described in the notice (Section 8.2) as the preferred alternative. The Reduced Density Alternative would develop the project area to approximately thirty-nine (39) percent of the remaining density allowed by existing land use entitlements.

OHA looks forward to seeing the DSEIS adequately supplementing the earlier environmental impact statement for the project area.[1] The technical reports generated to accurately identify the impacts of the project and propose the mitigation measures which will be described in the DSEIS must address the changes in conditions within and surrounding the project area which are identified in the 2010 Hawai'i Supreme Court ruling. The broad range of concerns, including those directly related to the interests of our beneficiaries- the Native Hawaiian people and our families, which have been consistently expressed by the North Shore community, should also be comprehensively considered and addressed in the SDEIS.

By letter dated April 18, 2011 (see enclosure), OHA responded to a request for comments ahead of a cultural impact statement (CIA) for the project. This CIA will be one of the technical reports generated to identify the impacts of the project and subsequently propose mitigation measures. It is our understanding the CIA will be prepared by Pacific Legacy, Inc. As we affirm in our response letter to Pacific Legacy, Inc., the scope of this (or any other) CIA must be broader than the project area to ensure that any indirect and/or cumulative impacts on traditional practices or resources are accurately identified and assessed.

OHA appreciates your commitment to preparing a supplemental archaeological inventory survey (AIS) for the project area. We are in receipt of the draft AIS plan which was prepared by Haun & Associates and transmitted to OHA by letter dated September 2, 2011 from Ku'iwalu. While our review of the draft AIS plan is continuing at this time, it appears that the scope of proposed subsurface archaeological testing program which is described intends to proactively address the concerns which have been expressed regarding the possibility of encountering iwi kūpuna during ground disturbing activities within the project area.

We note that certain proposals within the Comprehensive Plan which are described in the notice such as the rerouting of Kawela Stream[2] (Section 7.2) and the Punaho'olapa Marsh[3] enhancement (Section 7.3) may provide a federal nexus to the project and require the preparation of separate documents to support federal agency approvals and permits. Consultation with the U.S. Army Corps of Engineers, National Oceanic and Atmospheric Administration and U.S. Fish and Wildlife Service may be required. Furthermore, if ongoing NOAA efforts to propose rulemaking that will establish critical habitat for the Hawaiian Monk Seal in the Main Hawaiian Islands are successful, an additional layer of review for these proposals may be necessary as federal permits and approvals are considered.

---

[1] In October of 1985, the City and County of Honolulu-Department of Land Utilization accepted a final environmental impact statement (FEIS) for the proposed expansion of the "Kuilima Resort". The forthcoming SDEIS will cover the 1985 FEIS study area, plus an additional 26 acres described on page three of the notice.
[2] This proposal intends to reroute Kawela Stream back to its "historical" channel and reduce the amount of sediment which is currently discharged into Kawela Bay causing adverse impacts to near shore marine water quality and species.
[3] The Punaho'olapa Marsh is a wetland that provides a nesting habitat for several native bird species afforded Endangered Species Act protection.

It appears that there is a broad range of opinion with the North Shore community regarding this project with some eager to see it move forward and others maintaining their position that the "No Action (No Further Development) Alternative" described in Section 8.5 of the notice is the only choice that will preserve the very essence of this special place. We encourage you to continue your discussions with the community until the Chapter 343, HRS process is concluded and advocate that all comments and concerns expressed to you are afforded appropriate consideration so that final project plans are a true product of the community.

We have no additional comments at this time. Please send one electronic copy and one hardcopy of the DSEIS to OHA attn: Compliance Program when it is available. Should you have any questions or concerns, please contact Keola Lindsey at 594-0244 or keolal@oha.org.

'O wau iho nō me ka 'oia'i'o,

Clyde W. Nāmu'o
Chief Executive Officer

CWN:kl

Enclosures (1): April 18, 2011 OHA letter to Pacific Legacy, Inc.

C: Trustee Peter Apo, OHA
Sharon Nishiura, DPP
Lee Sichter

LEE SICHTER LLC
45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

Clyde Namu`o
Chief Executive Officer
Office of Hawaiian Affairs
711 Kapiolani Boulevard, Suite 500
Honolulu, Hawai`i 96813

Dear Mr. Namu`o:

I am writing in response to the letter you sent on September 7, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

1. The Draft SEIS will address the changes in conditions within and surrounding the project area which were identified in the 2010 Hawai`i Supreme Court ruling.
2. The scope of the Cultural Impact Assessment includes all of the ahupua`a within which the resort property is located. In addition, the CIA addresses cultural practices and traditions associated with Ko`olau Loa district and the North Shore districts as appropriate.
3. We are pleased to advise you that the Supplemental Archaeological Inventory Survey (SAIS) has now been completed and the report is being prepared. The report will be included in the Draft SEIS.
4. Consultation with the U.S. Army Corps of Engineers, the National Oceanic and Atmospheric Administration, and the U.S. Fish and Wildlife Service will be conducted as needed.
5. Community consultant continues and has resulted in the inclusion of a new alternative that will be presented in the Draft SEIS. This Conservation Partner Alternatives proposes the preservation of much of the resort's coastline in exchange for economic consideration by a third party in lieu of the foregone development rights.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and

an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

The official review and comment period will last 45 calendar days from the date that the OEQC publishes the Notice of Availability in its *Environmental Notice*. You can find the *Environmental Notice* on-line at the OEQC website:

http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

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Subject: [FWD: Re: SEIS Prep-Notice]
From: info@turtlebayseis.com
Date: Mon, Sep 12, 2011 12:23 pm
To: comments@turtlebayseis.com

-------- Original Message --------
Subject: Re: SEIS Prep-Notice
From: Kfletchb@aol.com
Date: Thu, September 08, 2011 7:31 am
To: info@turtlebayseis.com

I'm trying to register. It says it will send me my password via email and does not. I've tried twice. Yes. I want this in the SEIS formal doc.

Karen Banes
780 7297

In a message dated 9/8/2011 7:27:00 A.M. Hawaiian Standard Time, info@turtlebayseis.com writes:

> Mahalo for your interest in the future of Turtle Bay Resort. We sincerely appreciate your mana'o. By this email, we acknowledge receipt of your comments. We take all questions, comments and suggestions seriously and will incorporate them into our future considerations. And although you did not submit this as a formal SEIS Preparation Notice comment (see http://turtlebayseis.com/seis/submitting-an-seis-comment/) we would be pleased to include it, if that is your desire, provided that you confirm your name, address and contact information. With this information, we will be able to send you a formal response to your comments after the official comment period on the SEIS Preparation Notice has ended.
>
> Comment:
> Please do not follow through with this project. The Hawaiian Monk Seal is the most critically endangered marine mammal in the USA. They wean their pups on this property. A mom and pup are currently involved in an 8-week weaning period on a lagoon on the same spot you folks want to put condos. This monk seal mom has pupped here 3 times. If you do this, you take away her beach to raise her pups. For what? More condos. Please, please don't let this be all about money for once. Mahalo.

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October 26, 2012

To Karen Banes @ kfletchb@aol.com

I am writing in response to the email you sent on Monday, September 8, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

A marine resources study is being prepared for inclusion in the Draft SEIS. It will specifically address existing conditions pertaining to monk seals. The resort owners share your concerns about protecting the seals and their pups. The resort owners have already placed protocols in place that help to ensure that seals are not disturbed once they haul up. Volunteers immediately cordon off the area and maintain a presence (at a discrete distance) to intercept curious onlookers.

The proposed resort expansion plan provides setbacks for all development to ensure that it does not encroach upon the shoreline. The SEIS will address the expansion plan's potential impacts upon monk seals.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

RE: Turtle Bay Resort

1 message

ccComments <ccComments@honolulu.gov> **Mon, Sep 12, 2011 at 10:58 AM**
To: elizabeth nelson <hawaiiliz@yahoo.com>
Cc: "leesichter@gmail.com" <leesichter@gmail.com>, "drew@replayresorts.com" <drew@replayresorts.com>

Your comments for the Supplemental Environmental Impact Statement Preparation Notice for Turtle Bay resort have been received by the Department of Planning and Permitting. Please note that any further email comments to the department should be directed to ccComments@honolulu.gov.

Your comments were also sent to the Consultant and Applicant. Their contact information is:

Consultant:

Lee Sichter LLC

45024 Malulani Street #1

Kaneohe, Hawaii 96744

Contact – Lee Sichter, (808) 382-3836

leesichter@gmail.com

Applicant:

Turtle Bay Resort, LLC

57-091 Kamehameha Highway

Kahuku, Hawaii 96731

Contact – Drew Stotesbury, (808) 447-6951

drew@replayresorts.com

Thank you.

From: elizabeth nelson [mailto:hawaiiliz@yahoo.com]
Sent: Monday, September 12, 2011 9:01 AM
To: Nishiura, Sharon N.
Subject: Turtle Bay Resort

Aloha,

I have lived on Oahu for 37 years and I see more and more development, some of which is neat and needed, some is not and causes more traffic and sewer problems.

Every time I have stayed at Turtle Bay, I have felt like I was going outer Island. It was quiet, rather isolated and so beautiful. I fear that more hotels and condos there, and much more traffic will totally change that feeling.

Please do not change the ambiance of that area. Do we really need 3 or 4 more hotels out there? Will that really bring more people? Or will it make the North Shore just like Waikiki? Most of my friends and relatives go outer island now and completely skip Oahu because of the over development.

Thank you for your consideration.

Liz Nelson
Kaneohe

LEE SICHTER LLC
45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Elizabeth Nelson @ hawaiiliz@yahoo.com

I am writing in response to the email you sent on Monday, September 12, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

The owners of the Turtle Bay Resort share you concerns about preserving the rural character of the Turtle Bay resort and about the existing and future traffic volumes on Kamehameha Highway. Please be assured that the proposed project will not change the character of the coastline, and the proposed density will not undermine the resort's rural character.

With regard to traffic, the resort is part of the North Shore and Ko'olau Loa communities and is committed to finding workable solutions.

To reduce the impacts of the proposed resort expansion, new left-turn lanes and traffic signals will be funded by Turtle Bay Resort where the roads that will access the resort intersect with Kamehameha Highway. This should help to mitigate the impact of vehicles entering and leaving the resort. According to our recently completed traffic study, on an average annual basis the proposed resort expansion will increase traffic on the highway by about 4.5% during the morning peak hour and 3.0% during the afternoon peak hour.

In addition, the resort will implement a number of measures designed to reduce resort-related traffic. These will include van shuttle service for employees and guests. The resort is also exploring ways to extend the successful bike path at Malaekahana all the way to Hoalua Street and beyond to Ke Nui Road.

The owners of the resort are also committed to paying their fair-share of the cost for regional traffic improvements to help reduce traffic congestion, as determined by the State Department of Transportation. ("Fair-share" is calculated by the State DOT as a developer's portion of the total cost of new improvements based upon the percentage of new traffic generated by the developer's project.)

The traffic study and mitigation measures mentioned above will be presented in the Draft Supplemental Environmental Impact Statement for the resort. Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

The official review and comment period will last 45 calendar days from the date that the OEQC publishes the Notice of Availability in its *Environmental Notice*. You can find the *Environmental Notice* on-line at the OEQC website:

http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

RECEIVED

'11 SEP 13 A11:51

DEPT OF PLANNING
AND PERMITTING
CITY & COUNTY OF HONOLU.

September 12, 2011

Department of Planning and Permitting
650 S King Street, 7th Floor
Honolulu, Hawaii 96813

ATTN: Sharon Nishiura

RE: Comments on the SEIS for the Turtle Bay Resort Expansion

As noted in Section 9.20 of the SEISPN, the latest traffic study for the Turtle Bay Resort was updated in 2009 so a new traffic analysis will be prepared for the Draft SEIS. The new traffic analysis should take into account the cumulative impacts that the proposed developments in Laie will put on Kam Highway.

Respectfully,

Lynette Gehring

Lynette M Gehring
PO Box 235208
Honolulu HI 96823-3503

LEE SICHTER LLC
45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

Lynette Gehring
P.O. Box 235208
Honolulu, HI 96823-3503

Dear Ms. Gehring:

I am writing in response to the letter you sent on September 12, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

The update to the 2009 traffic impact analysis report will address the cumulative impacts of development within the study area (Kahalu`u to Hale`iwa), including the development proposed at Laie.

The traffic study will be presented in the Draft Supplemental Environmental Impact Statement for the resort.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

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Subject: [Turtle Bay Resort SEIS] Please moderate: "SEIS Preparation Notice"
From: Turtle Bay Resort Development <info@turtlebayseis.com>
Date: Wed, Sep 14, 2011 11:57 am
To: info@turtlebayseis.com

A new comment on the post "SEIS Preparation Notice" is waiting for your approval
http://turtlebayseis.com/seis/prep-notice/

Submitted : Sep 14, 2011 @ 11:57
Author : odin hill (IP: 165.248.247.136 , ip6.k12.hi.us)
E-mail : odinhill@gmail.com
URL :
Address :
City :
State :
Zip :
Phone :
Comment:
I feel that additional growth or infrastructure by turtle bay will adversely affect the community as a whole and may in fact reduce tourism to the north shore by insidious urbanization. Currently the draw to the north shore for tourists is that it is unlike honolulu and devoid of the sprawling hotels that town is so known for. If the development moves forward it will not longer be "town & country" it will just be "town & more town."

Approve it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=approve&c=88
Trash it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=trash&c=88
Spam it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=spam&c=88
Currently 34 comments are waiting for approval. Please visit the moderation panel:
http://turtlebayseis.com/tbr/wp-admin/edit-comments.php?comment_status=moderated

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October 26, 2012

To Odin Hill @ odinhill@gmail.com

I am writing in response to the email you sent on Wednesday, September 14, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. I understand that you oppose the proposed resort expansion plan.

In 1977, an amendment to the Oahu General Plan, voted on by the residents of the City and County of Honolulu, designated the Kuilima Hotel property to be reclassified as a Visitor Destination Area. Several years later, the Ko`olauloa Development Plan was adopted by the City as a means of implementing the General Plan. It depicted the Kuilima property as a resort. In 1986, the City Council approved an expansion plan for the resort that allows the development of five new hotels. It was decided at that time, that the development was needed to create new jobs in the region and to support the continuing health of the visitor industry.

Together, these plans and policies are intended to ensure that the rural character of the North Shore is preserved for future generations.

The SEIS will present a comprehensive evaluation of the environmental impacts of the proposed project.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

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Subject: [Turtle Bay Resort SEIS] Please moderate: "SEIS Preparation Notice"
From: Turtle Bay Resort Development <info@turtlebayseis.com>
Date: Wed, Sep 14, 2011 6:09 pm
To: info@turtlebayseis.com

A new comment on the post "SEIS Preparation Notice" is waiting for your approval
http://turtlebayseis.com/seis/prep-notice/

Submitted : Sep 14, 2011 @ 18:09
Author : Susan Cortes (IP: 74.213.206.139 , 74-213-206-139-moab-cable.etv.net)
E-mail : jblattau@gmail.com
URL :
Address :
City :
State :
Zip :
Phone :
Comment:
The SEIS states that the population has been stable over the last 30 years. This is not documented in the SEIS. What are the actual figures? Also, the vehicular traffic impact is not included in the SEIS, only referenced that a study will be completed later. This data needs to be clearly provided before the proposed project's impact can be evaluated by all interested parties before any plans are confirmed.

Approve it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=approve&c=90
Trash it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=trash&c=90
Spam it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=spam&c=90
Currently 36 comments are waiting for approval. Please visit the moderation panel:
http://turtlebayseis.com/tbr/wp-admin/edit-comments.php?comment_status=moderated

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PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Susan Cortes @ jblattau@gmail.com

I am writing in response to the email you sent on Wednesday, September 14, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

The document you reviewed is a notice to you that SEIS is being prepared. It was not intended to present a full analysis of the project. The SEIS will include all the information you request pertaining to population growth and vehicular impacts.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

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Subject: [Turtle Bay Resort SEIS] Please moderate: "SEIS Preparation Notice"
From: Turtle Bay Resort Development <info@turtlebayseis.com>
Date: Wed, Sep 14, 2011 11:09 am
To: info@turtlebayseis.com

A new comment on the post "SEIS Preparation Notice" is waiting for your approval
http://turtlebayseis.com/seis/prep-notice/

Submitted : Sep 14, 2011 @ 11:09
Author : Matt Kester (IP: 216.228.248.226 , nat-216-228-248-226.byuh.edu)
E-mail : matt.kester@gmail.com
URL :
Address :
City :
State :
Zip :
Phone :
Comment:
I feel that the "no growth" alternative is a non starter and is not consistent with demographic projections. It is also heavily defined by class - those with the means will continue to purchase property in the region, something that is equally deleterious to the character of the North Shore. Limited growth seems more politically realistic and represents the best option moving forward.

Approve it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=approve&c=85
Trash it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=trash&c=85
Spam it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=spam&c=85
Currently 31 comments are waiting for approval. Please visit the moderation panel:
http://turtlebayseis.com/tbr/wp-admin/edit-comments.php?comment_status=moderated

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PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Matt Kester @ matt.kester@gmail.com

I am writing in response to the email you sent on Wednesday, September 14, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

The resort owners agree with your conclusion that a limited growth alternative is the most realistic scenario for the future of the Ko`olau Loa district.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours,

Lee Sichter

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Subject: [Turtle Bay Resort SEIS] Please moderate: "SEIS Preparation Notice"
From: Turtle Bay Resort Development <info@turtlebayseis.com>
Date: Wed, Sep 14, 2011 11:44 am
To: info@turtlebayseis.com

A new comment on the post "SEIS Preparation Notice" is waiting for your approval
http://turtlebayseis.com/seis/prep-notice/

Submitted : Sep 14, 2011 @ 11:44
Author : Garid (IP: 128.171.183.135 , 128.171.183.135)
E-mail : gluvly@gmail.com
URL :
Address :
City :
State :
Zip :
Phone :
Comment:
I vote, endorse and advocate for the "No Growth" alternative which means keep it "as is". There are very few (if any) undeveloped coastal areas left on the island of O'ahu for cultural practitioners, hikers, surfers, and fisherman and others who enjoy the natural outdoors to access as they have done so for generations. As a conservational area, this "green and blue" section of Kahuku is a home and living space that is essential to a multitude of creatures from land to sea.

There have been countless incidents of cultural desecration through the years throughout the Ko'olauloa & Ko'olaupoko for the almighty dollar. It needs to stop or this area will shortly go the way of other once beautiful coastal areas on O'ahu: the place-based knowledge of the po'e and the 'aina will be lost forever! At best, it may be printed on the pages of a newspaper or as text and pictures on a website of the future or perhaps recreated as a Disney vision like Aulani.

We will have nothing to pass to the next generations as a "shared place", as once open spaces will be filled with concrete sidewalks, timeshares, tourists and empty stories of how we failed to malama what was our kuleana to safeguard. No wahipana will be left and the land will be dead. If you don't see it coming, then look at what has happened over the years to Waikiki or Kona. Capitalistic growth and destruction and the pressure it puts on people and places is insidious and relentless (traffic, congestion, pollution, stress, etc.).

Approve it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=approve&c=87
Trash it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=trash&c=87
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PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Garid @ gluvly@gmail.com

I am writing in response to the mail you sent on Wednesday, September 14, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

We acknowledge your support for no further expansion of the Turtle Bay Resort.

The Turtle Bay Resort property was reclassified to the State's Urban District in the mid-1980s and subsequently rezoned by the City for expansion as a visitor destination area. It is the policy of the City and County of Honolulu to encourage the continuing vitality of the visitor industry, in part, through the expansion of the Turtle Bay Resort. As the result of these actions, the resort property is not a "conservation area" as you describe it, but an urban area zoned for resort development.

The resort's owners share your concern about protecting and preserving the resort's coastal area. We hope that once you review the Draft SEIS, you will agree that the proposed expansion plan focuses on the preservation of this coastal region, as well as the perpetuation of cultural practices through the implementation of a truly sustainable plan. As you will see, the plan is now tied closely to the place-based knowledge of the past.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the two-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

The official review and comment period will last 45 calendar days from the date that the OEQC publishes the Notice of Availability in its *Environmental Notice*. You can find the *Environmental Notice* on-line at the OEQC website:

http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

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Subject: [Turtle Bay Resort SEIS] Please moderate: "SEIS Preparation Notice"
From: Turtle Bay Resort Development <info@turtlebayseis.com>
Date: Wed, Sep 14, 2011 11:40 am
To: info@turtlebayseis.com

A new comment on the post "SEIS Preparation Notice" is waiting for your approval
http://turtlebayseis.com/seis/prep-notice/

Submitted : Sep 14, 2011 @ 11:40
Author : edward j jones (IP: 67.49.129.183 , cpe-67-49-129-183.hawaii.res.rr.com)
E-mail : jonese002@hawaii.rr.com
URL :
Address :
City :
State :
Zip :
Phone :
Comment:
i my opinion there is no room for any deveolpment on the north shore as our infrastructure simply will not support it. the traffic is already horrible without more construction activity and additional hotel, condo or residential units. i would suggest anyone considering additional housing of any kind should live and work here as we do and the problems will bacome obvious

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Trash it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=trash&c=86
Spam it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=spam&c=86
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October 26, 2012

To Edward J. Jones @ jonese002@hawaii.rr.com

I am writing in response to the emails you sent on Wednesday, August 24, and Wednesday, September 14, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

We acknowledge your opposition to the proposed expansion plan.

The owners of the Turtle Bay Resort share you concerns about existing and future traffic volumes on Kamehameha Highway. The resort is part of the North Shore and Ko`olau Loa communities and is committed to finding workable traffic solutions.

As a two-lane highway serving nearly half the island extending from Kahalu`u to Hale`iwa, Kamehameha Highway has to accommodate local and regional traffic. Extending along a relatively narrow plain between the coastline and the base of the mountains, the highway cannot easily be widened, even if this was what the community wanted. And selective widening along limited straightaways would only exacerbate traffic conditions; eventually the widened roadway segment would have to narrow back to two lanes. Thus, we all have to work together to find alternate solutions.

Limiting development on the North Shore is neither a practical nor realistic answer. Even if there was no further development between Kahalu`u and Hale`iwa, there would still be traffic congestion on the highway. So long as the famed beaches of the North Shore remain an attraction for O`ahu's residents and visitors, people from Honolulu, Hawaii Kai, Kailua, Kane`ohe, Aiea, Pearl City, Waipahu, Ewa, Kapolei, Waianae and Wahiawa will come. As a community, we each must do our part to help reduce traffic and work together to address transportation issues. That means driving smarter, consolidating trips, ride-sharing, and using transit alternatives when possible, to name a few.

To reduce the impacts of the proposed resort expansion, new left-turn lanes and traffic signals will be funded by Turtle Bay Resort where the roads that will access the resort intersect with Kamehameha Highway. This should help to mitigate the impact of vehicles entering and leaving the resort. According to our recently completed traffic study, on an average annual basis the proposed resort expansion will increase traffic on the highway by about 4.5% during the morning peak hour and 3.0% during the afternoon peak hour.

In addition, the resort will implement a number of measures designed to reduce resort-related traffic. These will include van shuttle service for employees and guests. The resort is also exploring ways to extend the successful bike path at Malaekahana all the way to Hoalua Street and beyond to Ke Nui Road.

The owners of the resort are also committed to paying their fair-share of the cost for regional traffic improvements to help reduce traffic congestion, as determined by the State Department of Transportation. ("Fair-share" is calculated by the State DOT as a developer's portion of the total cost of new improvements based upon the percentage of new traffic generated by the developer's project.)

In 1977, the O`ahu General Plan was amended to establish population goals for the various areas around the island. The population goal for Ko`olau Loa was set at 1.8 percent of the island's population. In the late 1990s, several years after the Turtle Bay expansion plan was approved by the City Council, that population goal was lowered to 1.4 percent and it remains today. The population goal takes into account all the developable land, including the Turtle Bay Resort. Because the expansion plan now proposed reduces the residential component of the plan by 25 percent, implementation of the proposed project will ensure that the project remains consistent with the City's population policies. We provide this explanation because while it may seem intuitive that the project will exacerbate conditions on the roadway, the City anticipated those impacts when it approved the project in 1986.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

The official review and comment period will last 45 calendar days from the date that the OEQC publishes the Notice of Availability in its *Environmental Notice*. You can find the *Environmental Notice* on-line at the OEQC website:

http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

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Subject: [Turtle Bay Resort SEIS] Please moderate: "Community Engagement"
From: Turtle Bay Resort Development <info@turtlebayseis.com>
Date: Wed, Sep 14, 2011 4:46 pm
To: info@turtlebayseis.com

A new comment on the post "Community Engagement" is waiting for your approval
http://turtlebayseis.com/community/community-engagement/

Submitted : Sep 14, 2011 @ 16:46
Author : Chip Hartman (IP: 67.49.165.110 , cpe-67-49-165-110.hawaii.res.rr.com)
E-mail : seachip@yahoo.com
URL :
Address :
City :
State :
Zip :
Phone :
Comment:
Aloha, I would like to see very limited growth to the area. Please limit the entrance to only one site. If other exits are proposed they should some how be designed to loop back onto the property without ever letting the car onto Kamehameha Hwy. while making the driver feel that he/she has had a change of mind and really doesn't want to venture out after all.
Mahalo, Chip

Approve it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=approve&c=89
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October 26, 2012

To Chip Hartman @ seachip@yahoo.com

I am writing in response to the email you sent on Wednesday, September 14, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

The owners of the Turtle Bay Resort share you concerns about existing and future traffic volumes on Kamehameha Highway. The resort is part of the North Shore and Ko`olau Loa communities and its owners are committed to finding workable traffic solutions.

Traffic conditions on Kamehameha Highway will be impacted by the proposed expansion. At issue is what is the extent of the impact and what can the resort owners do to mitigate it. The traffic study presently being prepared as part of the SEIS to address this issue must be reviewed and approved by the State Department of Transportation. Once the project's impacts are quantified, the State DOT will determine the 'fair-share' cost of improvements that must be borne by the resort.

The requirement for multiple connections to Kamehameha Highway was included in the Unilateral Agreement that was approved by the City and County of Honolulu in 1985 as part of the rezoning of the property. Therefore, it is a requirement that must be fulfilled because it is a condition of zoning.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

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DEAN A. NAKANO
Acting Manager

September 15, 2011

RECEIVED
SEP 20 2011
TBR DEVELOPMENT

Mr. Drew Stotesbury
Turtle Bay Resort, LLC
57-091 Kamehameha Highway
Kahuku, Hawaii 96731

Dear Mr. Stotesbury:

Subject: Letter Dated August 19, 2011 Requesting Comments on the Supplemental Environmental Impact Statement Preparation Notice for Turtle Bay Resort Expansion, TMK: 5-6-3:1, 3, 10, 26, 33, 35, 37, 38, 40-44; 5-7-1:1,13, 16, 17, 20, 22, 30, 31, 33; 5-7-3:72; 5-7-6:1, 2, 22, 23

Thank you for the opportunity to comment on the proposed Turtle Bay Resort Expansion.

The developer will be required to install the necessary water system improvements to provide adequate fire flows and peak hour pressures in accordance with our Water System Standards. The revised water master plan should be submitted for approval.

The developer will be required to obtain Water Use Permit for the Opana Well System, to accommodate the proposed development.

Please be advised that this information is based upon current data and, therefore, the Board of Water Supply (BWS) reserves the right to change any position or information stated herein up until the final approval of your building permit application. The final decision on the availability of water will be confirmed when the building permit application is submitted for approval.

The developer should investigate the feasibility of using non-potable water for irrigation of the proposed landscape areas. If non-potable water is either unavailable or infeasible, a report of the investigation including proposed irrigation demands should be submitted to us before we will consider the use of potable water.

The proposed project is subject to BWS Cross-Connection Control and Backflow Prevention requirements prior to the issuance of the Building Permit Applications.

If you have any questions, please contact Robert Chun at 748-5443.

Very truly yours,

Susan Uyesugi

SUSAN UYESUGI
Program Administrator
Customer Care Division

cc: Ms. Sharon Nishiura, Department of Planning & Permitting
Mr. Lee Sichter, Lee Sichter, LLC

Water for Life . . . Ka Wai Ola

LEE SICHTER LLC
45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

Susan Uyesugi
Program Administrator
Customer Care Division
Honolulu Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawai'i 96843

Dear Ms. Uyesugi:

I am writing in response to your letter of September 15, 2011 concerning on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

1. The requirement to install fire flow systems in compliance with your standards is acknowledged.
2. The requirement for a Water Use Permit for the Opana Well System is acknowledged.
3. The need to confirm BWS' decisions based on building permit applications is acknowledged.
4. The developer will investigate the feasibility of employing non-potable irrigation and advise the Board as required.
5. Acknowledged.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. It will also be available at our website: www.turtlebayseis.com.

The official review and comment period will last 45 calendar days from the date that the OEQC publishes the Notice of Availability in its *Environmental Notice*. You can find the *Environmental Notice* on-line at the OEQC website:

http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Turtle Bay Resort
true hawai'i

Turtle Bay Resort Supplemental Environmental Impact Statement

Preparation Notice Comment Form

If you would like to submit an official comment on the SEIS Preparation Notice, please provide your name, mailing address, and comment below. (We are obligated to respond in writing to all "official" comments, thus, we need to know where to mail our response.) If you wish to mail your comment, please address it to: Lee Sichter LLC, 45024 Malulani Street #1, Kane`ohe, Hawai`i 96744. The deadline for mailed comments is September 22, 2011.

(Please Print)

Name: Sandy McClanahan

Street Address (or P.O. Box): Ocean Villa #318
57-091 Kamehameha Hwy.

City/State/Zip Code: Kahuku, HI 96731

Comment:

I am concerned about the reefs, turtle habitats along the Turtle Bay property shoreline and I am concerned that the only public beach on this property is already very crowded during summer & holidays & weekends. There are no other appropriate areas to create another beach along the shoreline & the number of people that already use this beach are destroying the reefs. The public beach cannot handle more people! How will this issue be addressed?

Mahalo

Hotel guests (or residents) are not going to want to drive to other beaches as was suggested at the recent meeting!

LEE SICHTER LLC

45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

Sandy McClanahan
Ocean Villa #318
57-091 Kamehameha Highway
Kahuku, HI 96731

Dear Ms. McClanahan:

I am writing in response to the written comment you provided on September 15, 2011 at the Public Information meeting, regarding the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice.

The resort owners share your concerns about the need to protect the reefs and the marine resources along the Turtle Bay Resort coastline.

With over five miles of shoreline fronting the resort property, there are no plans to create additional beaches.

A marine resources impact analysis has been conducted for the proposed project and will be included in the SEIS. Contrary to your conclusions, based upon over 20 years of observations, there has been no destruction of reefs resulting from human activity.

The number of people who use the shoreline on any given day will be a function of the number of guests staying at the resort, the number of residents on site, and the number of people from the general public who come to use the Turtle Bay Resort shoreline. The total number of beach users is expected to increase as the result of the proposed expansion plan. However, with the proposed over 60% reduction in density and over 4 miles of coastline, implementation of extensive natural and cultural guidelines designed into the project legal documents so they can be enforced over time will help to ensure the long-term preservation of the coastal region. The goal is to provide open access to this treasure of natural and cultural resources, but at the same time provide education and rules to preserve and protect them from over use. Also, the Applicant is working closely with its adventure tour team and local conservation groups to provide on-going Hawaiian Cultural and Natural Resource tours and education to better inform and make aware all users of how to honor and respect these resources.

An additional mitigation measure is the implementation of a public education program to inform beach users about the sensitivity of the coastal environment.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Sierra Club
Hawai'i Chapter
PO Box 2577, Honolulu, HI 96803
808.538.6818 hawaii.chapter@sierraclub.org

Thursday, September 15, 2011

Mr. Lee Sichter
45-024 Malulani Street
Kaneohe, HI 96744

Re: Turtle Bay Resort Environmental Assessment & Supplemental Environmental Impact Statement Preparation Notice

Dear Mr. Sichter:

Thank you for the opportunity to comment. We offer the following questions and comments in effort to propose a better project for O'ahu's residents:

Endangered Flora and Fuana:

Monk seals use the beach around and near the Turtle Bay Hotel. The seals are an endangered species that have recently suffered a significant population decline in the Northwestern Hawaiian Islands. The population in the main Hawaiian Islands, however, appears to be expanding.

- What would the impacts of this project be on the monk seals?
- Would the number of people along the coastline increase? How will you protect the seals from the increased number of people on the beach?
- Since the law is that people must remain at least 150 feet away from the monk seals, what is your plan to educate people about the law?
- How far will the shoreline setback be? How will you keep development and monk seals separated?

The proposed resort expansion is located relatively near the James Campbell National Wildlife Refuge in Kahuku and the Punaho`olapa Marsh.

- What impacts will the development have be on endangered water birds in this area, such as the effect of increased traffic?
- What are the planned mitigation measures for these bird refuges?

Hawai'i is considered the endangered species capitol of the world. Contrary to popular belief, the bulk of Hawai'is ecodiversity was found along dryland forests and the coastal areas.

- With respect to landscaping, what types of plants will be used? Will native plants be utilized?
- Will the proposed project consider using endangered plants that used to be common to this area as a means of reestablishing their habitat and preserving Hawai'i's special sense of place?

Global Climate Change:

In the next few decades, sea level rise is projected due to global warming. The undeveloped lands near Turtle Bay are some of the last undeveloped bays on O'ahu. They offer "retreat" areas -- places for coastal flora and fauna to move when sea level rises.

- How will you mitigate the loss of finite, undeveloped coastal areas?
- How will the proposed shoreline setback account for sea level rise?
- What are the options for endangered animals in the area that might be impacted by sea level rise without a retreat area?

Energy Consumption:

Because of its over dependence on imported fossil fuels and the impacts of climate change, Hawai'i statutorily adopted 70% energy reduction requirements (40% renewable, 30% energy efficiency) as a part of the Hawai'i Clean Energy Initiative. These requirements are directly placed upon the utility and by extension, the ratepayers. New developments increase the amount of electricity demand and cost to each ratepayer, which should be mitigated.

- What is the net electricity demand and total energy consumption for the proposed project?
- How will the proposed development mitigate its impacts on the State of Hawai'i's clean energy targets?
- What type of energy efficient designs and implementation steps will be put into place?

- What type of renewable energy sources will be installed?

Traffic Impacts:

Kamehameha Highway is a 2-lane road that functionally acts as a parking lot at times, especially during big winter surf.

- If the road is overwhelmed by peak traffic now, how will it handle the increased traffic an expanded Turtle Bay Resort will bring?
- What are the projected Kamehameha Highway traffic counts in the vicinity of Turtle Bay for 2015? 2020? 2025? 2030?
- What are the projected LOS for Kamehameha Highway at the entrance to Turtle Bay Hotel for 2015? 2020? 2025? 2030?
- What are the plans (if any) to accommodate the increased traffic on Kam Hwy? Will additional lanes be built (such as turning lanes)? If so, where and in which direction?
- What are the effects of increased traffic on neighboring communities such as Kahuku, Laie, Sunset, Waimea, Pupukea-Paumalu and Haleiwa?
- How will the resort mitigate these effects on the neighboring communities?

We look forward to your reply.

Very Truly Yours,

Randy Ching

Randy Ching
~~Secretary~~, Sierra Club, O'ahu Group
Vice-Chair

LEE SICHTER LLC
45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

Robert Harris, Chair
Sierra Club – O'ahu Group
P.O. Box 2577
Honolulu, Hawai'i 96803

Dear Mr. Harris:

I am writing in response to Randy Ching's September 15, 2011 letter commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate his taking the time to write. Following are our responses to his comments in the order they were presented in his letter.

1. A marine resources study has been prepared for inclusion in the SEIS. It will discuss the anticipated increase of shoreline use and it's potential impact upon Hawaiian monk seals.
2. Measures to mitigate the potential impact of the expansion plan upon Hawaiian monk seals will be provided.
3. The resort owners have already established protocols that help to ensure that seals are not disturbed once they haul out. Resort Security works with NOAA and volunteers to immediately cordon off the area and maintain a presence (at the proscribed distance) to intercept curious onlookers.
4. Development setbacks at the Turtle Bay Resort have been voluntarily expanded to a range from 150 feet to 300 feet (was 100 feet) inland of the certified shoreline. Based on the experience of resort personnel, when seals haul out, they tend to stay relatively close to the water's edge, well seaward of the vegetation line. Thus, it is highly unlikely that a seal will haul out inland of the certified shoreline and call the setback into question.
5. The SEIS will discuss the potential impacts of the development on endangered waterbirds.
6. The SEIS will discuss any measures recommended to minimize the impact of the development on the Punaho'olapa Marsh.
7. The project's botanist recommends employing native plants in resort landscaping when feasible. Also recommended is the need to preserve the fragile coastal strand along the coastline. A decision about the use of endangered plants has not yet been made but will be considered.
8. The project's proposed setbacks are intended to accommodate the loss of finite coastal lands due to potential changes in sea level.

9. The options for endangered animals in the area that might be impacted by sea level rise without a retreat area is under consideration. The potential impacts of sea level rise will be addressed in the SEIS.
10. The electricity demand and total energy consumption estimates for the proposed project will be addressed in the SEIS.
11. A sustainability analysis is being conducted for the project and will include a review of energy efficient practices that can be employed to assist in meeting the State's clean energy targets.
12. The type of energy efficient designs and renewable energy sources to be utilized at the resort will be discussed in the SEIS.
13. All of your questions regarding traffic impacts will be addressed in the SEIS. An update to the approved 2009 Traffic Impact Analysis Report is presently being prepared and will be included in the SEIS.

Because Mr. Ching took the time to comment on the SEIS Preparation Notice, the O`ahu Chapter of the Sierra Club is considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

The official review and comment period will last 45 calendar days from the date that the OEQC publishes the Notice of Availability in its *Environmental Notice*. You can find the *Environmental Notice* on-line at the OEQC website:

http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours,

Lee Sichter

Turtle Bay Resort
true hawai'i

Turtle Bay Resort Supplemental Environmental Impact Statement

Preparation Notice Comment Form

If you would like to submit an official comment on the SEIS Preparation Notice, please provide your name, mailing address, and comment below. (We are obligated to respond in writing to all "official" comments, thus, we need to know where to mail our response.) If you wish to mail your comment, please address it to: Lee Sichter LLC, 45024 Malulani Street #1, Kane`ohe, Hawai`i 96744. The deadline for mailed comments is September 22, 2011.

(Please Print)

Name: Julie Cooke

Street Address (or P.O. Box): 57-068 Eleku Kuilima Pl #148

City/State/Zip Code: Kahuku, HI 96731

Comment:

The truest value of the Turtle Bay Resort lands is the open, unspoiled & undeveloped aspects of the area. That is the largest draw for visitors. As things are at present, there are available rooms for rent most of the year. Why is there a need for more units? There is no money to be made, so why spend money developing more units? Who really wants this development? Is there really an untapped market for filling all of these units? How can the SEIS determine if there is an untapped market, or a real need for this development? Traffic concerns, culture change, energy flow, this plan is not a winner if it includes all of three valuable units being developed. The re-routing of drainage to original flow may be desirable. Please realize that the existing structures are sufficient. Let us work toward developing a community food growing operation. Let us become less reliant on shipping in our food

Mahalo

LEE SICHTER LLC
45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

Julie Cooke
57-068 Eleku Kuilima Place #148
Kahuku, HI 96731

Dear Ms. Cooke:

I am writing in response to the form you filled out at the Public Information meeting held on September 15, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

The resort owners agree that the rural character of the area is one of the resort's greatest assets, and they wish to assure you that the proposed expansion plans will not undermine that character.

Contrary to your experience, the existing hotel operates at near full occupancy much of the year and visitors seeking reservations are turned away regularly. The proposed expansion plan responds to this demand. A market study has analyzed the proposed project and its findings will be presented in the SEIS.

The resort owners share your concern about preserving the rural character of the resort. They recognize that it is a particular attraction to the resort's visitors. Please be assured that the proposed expansion plan focuses on the preservation of this valued coastal resource.

The purpose of preparing the SEIS is to disclose the anticipated impacts that project will have. The SEIS will include an evaluation of the project's impacts on traffic, cultural resources, and utilities. It will also include a detailed discussion of how the resort's long-term sustainability will be improved.

The resort owners feel that the proposed expansion will benefit the community and the region. In addition to increased public shoreline access and several new community parks, the resort will include a farmers' market. The resort owners are also committed to improving the productivity of its agricultural lands on the mauka side of Kamehameha Highway and improving the food-to-place connectivity between those lands and the resort.

The SEIS will also include an evaluation of the impacts that the project will have on cultural resources, including burial sites.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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Very truly yours

Lee Sichter

Turtle Bay Resort
true hawai'i

Turtle Bay Resort Supplemental Environmental Impact Statement

Preparation Notice Comment Form

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(Please Print)

Name: Bonnie Corrigan

Street Address (or P.O. Box): 66-314 Waialua Beach Rd

City/State/Zip Code: Haleiwa, Hawaii 96712

Comment:

Every day a hotel guest will say "they come to stay at Turtle Bay because it is the way it is. They chose to stay at Turtle Bay because it is the only hotel. There is already a Waikiki. The visitors will go directly to another Island - Maybe you should honor the promise of "only one" hotel.

Mahalo

LEE SICHTER LLC

45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

Ms. Bonnie Corrigan
66-314 Waialua Beach Road
Haleiwa, HI 96712

I am writing in response to the comment form you filled out on Thursday, September 15, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

We understand the attraction of the Turtle Bay Hotel and the careful balance that must be achieved between expanding the resort in a manner that meets demand and provides a richer visitor experience while preserving the rural character of the resort area. The resort owner's sincerely believe that the proposed expansion plan achieves that balance. A market analysis is being conducted for the project and its conclusions will be presented in the Draft SEIS.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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Very truly yours

Lee Sichter

re:play

Turtle Bay Resort
true hawai'i

Turtle Bay Resort Supplemental Environmental Impact Statement

Preparation Notice Comment Form

If you would like to submit an official comment on the SEIS Preparation Notice, please provide your name, mailing address, and comment below. (We are obligated to respond in writing to all "official" comments, thus, we need to know where to mail our response.) If you wish to mail your comment, please address it to: Lee Sichter LLC, 45024 Malulani Street #1, Kane'ohe, Hawai'i 96744. The deadline for mailed comments is September 22, 2011.

(Please Print)

Name: Sean Ginelli

Street Address (or P.O. Box): 57-477 Kam Hwy

City/State/Zip Code: Kahuku, HI 96731

Comment: Plan calls for four parks — if public how? can you stop homeless & squatters? Partially in Kawela Bay? Can you make Kawela Bay private non-profit park + or, NO park at Kawela.

mahalo

Aloha

Mahalo

LEE SICHTER LLC
45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

Sean Ginella
52-477 Kamehameha Highway
Kahuku, HI 96731

Dear Mr. Ginella:

I am writing in response to the written comment you provided on September 15, 2011 at the Public Information meeting, regarding the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice.

The new parks proposed at the Turtle Bay Resort consist of four (4) required and one (1) voluntary passive park and are generally governed by agreements negotiated with the City and County of Honolulu. . Even though the required parks must be dedicated to the City and County of Honolulu, there are provisions in the agreements that have the majority of the parks maintained privately by the Applicant or its successors. The Master Development documents contemplate each development parcel to contribute to an operating and maintenance fund that would pay for appropriate and systematic surveillance, security and maintenance of these amenities. We do not anticipate that occupation by squatters will be a significant problem.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

From: **DeeDee Letts** <ddletts@lava.net>
Date: Fri, Sep 16, 2011 at 2:55 PM
Subject: DEIS Prep notice Comments
- Hide quoted text -
To: snishiura@honolulu.gov, Lee Sichter <leesichter@gmail.com>
Cc: Defend Oahu Coalition <savekawelabay@yahoo.com>

Please reply so that I know these were recieved. See Comments attached.

Dee Dee

Gmail

DEIS Prep notice Comments

Lee Sichter <leesichter@gmail.com> Fri, Sep 16, 2011 at 4:20 PM
To: DeeDee Letts <ddletts@lava.net>
Cc: snishiura@honolulu.gov, Defend Oahu Coalition <savekawelabay@yahoo.com>

Mahalo DeeDee

I have received your comments on the SEISPN.

Lee

Lee Sichter LLC
45024 Malulani Street #1
Kaneohe, Hawaii 96744
ph. (808) 392 3936
fax. (808) 234-0872
email. leesichter@gmail.com
web. www.leesichter.com

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On Fri, Sep 16, 2011 at 2:55 PM, DeeDee Letts <ddletts@lava.net> wrote:
Please reply so that I know these were recieved. See Comments attached.

Dee Dee

September 16, 2011

TO: Department of Planning and Permitting
Mr Lee Sichter

FR: Dee Dee Letts

RE: Turtle Bay Supplemental Environmental Impact Statement (SEIS) Preparation Notice

Mahalo for the opportunity to comment on the SEIS Preparation Notice Prior to beginning my comments I would like to recognize Replay Resorts for their willingness to meet and talk with a range of members of the Ko'olau Loa/North Shore community regardless of their prior views on the proposed resort. This approach is truly unique for a developer in our area and a very welcome change from the others we are currently dealing with.

While I recognize that this is only a preparation notice there are several concerns that it raises that I hope are more thoroughly addressed in the Draft Supplemental Environmental Impact Statement (DSEIS). I have taken time to note the key ones below.

- The ahupua'a concept of sustainability and collaboration through mutual dependency for the survival and benefit of all living within the ahupua'a does not translate well to a for profit model. The intent of this master plan and SEIS is to achieve a level of entitlements for the land that will then be sold to the highest bidder for a profit. If the applicant were going to ultimately develop 100% of the project there might be some faith that the Hawaiian concepts so easily used in this document might be implemented but as it is the intent to sell to other entities once the entitlements are achieved makes these concepts more a window dressing for decision makers then a real commitment on the part of the landowner. If the DSEIS wants to continue to use these concepts as a selling point for their plan then it needs to address how they will assure that the concepts are implemented This would include limits on number of keys, making sure that new buyers can't apply for variances, that design features are not guidelines and that any oversight person or agency has authority to make decisions that are mandated to be followed by all subsequent owners at a minimum. If compliance can not be guaranteed then the lovely concepts are not worth the paper they are written on.
- Resort development is by its nature not a sustainable use of land. If we consider job creation part of modern sustainability then this document falls far short in even that area. There are no promises made as to the types of resort uses that will ultimately be developed by the purchasers of the entitlements. They might be hotels or condominiums or timeshares. The employment differences between the three are immense as is the range of pay scales provided by each. Most do not provide a livable wage to support a family in Hawai'i without supplemental income.
- The applicant's various intents for management and uses by regions as outlined in Section 5, appears to be a statement of their intent for purposes of the DSEIS it may not be the intent of the ultimate developer as previously stated therefore the document should focus on facts rather then concepts that may are or may be implemented. These facts should include area footprint increase, number of keys, traffic etc.
- The reference to partnering with the military for a sustainable ahupua'a model is really troubling. Does the applicant know that the military's EIS for the stryker training grounds admitted? It admitted that the vehicles would so compact the soil that in all likelihood nothing would ever grow on the land again.
- As far as being ahupua'a friendly the friendliest this development could be would be to focus on no development outside of the existing footprint of the resort and leave the Kahuku point and other undeveloped lands alone. More hotel rooms within the existing footprint to concentrate development and allow visitors the access to wild undeveloped coastline would be a better design for the resort. The old argument that a stand alone hotel can't make it (which is also alluded to in this document) has been disproved by the success of the existing hotel.
- If you concentrated the development in the existing footprint you would not need the interior road and all the costs and potential cultural issues that go with the development of the road.
- Please drop the use of the word piko to describe a bar and shopping area. I am not native Hawaiian but having lived in this community for over 40 years I find that term offensive from a cultural standpoint.
- Please consider locating the farmers market on Kamehameha Highway. The document references the Haliewa Farmers Market which is successful because it is on the main road – in fact it is located so it gets traffic from both the bypass and the Haleiwa town road. A farmers market is not a tourist draw and if it is inside and not accessible from the highway it will not be a local draw either.
- Need to discuss how the golf course serves to protect the marsh as golf course runoff is often laden with pesticides and nitrates.
- The cultural associations are high across this entire property not higher in one place or the other as the document implies.
- The setbacks are deeper in some areas then the law requires however in the Kawela Bay area in particular a prior communication from SHPO suggest that in order to protect 'iwi kupuna the setback should be 200 to 300 **meters** not feet.
- 'Iwi Kupuna are not mentioned in the Prep Notice and need to be fully dealt with in the DSEIS. I believe there have been 19 sets found on site some of which have gone missing and can not be found. The suggestion in the document that since the land was disturbed for agriculture etc. this will not be a problem is false Disturbing the land to plant a crop is very different from disturbing the land to plant a building both in depth of disturbance and in magnitude of disturbance. Please do not treat this important issue lightly. This is an important consideration when it comes to calculating the potential costs of concentrating the development in the most disturbed footprint as opposed to stringing it out across the entire property.

- The document states that no more then 1000 keys will be provided for lock out units at Kawela Bay – how will this be accomplished? Will the condos or timeshare or whatever units on the Kahuku side or around the existing hotel also have the potential to be developed as lock outs and if so how many keys will be allowed here?
- All traffic studies should be predicated on number of keys not number of units for sale.
- Many of the concepts in the document such as architectural guidelines, a compliance entity (konohiki) are nice concepts but unless as previously stated they are enforceable they come back to window dressing. I look forward to a discussion in the DSEIS as to how the applicant intends to operationalize these.
- Any claim of reduction in size must be calculated based on keys not number of units so it is not clear whether the preferred alternative is 60% less or not. Also please discuss how large an increase it is over what already exists.
- All setbacks should be predicated on a new certification of the shoreline.
- The Amphitheater proposal must address maximum size of events to take place and deal with the traffic and parking issues raised by the event size. How will the maximum event size set be enforced as a private owner will want to maximize return and therefore exceed any set maximum number of patrons set. The 4th of July celebration took longer to get to, park and get out of then the event itself lasted. Also as this area is identified to be a "private park" it should not be counted in the park space acreage claimed for the project as it will not necessarily be open to the public and will be a profit center.
- Looking forward to a discussion on the affordable housing concept – affordable to residents in our area or will it be set by the 80 to 120% of median income for the island. If intended to be affordable to local residents how do you enforce something that is more restrictive than state law? Are you looking at rentals which are a bigger need and tend to be affordable for lower incomes etc.?
- All future plantings should be with native plants and invasive species should be removed in any areas developed.

In closing for now I look forward to the DSEIS and especially to its discuss on how the soft "window dressing" issues will be operationalized to assure that they are implemented. In the event they can not be developed in a way that guarantees implementation and adherence then I would prefer they be dropped for the DSEIS as they seize to be relevant to any decision making or disclosure requirements of the document.

Print | Close Window

Subject: [Turtle Bay Resort SEIS] Please moderate: "SEIS Preparation Notice"
From: Turtle Bay Resort Development <info@turtlebayseis.com>
Date: Tue, Sep 20, 2011 4:16 pm
To: info@turtlebayseis.com

A new comment on the post "SEIS Preparation Notice" is waiting for your approval
http://turtlebayseis.com/seis/prep-notice/

Submitted : Sep 20, 2011 @ 18:16
Author : JESS SNOW (IP: 66.91.172.154 , cpe-66-91-172-154.hawaii.res.rr.com)
E-mail : JESS59@HAWAII.RR.COM
URL :
Address :
City :
State :
Zip :
Phone :
Comment:
BUILDING MORE HOTELS ONLY ALLOWS FOR LIMITED CONSTRUCTION WORK AND LOW PAYING SERVICE JOBS. THIS IS ONE OF THE LAST OPEN AND PRISTEN AREAS ON OAHU THAT SHOULD NOT BE RUINED BY CORPORATIONS WITH NO ROOTS IN THE COMMUNITY AND WHO'S ONLY INCENTIVE IS PROFIT. WE NEED TO CREATE A MORE SUBSTAINABLE VISION BY MOVING JOBS AWAY FROM TOURISM AND DIVERSIFY OUR ECONOMY, FOCUSING ON EXPANDING AGRICULTURE,AQUACULTURE, AND LIGHT INDUSTRY.

Approve it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=approve&c=104
Trash it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=trash&c=104
Spam it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=spam&c=104
Currently 39 comments are waiting for approval. Please visit the moderation panel:
http://turtlebayseis.com/tbr/wp-admin/edit-comments.php?comment_status=moderated

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45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Jess Snow @ jess59@hawaii.rr.com

I am writing in response to the mail you sent on Tuesday, September 20, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

1. The resort expansion project was originally approved in the mid-1980s to provide new employment opportunities for the community and the region. That need has not changed. A socio-economic impact analysis is being prepared for the project and will be included in the SEIS. It will address employment and job creation.
2. The resort's owners are committed to ensuring that the proposed expansion maintains the rural character of the region and preserves the character of the coastal area.
3. A fundamental characteristic of Hawai`i is that it is populated by immigrants. Even the Hawaiians were immigrants, who laid down roots and survived. At some point in most people's lives, they may move to a new place, invest in it, and hopefully prosper. Profiting from their hard work is their goal and it is the basis of our society and our economy.
4. It is the policy of the State and the counties that the visitor industry should continue to be pursued as our primary economic focus. Economic diversification is a worthy goal, and the resort's owners are recommending new initiatives to support increased agricultural productivity on the resort's mauka lands.
5. The resort owners agree with your recommendations concerning sustainability. The SEIS will include a detailed discussion of how the resort can become more sustainable.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

TBR SEIS Prep Notice Comments

1 message

mattoonc001@hawaii.rr.com <mattoonc001@hawaii.rr.com> **Tue, Sep 20, 2011 at 3:19 PM**
To: drew@replayresorts.com, snishihara@honolulu.gov, leesichter@gmail.com
Cc: "mattoonc001@hawaii.rr.com" <mattoonc001@hawaii.rr.com>

Aloha kakou,

Attached please find my comments on TB SEIS Prep Notice.

Creighton Mattoon

2 attachments

Comments on TB Prep SEIS.docx
18K

Comments on TB Prep SEIS.docx
18K

September 20, 2011

To: drew@replayresorts.com; snishihara@honolulu.gov; leesichter@gmail.com

From: Creighton U. Mattoon

Subject: Turtle Bay Resort ---Environmental Assessment & Supplemental Environmental Impact Statement Preparation Notice

I submit these comments as an individual member of the Ko`olauloa community although I have or have had leadership positions with several organizations such as Hawai`i's Thousand Friends, Punalu`u Community Association, Kahuku Medical Center Board of Directors, Ko`olauloa Hawaiian Civic Club, Ko`olauloa Neighborhood Board, Ko`olauloa/North Shore Alliance and the Planning Advisory Committee for the Ko`olauloa Sustainable Communities Plan.

The Ko`olauloa Sustainable Communities Plan of June 2009, produced by the 27-member Planning Advisory Committee proposed no future expansion of visitor accommodations at Turtle Bay, that the area be designated a Special Planning Area. Turtle Bay Resort expansion is yet another example of an *urban* development plan for an area which has been designated *rural* in the State's Sustainability 2050 Plan, the O`ahu General Plan, and the Ko`olauloa Sustainable Communities Plan. Urban development is supposed to take place in Leeward O`ahu and the Ewa Plain.

On page 13, Section 6, I believe that the statement "the Goal of the Comprehensive Plan for Turtle Bay is to develop and manage the Turtle Bay Lands in a holistic manner drawing inspiration from the traditional ahupua`a model of sustainability and respect for the environment, cultural, social and economic elements" is misleading to the general public and insulting to members of the host culture. Actually, the goal is to bring the most profit to the owners/investors in the project. It is totally inappropriate to use the term ahupua`a, a practice and not merely a concept as the developer would propose, in the same context with a for-profit plan which is neither sustainable nor respectful of the `aina and `iwi kupuna which lay resting within the `aina.

The lack of respect for `iwi kupuna is shown by the noticeable lack of any meaningful discussion of this topic. But on pages 25 and 26 in discussing the physical setting it is stated that since the development will occur within a previously disturbed area no significant impacts are foreseen. Further on page 37 it is stated that no significant adverse impacts upon cultural resources are anticipated. The assumption that because an area has been previously disturbed no future significant adverse impact can be anticipated is seriously flawed. I say this with conviction because as cultural claimants for `iwi kupuna at Mokapu we have been alerted to continuing disturbances of `iwi on lands where there have been previous disturbances.

Another concern is with the need for a comprehensive traffic study for Kamehameha Highway from Hale`iwa to Kane`ohe. It should include the cumulative impact of development at Kahuku, Malaekahana, and La`ie as well as the proposed expansion at Turtle Bay Resort. If all the

proposed developments become a reality then the future of traffic on the two-lane highway is certainly going to be gridlock. A Department of Transportation spokesman at the last Ko`olauloa Neighborhood Board meeting indicated that there are no plans for any alterations to Kamehameha Highway in the foreseeable future. However, should widening of the highway ever become an option then many residential and business properties along the highway will be lost to eminent domain.

Another concern is the proposal to partner with the military. It should be noted that military spokespersons have indicated that Stryker Brigade activities have already damaged the land so severely that nothing will grow on it ever again. Further, it has been reported that the activities have also brought in an invasive weed which is resistant to eradication and is thriving along Drum Road.

Finally, I am concerned that if expansion is approved at Turtle Bay, there is no assurance that the owners/investors in the future will not decide to develop beyond what is now being proposed.

LEE SICHTER LLC

45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Creighton Mattoon @ mattoonc001@hawaii.rr.com

I am writing in response to the email you sent on Tuesday, September 20, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

1. The Turtle Bay Resort property was reclassified to the Urban District in the mid-1980s in compliance with the Ko`olauloa Development Plan and the O`ahu General Plan that both called for the expansion of the Kuilima property to a visitor destination area. The Unilateral Agreement that constitutes a part of the Conditional Zoning for the project requires that the proposed expansion be implemented in a manner that is consistent with the rural character of the region. Thus, the proposed expansion has been deemed to be consistent with and supportive of the General Plan's goals to perpetuate Ko`olau Loa as a rural area. We believe that the reduced density that now constitutes the Proposed Action is also consistent with the City's long-standing policy.
2. The concept of Tomorrow's Ahupua`a represents the core values being articulated in the project's revised master plan. We regret that you find it insulting. However, please understand that its disclosure in the Preparation Notice was not intended to represent it in its final form. We hope that you will find the Draft SEIS to be a far better expression of the plan's intent.
3. Please be assured that concern for and respect of the *iwi kupuna* are among the greatest concerns of the resort's owners. A Supplemental Archaeological Inventory Survey has now been completed for the entire resort area and its findings will be included in the Draft SEIS. The study affirms the statements you referenced in the SEIS Preparation Notice.
4. A traffic impact analysis report (TIAR) for the Turtle Bay Resort was approved by the State Department of Transportation in 2009. It is now being updated for the Draft SEIS and its findings and recommendations will be included in the document. The scope of the update extends from Kahalu'u to Hale`iwa. (The intersection of Kamehameha Highway and Kahekili Highway was chosen as the southern endpoint of the study because from that point on, the specific impacts of Turtle Bay Resort traffic are absorbed and diluted in the mix of regional and locally generated Kane`ohe traffic flow.)

5. We understand that the future widening of Kamehameha Highway for the purpose of adding lanes is not under consideration by either DOT or the City. Therefore, measures to mitigate traffic impacts must focus on transportation demand management (TDM); how to better utilize existing resources. To that end, the resort owners have commissioned a TDM study. The TDM recommendations will be included in the Draft SEIS.
6. The reference to partnering with the military is intended to assure the community that the resorts owners are mindful of how other activities in the region impact the coastal area.
7. The resort owner's representative has stated publicly on numerous occasions that documenting commitments in the form of Covenants, Restrictions and Conditions (CC&Rs) would represent an appropriate mechanism for tying the commitments to the title of the land, just as the Unilateral Agreement is tied forever to the property.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

The official review and comment period will last 45 calendar days from the date that the OEQC publishes the Notice of Availability in its *Environmental Notice*. You can find the *Environmental Notice* on-line at the OEQC website:

http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

Turtle Bay SEIS Prep Notice Comments

1 message

mattoonc001@hawaii.rr.com <mattoonc001@hawaii.rr.com> **Tue, Sep 20, 2011 at 5:16 PM**
To: "drew@replayresorts.com" <drew@replayresorts.com>, "snishihara@honolulu.gov" <snishihara@honolulu.gov>, "leesichter@gmail.com" <leesichter@gmail.com>
Cc: "mattoonc001@hawaii.rr.com" <mattoonc001@hawaii.rr.com>

Aloha kakou,

Attached are my comments on the Turtle Bay Resort Environmental Assessment and Supplemental Environmental Impact Statement Preparation Notice.

Cathleen Mattoon

TB SEIS Prep Notice Comments.docx
18K

September 20, 2011

To: drew@replayresorts.com; snishihara@honolulu.gov;leesichter@gmail.com

From: Cathleen Pi`ilani Mattoon, Ko`olauloa Hawaiian Civic Club

Subject: Turtle Bay Resort Environmental Assessment and Supplemental Environmental Impact Statement Preparation Notice

Ko`olauloa Hawaiian Civic Club (KHCC), founded in 1924, is dedicated to the preservation and practice of Native Hawaiian culture and are recognized claimants of iwi kupuna at Kualoa, Mokapu and Ko`olauloa. We are committed to malama the ancestral remains of our kupuna and moepu by protecting them, preferably where they lie. We are also prepared to malama those purposefully removed from their graves by those who do not respect our beliefs and customs but claim the legal right to do so.

Over the past six years KHCC has participated in community planning in our moku by serving on the Public Advisory Committee for the Ko`olauloa Sustainable Community Plan and the governor's Turtle Bay Advisory Working Group; testified before the City Council, State Legislature and Oahu Island Burial Council and also participated in Ko`olauloa North Shore Alliance (KNSA) "Talk Story" forums. Finally, KHCC was represented at all meetings of the KNSA and Drew Stotesbury of Replay Resorts.

Listed here are our comments and concerns regarding the Turtle Bay EA and SEIS Prep Notice

- page 5, 4. Agencies, Community Groups, and Individuals Consulted: A request by KHCC to be included in the Cultural Advisory Group (OIBC Meeting 8/8/07) went unanswered.

-page 6 -13, 5. Overview Of The Comprehensive Plan: Tomorrow's Ahupua`a-Turtle Bay Resort Master Plan: This entire section needs to be removed from the document. That the author of this section of the report is attempting to wrap this for- profit proposal in "ahupua`a elements" (see 6.5:3) is reprehensible. The manipulation of the beliefs and practices which are being inserted into this plan is insulting to the host culture.

-page 15, 7. The planner has laid out this project without concern for the probable disturbance of cultural sites and burials. It is obvious that the August 2006 Archaeological Mitigation Plan for the Turtle Bay Resort Land Use Master Plan Project compiled by Cultural Survesy Hawaii, Inc. is being ignored. Although Turtle Bay ordered and paid for it, but has chosen to withdraw it from State Historic Preservation Office review, it cannot hide the facts presented therein or the recommendations for setbacks made by SHPO at that time.

KHCC supports development within the footprint of the currently developed property. It is willing to continue to seek ways by which State/Private funds can be used to acquire the undeveloped lands along this shoreline for the use of all of the people of Hawaii.

LEE SICHTER LLC

45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Cathleen Mattoon @ mattoonc001@hawaii.rr.com

I am writing in response to the email you sent on Tuesday, September 20, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

1. We apologize for the oversight. The resort's Cultural Advisory Committee is limited to Kupuna and lineal descendants associated with the Turtle Bay Resort property.
2. The concept of Tomorrow's Ahupua`a represents the core values being articulated in the project's revised master plan. We regret that you find it offensive. However, please understand that its disclosure in the Preparation Notice was not intended to represent it in its final form. We hope that you will find the Draft SEIS to be a far better expression of the plan's intent.
3. Please be assured that the concern for the potential disturbance of cultural sites and burials is of the highest importance to the resort owners. To that end, an entirely new archaeological inventory survey has been conducted on the property and is presented in its entirety in the Draft SEIS. The study was conducted in direct response to the recommendations made by the SHPO and has been carefully coordinated with that office. A plan for the study's implementation was submitted to and approved by SHPO before any field-work commenced.
4. In its Alternatives Analysis, the Draft SEIS includes a Conservation Partner Alternative that proposes to withdraw development from much of the coastline and centralize it around the existing hotel as you recommend. The implementation of the Conservation Partner Alternative is subject to the participation of a third party or parties who would provide economic consideration in lieu of the foregone development rights.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive

a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

The official review and comment period will last 45 calendar days from the date that the OEQC publishes the Notice of Availability in its *Environmental Notice*. You can find the *Environmental Notice* on-line at the OEQC website:

http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

RE: No to Turtle Bay Expansion

1 message

ccComments <ccComments@honolulu.gov> **Wed, Sep 21, 2011 at 10:03 AM**
To: Mike Dixon <helmsman@lava.net>
Cc: "leesichter@gmail.com" <leesichter@gmail.com>, "drew@replayresorts.com" <drew@replayresorts.com>

Your comments for the Supplemental Environmental Impact Statement Preparation Notice for Turtle Bay resort have been received by the Department of Planning and Permitting. Please note that any further email comments to the department should be directed to ccComments@honolulu.gov.

Your comments were also sent to the Consultant and Applicant. Their contact information is:

Consultant:

Lee Sichter LLC

45024 Malulani Street #1

Kaneohe, Hawaii 96744

Contact – Lee Sichter, (808) 362-3836

leesichter@gmail.com

Applicant:

Turtle Bay Resort, LLC

57-091 Kamehameha Highway

Kahuku, Hawaii 96731

Contact – Drew Stolesbury, (808) 447-6951

drew@replayresorts.com

Thank you.

From: Mike Dixon [mailto:helmsman@lava.net]
Sent: Wednesday, September 21, 2011 9:18 AM

To: Nishiura, Sharon N.
Subject: No to Turtle Bay Expansion

Dear Sirs/Madams

Please do not allow any further expansion until you project how you will increase the ability of the local roadways to handle the traffic.

We are already in gridlock out here all day Sat and Sun and if there is any high surf warning those days as well.

I do not think you can expand Kaw Hwy in either direction without destroying these coastlines. For example see how California destroyed the coast line up to Santa Barbara with a four lane highway.

Expansion is for Eva as it says in the Master Plan.

Stick to your existing Master plans.

Sincerely,

Mike Dixon
P O Box 461
Haleiwa, Hi 96712

LEE SICHTER LLC
45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Mike Dixon @ helmsman@lava.net

I am writing in response to the email you sent on Wednesday, September 21, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

The owners of the Turtle Bay Resort share you concerns about existing and future traffic volumes on Kamehameha Highway. The resort is part of the North Shore and Ko`olau Loa communities and is committed to finding workable traffic solutions.

As a two-lane highway serving nearly half the island extending from Kahalu`u to Hale`iwa, Kamehameha Highway has to accommodate local and regional traffic. Extending along a relatively narrow plain between the coastline and the base of the mountains, the highway cannot easily be widened, even if this was what the community wanted. And selective widening along limited straightaways would only exacerbate traffic conditions; eventually the widened roadway segment would have to narrow back to two lanes. Thus, we all have to work together to find alternate solutions.

Limiting development on the North Shore is neither a practical nor realistic answer. Even if there was no further development between Kahalu`u and Hale`iwa, there would still be traffic congestion on the highway. So long as the famed beaches of the North Shore remain an attraction for O`ahu's residents and visitors, people from Honolulu, Hawaii Kai, Kailua, Kane`ohe, Aiea, Pearl City, Waipahu, Ewa, Kapolei, Waianae and Wahiawa will come. As a community, we each must do our part to help reduce traffic and work together to address transportation issues. That means driving smarter, consolidating trips, ride-sharing, and using transit alternatives when possible, to name a few.

To reduce the impacts of the proposed resort expansion, new left-turn lanes and traffic signals will be funded by Turtle Bay Resort where the roads that will access the resort intersect with Kamehameha Highway. This should help to mitigate the impact of vehicles entering and leaving the resort. According to our recently completed traffic study, on an annual average basis the proposed resort expansion will increase traffic on the highway by about 1.5% during the morning peak hour and 3.0% during the afternoon peak hour.

In addition, the resort will implement a number of measures designed to reduce resort-related traffic. These will include van shuttle service for employees and guests. The resort is also exploring ways to extend the successful bike path at Malaekahana all the way to Hoalua Street and beyond to Ke Nui Road.

The owners of the resort are also committed to paying their fair-share of the cost for regional traffic improvements to help reduce traffic congestion, as determined by the State Department of Transportation. ("Fair-share" is calculated by the State DOT as a developer's portion of the total cost of new improvements based upon the percentage of new traffic generated by the developer's project.)

The traffic study and mitigation measures mentioned above will be presented in the Draft Supplemental Environmental Impact Statement for the resort. Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

The official review and comment period will last 45 calendar days from the date that the OEQC publishes the Notice of Availability in its *Environmental Notice*. You can find the *Environmental Notice* on-line at the OEQC website:

http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

Turtle Bay Development

1 message

Karenturnr@aol.com <Karenturnr@aol.com> Wed, Sep 21, 2011 at 11:29 AM
To: leesichter@gmail.com
Cc: cccomments@honolulu.gov

Aloha Mr Sichter,
The development you propose does not consider that the TB shoreline is frequently used as a Haul out beach by the Hawaiian Monk Seal, a critically endangered species. The isolated section of the coast has been used 4 times in the past five years as a birthing and weaning location for pups. Building along the entire length of the coast from Kawela to Kahuku point, even at the set-back you propose is not acceptable. It introduces another threat to these animals.
Karen Turner
Kahukyu

LEE SICHTER LLC

45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Karen Turner @ karenturnr@aol.com

I am writing in response to the emails you sent on Tuesday, August 23, 2011 and on Wednesday, September 21, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

Please be advised that the SEIS includes a new alternative. The Conservation Partner alternative proposes that the development be centralized around the existing hotel and that much of the remaining coastline be preserved as open space. To be implemented, it will require the participation of a third party or parties who would provide economic consideration in lieu of the foregone development rights.

A marine resources study is being prepared for inclusion in the Draft SEIS. It will specifically address existing conditions pertaining to monk seals. The SEIS will address the expansion plan's potential impacts upon monk seals.

The resort owners share your concerns about protecting the seals. The resort's owners have already placed protocols in place that help to ensure that seals are not disturbed once they haul up. Volunteers immediately cordon off the area and maintain a presence (at a discrete distance) to intercept curious onlookers.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://oahwan.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

Proposed Turtle Bay development

1 message

Everett <emagnuson@earthlink.net> **Wed, Sep 21, 2011 at 11:31 AM**
To: leesichter@gmail.com
Cc: Comments@honolulu.gov

Aloha,

As a condominium owner in Kuilima Estates I am opposed to the new development plan for Turtle Bay. While some additional development is, I believe, warranted this plan is too disruptive to the current setting. In particular, the proposed additional roadway though the development will significantly detract from the desirability of the Kuilima Estates condominiums.

Best regards,

Everett Magnuson

Kuilima Estates East

LEE SICHTER LLC

45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Everett Magnuson @ emagnuson@earthlink.net

I am writing in response to the emails you sent on Friday, September 2, and Wednesday, September 21, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

We acknowledge your opposition to the scale of the proposed expansion plan. The location of the two new hotels in proximity to the Turtle Bay Hotel is intended to minimize development impacts on the remainder of the resort property.

Please note that the SEIS will include the discussion of an alternative development plan that specifically addresses your concerns about the lateral road. The Conservation Partner alternative proposed the preservation of most of the resort's coastal areas. By eliminating development in the outlying areas, the need for the lateral road extending to those areas is reduced. To be implemented, the alternative will require the participation of a third party or parties who would provide economic consideration in lieu of the foregone development rights.

The owners of the Turtle Bay Resort share you concerns about existing and future traffic volumes on Kamehameha Highway. The resort is part of the North Shore and Ko`olau Loa communities and is committed to finding workable traffic solutions.

As a two-lane highway serving nearly half the island extending from Kahalu`u to Hale`iwa, Kamehameha Highway has to accommodate local and regional traffic. Extending along a relatively narrow plain between the coastline and the base of the mountains, the highway cannot easily be widened, even if this was what the community wanted. And selective widening along limited straightaways would only exacerbate traffic conditions; eventually the widened roadway segment would have to narrow back to two lanes. Thus, we all have to work together to find alternate solutions. As a community, we each must do our part to help reduce traffic and work together to address transportation issues. That means driving smarter, consolidating trips, ride-sharing, and using transit alternatives when possible, to name a few.

To reduce the impacts of the proposed resort expansion, new left-turn lanes and traffic signals will be funded by Turtle Bay Resort where the roads that will access the resort intersect with Kamehameha Highway. This should help to mitigate the impact of vehicles entering and leaving the resort. According to our recently

completed traffic study, on an average annual basis the proposed resort expansion will increase traffic on the highway by about 4.5% during the morning peak hour and 3.0% during the afternoon peak hour.

In addition, the resort will implement a number of measures designed to reduce resort-related traffic. These will include van shuttle service for employees and guests. The resort is also exploring ways to extend the successful bike path at Malaekahana all the way to Hoalua Street and beyond to Ke Nui Road.

The owners of the resort are also committed to paying their fair-share of the cost for regional traffic improvements to help reduce traffic congestion, as determined by the State Department of Transportation. ("Fair-share" is calculated by the State DOT as a developer's portion of the total cost of new improvements based upon the percentage of new traffic generated by the developer's project.)

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

Turtle Bay Developement

1 message

michael schwinn <michaelschwinn@hawaii.rr.com> **Wed, Sep 21, 2011 at 11:40 AM**
To: leesichter@gmail.com

NO Way more cars, development, or resorts are needed or wanted on the N. Shore. Let them build by the Disney Resort!!!

Michael Schwinn

LEE SICHTER LLC
45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Michael Schwinn @ michaelschwinn@hawaii.rr.com

I am writing in response to the email you sent on Wednesday, September 21, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

The resort owners acknowledge your opposition to the proposed expansion plan. The Turtle Bay Resort property was reclassified to the Urban District and rezoned in the mid-1980s in compliance with the Ko`olauloa Development Plan and the O`ahu General Plan that both called for the expansion of the Kuilima property to a visitor destination area to ensure the continued vitality of the island's visitor industry. It continues to be the policy of the State and the City and County of Honolulu that the Turtle Bay property be developed as a resort.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line.

We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

From: ann palacios [mailto:kamaka68@gmail.com]
Sent: Wednesday, September 21, 2011 11:45 AM
To: ccComments
Subject: Keep the Country, Country Please, Thank You

Aloha,

I am NOT in favor of the new plan for massive development at Turtle Bay.

Mahalo Nui,

Ann Palacios

LEE SICHTER LLC

45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Ann Palacios @ kamaka68@gmail.com

I am writing in response to the email you sent on Wednesday September 21, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. I understand that you oppose the proposed resort expansion plan. However, we hope that once you have had an opportunity to review the project's Draft SEIS that discusses the project in detail, you might decide that the project is worthy of your support.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

SEIS Turtle Bay Resort

1 message

Elaine Hornal <ewh@hawaii.rr.com> **Wed, Sep 21, 2011 at 12:55 PM**
To: leesichter@gmail.com
Cc: ccComments@honolulu.gov

In regard to the planned expansion of Turtle Bay Resort, I am very concerned about additional traffic congestion on Kamehameha Highway through Haleiwa leading up to Waimea Bay. As a Turtle Bay worker, I am exposed to the weekend, holiday, big wave, and turtle beach traffic back-ups already affecting the North Shore commute from Hale'iwa to Kahuku.

Adding another hotel and more condos at the Turtle Bay Resort will be a nightmare to local people as well as visitors to the North Shore who come here to get away from the crowds and traffic problems plaguing the south shores of Oahu. The natural bottle-neck at Waimea Bay must be taken into account when discussing traffic issues that will ensue if this expansion is allowed to move forward as planned.

Thank you,

Elaine Hornal
68-012 Au Street
Waialua, HI 96791

LEE SICHTER LLC
45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Elaine Hornal @ ewh@hawaii.rr.com

I am writing in response to the email you sent on Wednesday, September 21, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

The owners of the Turtle Bay Resort share you concerns about existing and future traffic volumes on Kamehameha Highway. The resort is part of the North Shore and Ko`olau Loa communities and is committed to finding workable traffic solutions.

As a two-lane highway serving nearly half the island extending from Kahalu`u to Hale`iwa, Kamehameha Highway has to accommodate local and regional traffic. Extending along a relatively narrow plain between the coastline and the base of the mountains, the highway cannot easily be widened, even if this was what the community wanted. And selective widening along limited straightaways would only exacerbate traffic conditions; eventually the widened roadway segment would have to narrow back to two lanes. Thus, we all have to work together to find alternate solutions.

Limiting development on the North Shore is neither a practical nor realistic answer. Even if there was no further development between Kahalu`u and Hale`iwa, there would still be traffic congestion on the highway. So long as the famed beaches of the North Shore remain an attraction for O`ahu's residents and visitors, people from Honolulu, Hawaii Kai, Kailua, Kane`ohe, Aiea, Pearl City, Waipahu, Ewa, Kapolei, Waianae and Wahiawa will come. As a community, we each must do our part to help reduce traffic and work together to address transportation issues. That means driving smarter, consolidating trips, ride-sharing, and using transit alternatives when possible, to name a few.

To reduce the impacts of the proposed resort expansion, new left-turn lanes and traffic signals will be funded by Turtle Bay Resort where the roads that will access the resort intersect with Kamehameha Highway. This should help to mitigate the impact of vehicles entering and leaving the resort. According to our recently completed traffic study, on an annual average basis the proposed resort expansion will increase traffic on the highway by about 4.5% during the morning peak hour and 3.0% during the afternoon peak hour.

In addition, the resort will implement a number of measures designed to reduce resort-related traffic. These will include van shuttle service for employees and guests. The resort is also exploring ways to extend the successful bike path at Malaekahana all the way to Hoalua Street and beyond to Ke Nui Road.

The owners of the resort are also committed to paying their fair-share of the cost for regional traffic improvements to help reduce traffic congestion, as determined by the State Department of Transportation. ("Fair-share" is calculated by the State DOT as a developer's portion of the total cost of new improvements based upon the percentage of new traffic generated by the developer's project.)

The traffic study and mitigation measures mentioned above will be presented in the Draft Supplemental Environmental Impact Statement for the resort. Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

Turtle Bay Expansion

1 message

Carl Higgins <carlh@hawaii.rr.com> **Wed, Sep 21, 2011 at 2:18 PM**
To: leesichter@gmail.com

Dear Mr. Sitcher,

As a long term resident of Hawaii and the north shore of O'ahu I am very concerned about the expansion of the Turtle Bay for a number of reasons, one of which is the environment. We value our pristine waters, clean beaches, lower density and country feel of this corner of our Island.

We the people have made our voices heard loud and clear, we do not want the Turtle Bay expansion, even the recent revision of the plan. Kamehameha Highway simply cannot handle more traffic and the north shore does not have the infrastructure to handle this expansion ,period. To even consider this expansion without a full blown SEIS Statement is simply insane. So many things have changed environmentally since the Turtle Bay owners were given the expansion permit 20+ years ago. We the people are much more aware of things that damage our fragile coastal areas.

You hear folks talking about "it will bring jobs'. Yes some menial paying jobs will come but at what cost to our beautiful north shore. We who live out here in a world away from urban Honolulu chose to do so knowing we must travel for jobs, we do not expect jobs here. We are here for one common reason, to live in the country away from development.

Please do your best to make our voices heard. Keep the country country!

Aloha,

Carl J. Higgins R CHMS CNAS CRS GRI

Vice-President

Coldwell Banker Pacific Properties

Certified Home Marketing Specialist

Cartus Network Affinity Specialist (Relocation)

Certified Residential Specialist

Graduate Realtor Institute

98-211 Pali Momi Street, Suite 411

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October 26, 2012

To Carl Higgins @ carlh@hawaii.rr.com

I am writing in response to the email you sent on Wednesday, September 21, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

1. We acknowledge your opposition to the proposed expansion of the Turtle Bay Resort. The Turtle Bay Resort property was reclassified to the State's Urban District in the mid-1980s and subsequently rezoned by the City for expansion as a visitor destination area. It is the policy of the City and County of Honolulu to encourage the continuing vitality of the visitor industry, in part, through the expansion of the Turtle Bay Resort.

2. The owners of the Turtle Bay Resort share you concerns about existing and future traffic volumes on Kamehameha Highway. The resort is part of the North Shore and Ko`olau Loa communities and its owners are committed to finding workable traffic solutions.

Traffic conditions on Kamehameha Highway will be impacted by the proposed expansion. At issue is what is the extent of the impact and what can the resort owners do to mitigate it. The traffic study presently being prepared as part of the SEIS to address this issue must be reviewed and approved by the State Department of Transportation. Once the project's impacts are quantified, the State DOT will determine the 'fair-share' cost of improvements that must be borne by the resort.

To reduce the impacts of the proposed resort expansion, new left-turn lanes and traffic signals will be funded by Turtle Bay Resort where the roads that will access the resort intersect with Kamehameha Highway. These improvements are required pursuant to a Unilateral Agreement attached to the property title. This should help to mitigate the impact of vehicles entering and leaving the resort. According to our recently completed traffic study, on an average annual basis the proposed resort expansion will increase traffic on the highway by about 4.5% during the morning peak hour and 3.0% during the afternoon peak hour.

In addition, the resort will implement a number of measures designed to reduce resort-related traffic. These will include van shuttle service for employees and guests. These actions are also required by the existing Unilateral Agreement. The

resort owners are also exploring ways to extend the successful bike path at Malaekahana all the way to Hoalua Street and beyond to Ke Nui Road.

The owners of the resort are also committed to paying their fair-share of the cost for regional traffic improvements to help reduce traffic congestion, as determined by the State Department of Transportation. ("Fair-share" is calculated by the State DOT as a developer's portion of the total cost of new improvements based upon the percentage of new traffic generated by the developer's project.)

The Unilateral Agreement also includes requirements for the provision of affordable housing, parks, and public beach accesses, all funded by the developer.

3. The Supplemental EIS will address existing environmental conditions and carefully evaluate the extent to which the proposed resort expansion will impact them. It will also evaluate the socio-economic impacts of the proposal and its effect upon job creation.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Cino and Priscilla Magallanes <cinomagz@hotmail.com>

To: leesichter@gmail.com

Thu, Aug 25, 2011 at 4:40 PM

Wed, Sep 21, 2011 at 12:34 PM

Aloha! I live in the sunset beach area(v-land) and i attented your meeting at turtle bay on 9/15...I came with an open mind but left there feeling discouraged. I am not Hawaiian(although my husband and children are) and moved here in 1975 and chose to stay (36 yrs)... I LOVE the North Shore and have witnessed the small but acceptable changes over the years.. The current "preferred" plan is unacceptable to me, my family and all the people I know who have made the north shore their HOME...I understand the current owners want to make the area profitable and everyone's expense... Don't get me wrong , I love the hotel as it is... it employs many family and friends...I enjoy the exercise classes, the pool bar and the awesome resturaunts...Why not make 1 super high-end luxury hotel/beach bungalow type (this could employ a lot more sevice people in addition to the ones already employed) that would be considered a 5-6 star..and a couple of more returaunts. The lands could be used for hawaiian farming, gardens, wedding sites, lu'au sites, outdoor music venue, and no more than 100 homesites(market/affordable)....please consider the feelings of ALL the people who LOVE the North Shore...Mahalo nui loa, Priscilla Magallanes,Teacher DOE

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October 26, 2012

To Priscilla Magallanes @ cinomagz@hotmail.com

I am writing in response to the email you sent on Thursday, August 25, 2011/Wednesday, September 21, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

We acknowledge your concerns with the preferred plan to expand the resort to include two new hotels. A market analysis conducted for the project concludes that there is adequate demand in the marketplace for two hotels containing a total of 625 units. The level of service provided by these hotels has not yet been finalized.

The proposed project includes a Gathering Place and other venues that could accommodate some of the activities you recommend.

The resort property includes several hundred acres of farmland on the mauka side of Kamehameha Highway. The type of farming done there is left to the decision of the tenants.

Finally, representatives of the resort owners has participated in a two-year long community outreach program to determine a development plan that would best fit the needs of the North Shore and Ko'olau Loa communities.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Tiniest Bar in Texas <thetiniest@yahoo.com> Wed, Sep 21, 2011 at 2:43 PM
Reply-To: Tiniest Bar in Texas <thetiniest@yahoo.com>
To: Lee Sichter <leesichter@gmail.com>
To whom it may concern,
The Native wildlife to include one of the most endangered species in the world, the Hawaiian Monk Seal use the area where Turtle Bay resort is to live, breed and raise their young. There has been a monk seal pup birthed at one of the beaches just east of the main resort structure for the last 3 years. We should not remotely take the risk of disturbing this species saving nursery. The chance of damaging this habitat is to great to take the risk of development. What can the developer do to ensure that this seal known for its reclusive nature is not scarred from it's chosen nursery. It can only make suggestions on how to mitigate the consequences of it's endeavors, but it cannot ensure without a doubt that it will not effect this animal. It is believed that the specieshas the best chance of survival in the main Hawaiian islands and this is one of the few places with the seclusion these animals need in order to raise their young. For perspective there are more people in the resort of Turtle Bay at this very moment than Monk seals are left in the entire world. For this reason, along with the fact that vacation resorts are not an endangered species, the island is full of them, I ask that we come up with an alternative to developing this property. At the very least we heed the words of our Governor and develop on the existing footprint only.!!!! What makes this resort so special is its unmolested beauty. Yes I know the master plan calls for the shore front not to be disturbed, but there will be an impact to water quality and shore line quality when a large population is encouraged to use it. As a solution I would like to propose a land swap with the developers for property in an area that the state of Hawaii and its residents would like to see developed, like for example Ko Olina. There is infrastructure and the will of the people behind building in this area unlike both that the developer keeps disregarding in the case of further development at Turtle Bay Resort.
sincerely,
Jason
North Shore Resident

LEE SICHTER LLC

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PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Jason @ thetiniest@yahoo.com

I am writing in response to the email you sent on Wednesday, September 21, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

A marine resources study is being prepared for inclusion in the Draft SEIS. It will specifically address existing conditions pertaining to monk seals and turtles. The resort owners share your concerns about protecting both species.

However, we would note regarding Hawaiian monk seals, that they are not as reclusive as you suggest in your email. Seals regularly haul up in areas heavy populated by humans, including Waikiki and Kailua Beach on O`ahu. The presence of humans does not appear to inhibit their activity.

That said, the resort owners have already placed protocols in place that help to ensure that seals are not disturbed once they haul up. Volunteers immediately cordon off the area and maintain a presence (no closer than 150 feet) to intercept curious onlookers.

Your concerns about water quality impacts are well taken, and will be addressed in the SEIS.

Finally, the owners appreciate your suggestion concerning a land swap with another resort area. While this idea has been rejected as not being a reasonable alternative, the owners have put a variation to this idea on the table. The SEIS includes a new alternative called the Conservation Partner alternative that proposes that the development be centralized around the existing hotel and that much of the remaining coastline be preserved as open space. To be implemented, it will require the participation of a third party or parties who would provide economic consideration in lieu of the foregone development rights.

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Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

TB expansion

1 message

linda shea <klindama@yahoo.com> **Wed, Sep 21, 2011 at 2:56 PM**
To: leesichter@gmail.com

Attn: Turtle Bay developers,
As a taxpayer and local full time homeowner I would like to add my concerns about Turtle Bay expansion.
The roads to TB cannot handle any additional burden. it is very difficult to plan travel time as it is. Added homes, condos or hotels would make the gridlock impossible. People from all walks of life leve on the North Shore to stay out of traffic. Additional building would only make daily life more difficult.
I would suggest TB work to improve the existing hotel so that it would be attractive to visitors as a "country" resort and with improvements perhaps it would be full and more profitable.
Aloha, Linda Shea
Pupukea resident

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October 26, 2012

To Linda Shea @ klindama@yahoo.com

I am writing in response to the emails you sent on Tuesday, August 23, 2011 and Wednesday, September 21, 2012 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

The owners of the Turtle Bay Resort share you concerns about existing and future traffic volumes on Kamehameha Highway. The resort is part of the North Shore and Ko`olau Loa communities and is committed to finding workable traffic solutions.

As a two-lane highway serving nearly half the island extending from Kahalu`u to Hale`iwa, Kamehameha Highway has to accommodate local and regional traffic. Extending along a relatively narrow plain between the coastline and the base of the mountains, the highway cannot easily be widened, even if this was what the community wanted. And selective widening along limited straightaways would only exacerbate traffic conditions; eventually the widened roadway segment would have to narrow back to two lanes. Thus, we all have to work together to find alternate solutions.

Limiting development on the North Shore is neither a practical nor realistic answer. Even if there was no further development between Kahalu`u and Hale`iwa, there would still be traffic congestion on the highway. So long as the famed beaches of the North Shore remain an attraction for O`ahu's residents and visitors, people from Honolulu, Hawaii Kai, Kailua, Kane`ohe, Aiea, Pearl City, Waipahu, Ewa, Kapolei, Waianae and Wahiawa will come. As a community, we each must do our part to help reduce traffic and work together to address transportation issues. That means driving smarter, consolidating trips, ride-sharing, and using transit alternatives when possible, to name a few.

To reduce the impacts of the proposed resort expansion, new left-turn lanes and traffic signals will be funded by Turtle Bay Resort where the roads that will access the resort intersect with Kamehameha Highway. This should help to mitigate the impact of vehicles entering and leaving the resort. According to our recently completed traffic study, on an annual average basis the proposed resort expansion will increase traffic on the highway by about 4.5% during the morning peak hour and 3.0% during the afternoon peak hour.

In addition, the resort will implement a number of measures designed to reduce resort-related traffic. These will include van shuttle service for employees and guests. The resort is also exploring ways to extend the successful bike path at Malaekahana all the way to Hoalua Street and beyond to Ke Nui Road.

The owners of the resort are also committed to paying their fair-share of the cost for regional traffic improvements to help reduce traffic congestion, as determined by the State Department of Transportation. ("Fair-share" is calculated by the State DOT as a developer's portion of the total cost of new improvements based upon the percentage of new traffic generated by the developer's project.)

The traffic study and mitigation measures mentioned above will be presented in the Draft Supplemental Environmental Impact Statement for the resort.

The current owners have carefully evaluated the existing zoning for the resort and have decided to proceed with a reduced scale of the original expansion plan. The impacts of this Proposed Action will be addressed in the SEIS.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

P.O. Box 629, Ka'a'awa, Hawaii 96730

drjant@aol.com; **808-237-1254**

RECEIVED
SEP 23 2011
TBR DEVELOPMENT

Cover Note

September 21, 2011

Mr. Hooser
Mr. Stotesbury
Mr. Tanoue
Mr. Sichter

re: SEIS PREPARATION NOTICE—OUR RESPONSE: critique, comments, questions

Gentlemen:

I attach hereto our response to your invitation that we respond to your publicly noticed SEIS Preparation Notice.

Sincerely yours

J.M. Anthony, Ph.D.

Encl.

covernote_seisprepnotice.09212011

P.O. BOX 629, KA'A'AWA, HAWAI'I 96730
drjant@aol.com

September 19, 2011

MR. GARY L. HOOSER, DIRECTOR, Office of Environmental Quality Control, 235 South Beretania Street, Suite 702, Honolulu, Hawaii 96813
APPLICANT: Turtle Bay Resort, LLC, 57-091 Kamehameha Highway, Kahuku, Hawaii 96731
ACCEPTING AUTHORITY: Department of Planning and Permitting, 650 South King Street, 7th Floor, Honolulu, Hawaii 96813
CONSULTANT: Lee Sichter, LLC, 45-024 Malulani Street #1, Kane'ohe, Hawaii 96744

SUBJECT: TURTLE BAY RESORT—SEIS PREPARATION NOTICE--CITIZEN RESPONSE: CRITIQUE, COMMENTS, QUESTIONS

Preliminaries: Overall comments:

The 'piko' of the problem:

You, we, all of us—have to keep in mind that is not a project that is beginning from scratch, from a brand new set of starting blocks on a new track.

The land has already been violated by a design that is foreign to the place. Its centerpiece is a concrete box at what is arguably its most prominent location. Burial sites have been disturbed. A sewage treatment plant (capacity not disclosed so far and it should) is in place and has been for more than three decades, There are housing and other units and parking places splashed across the terrain within the artificial confines of the applicant's property.

And now, because the applicant has the required zoning in place, you want to build more: 'black letter of the law' entitlement. Lurking in the back of this is a takings lawsuit based on Nollan. The applicant's present offer is to build out to 1,375 new units—we do not have a number that says how many sq. feet the new build out represents. It would be nice to have that number.

For the build out the applicant's argument is that the only way for this whole enterprise to be justified is that, bottom line, substantial expansion is unavoidable. This means that that as dollar and cents people the applicant's calculus of considerations dictate that the value of the property must be enhanced so that it becomes more attractive when it next

goes on the auction block. There is nothing mysterious about this. It is called business, prudent investment to increase the value of an asset.
One of the 'barnacles' attached to the tangled web of arguments in which this matter is embedded is the question of jobs. As someone who made his entre into public interest activism via the trade union movement, I am not insensitive to jobs—provided they pay well, include benefits and are union protected with guaranteed rights of tenure, job security. But jobs alone, as a single factor, ought not to drive the larger additional footprint that the applicant now contemplates. Remember, now, the larger **additional** footprint is **additional** to what is already there and is justified by the repeated use of the word 'additional' twice in one short sentence. The number of anticipated jobs to be created using one of several benchmarks ought to be made specific. If job creation turns what is supposed to be a rural area into one that is urban, semantics alone will not change that fact. The Preparation Notice is strangely, but then maybe not so strangely, silent on the controversial jobs issue. "Environmental Impact" is driven in part by the number of jobs created and in this case this is particularly pertinent. Addressing this issue as well as a number of others, puts the applicant's propensity to tell the truth to an important test. It is, in fact, a measure of the applicant's credibility. Quality and extent of disclosure are both related to the applicant's credibility. They are not required by law, perhaps, but they are certainly required by common sense, fair dealing, honor. If the SEIS does not meet these criteria you can expect trouble and resentment.

The applicant has sweetened a possible deal somewhat in its discussions with some stakeholders (self appointed, aggressive, well intentioned, some of them, highly credentialed but not representative of the entire Ko'olauloa/Ko'olaupoko corridor): agricultural lands will be set aside and dedicated to ag but the fee simple ownership of the land will be retained by the present owner of record. The applicant says quite openly that they are open to discussion, debate, alternative ideas. Access of this kind is not to be sneezed at. An open door genuinely held open gives us ready entre to a seat at the table where decisions can be made. Dandy.

The applicant's point of view regarding the point of diminishing returns for its investment may well be different from ours. Snag # 1.

It's at this point that the rubber of reality hits the road. The applicant's 1,375 units will, no doubt, based on present zoning and the black letter of the law, be approved by DPP. Behind DPP is Corporation Counsel, notoriously litigation averse. Corporation Counsel rides two horses: one called the public interest, the other called the "interests of the City." Corp Counsel plays politics and plays at the game called "the law".

Even a blind man on a galloping horse can "see" that community stakeholders play this game at an enormous disadvantage on a playing field that is far from even. The ultimate power of community stakeholders lies in political action, outside of the barbed and razor wire fence of the black letter of the law. The applicant knows all of this and will gamble on whether the community stakeholders will head back to litigation or fold their tents like pliant "Arabs" and steal away into the night,

We'll see.

As an instrument designed to encourage citizens to comment on, critique and ask questions about the yet to be completed SEIS, the Preparation Notice barely serves its stated purpose.

The Preparation Notice is badly written, does not cover important areas of disclosure and fails to inform citizens as to what their appeal rights are under Chapter 343 despite the fact that this issue was raised at a public meeting on September 15, 2011. Mr. Sichter sat on the elevated platform, heard my question and kept mum. Disclosure means "disclosure". Telling citizens what their appeal rights are and how an appeal is to be filed, what the requirements are for timely filing and other relevant details, are of immense importance to the whole issue of disclosure. Citizens have been shabbily treated—especially at an event sponsored by the applicant to disseminate information on a wide range of issues related to the SEIS.

There is an undercurrent in the Preparation Notice by which the applicant seems to be saying: We will do everything possible that the law requires us to do and we may even do a few 'extra things' that might be convenient but not much more. "We'll honor the black letter of the law, " the applicant seems to be saying, "but anything too far away from that is another matter." Throughout the Prep Notice, disclosure is truncated, many issues that ought to have found their way into this important document are just not there as I will presently show.

I would feel a lot more comfortable if Re-Play were to have enclosed a memorandum to Mr. Sichter saying that this project was to be done differently from the usual canned approach to EIS research and writing with which this consultant has had an enormous amount of experience. And yet what I see is the same old tried and tested approach—the same old epistemological premises which skirt a bunch of important issues to which I will turn in the text of this submission.

"Place" (including sacred space)—well grounded and carefully researched histories of each segment of land, *ahupua'a* by *ahupua'a*, that is to be impacted further by human actions—buildout involving structures of whatsoever kind, landscaping, the proposed community gathering place and so on, should be so designed, as to take fully into account the nature of these places. A commitment to do that is nowhere explicitly raised in the Prep Notice. This, in my view, is the pathway to the kind of "Polynesian design and 'appropriate' design in general" which is exemplified by carved tikis which have no genitals. This kind of thing, too long tolerated, invites some of us to make the

observation that: You colonize us. You cut off our private parts. And then, adding insult to injury, you put replicas of our gods on display with no genitals. The implication is clear enough to me: In neutering our gods you have also brutally neutered us, taken away our manhood, or tried to. That has been offensive for much too long. As people of color the impact on us is enormous. The cultural insensitivity is enormous. (None of this is original: I invite you to read Ngugi, Fanon, Memmi, Lamming, Achebe even--and others. When you do similar things by treating place and sacred space disrespectfully—whether by design or inadvertence—it makes no difference. In choosing a consultant like Mr. Sichter, long stuck in his ways, attached to the black letter of the law in Chapter 343, we have every reason to be alarmed. Mr Sichter knows that the issues I raise here do not violate Chapter 343 and he can, therefore, hope, because hope has worked before, to ignore them, your good intentions as the applicant notwithstanding. But these are different times: we've learned now from the bitter and humiliating experiences from the past that law is not everything. What law doesn't give us this time around we will—or some of us will—resort to politics. You may see, this time around for your project and the one just down the road public protest unlike any you have seen In Hawaii since the days of Bumpy Kanahele taking hundreds of protesters down the streets of Waikiki and, not long ago, in the 70s, the people of Waiahole-Waikane ready to do battle against development literally.

Frankly, in short, I do not believe that Mr. Sichter has been given a free hand to be independent. My point is that Sichter cannot be independent. He never has been. He just does not know how. Mr. Sichter is MIA—made as instructed. Debatable, yes I know. But the point must be made as this is an issue which will come back like a boomerang.

I trust that we (citizens and representatives of the applicant) do not wish to go down the road I have outlined. Reliance on muscling your way through the EIS via the black letter of the law is not the way to get this done with honor and dignity and good sense. We can either do this right by doing it right or invite an enormous amount of social upheaval borne of long festering discontent.

In terms of the quality of this Prep Notice it is appropriate for me to say here that it is unnerving to see what Mr. Sichter has included in his Bibliography and what he has left out. This is a good indication of where Mr. Sichter's head is at, to use a conventional expression. A small handful of references drawn from what is now a broad range of diverse, peer reviewed professional literature on planning and design, might have given me some hope that this being a $1.2 **billion** project your consultant would have shown some familiarity with the literature I have in mind. It is not for me to do Mr. Sichter's work for him and lay out for him what he should read and cite in his list of references. As it stands Sichter's bibliography is a disaster. Perhaps Mr. Sichter thinks that he really doesn't need to have read or to cite works written by distinguished scholars and practitioners in the related fields of design and planning. Hawaii is such a back water

that you can pretty much get away with anything, any short cut. And besides, Chapter 343 does not require you to have read, say, David Orr, Bill McDonough or a host of other distinguished Americans. That being the case , if it is, Sichter, no matter what else he is likely to say in the SEIS, he will rely on the black letter of the law acceptable to DPP. I warn you: this is a dangerous gamble. I would urge you, Mr. Stotesbury, to get more for your money and spend more money to get some high quality advice for a project, tagged at a staggering $1.2 **billion**. Look: let me be even more blunt than I have been. My professional view is that Mr. Sichter cannot alone carry the enormous burden of producing this SEISin a manner that reflects creativity of a high order. My guess is that he just doesn't have it. Having said that, I will make this concession: Mr. Sichter is your albatross, not mine. He urgently needs help if he is going to get this job done by viewing it through a wide angled lens. Mr. Sichter has not said a word in the Prep Notice about the larger Ko'olauloa/Ko'olaupoko corridor of which this project is a part. No matter how much Mr. Sichter might try to wriggle out of it, it is ethically irresponsible to pretend that TBR is a stand alone island all unto itself. It isn't and no sleight of hand will make that pretense credible. There is no way that you can run from having a master transport impact study done for the entire area from Kane'ohe to Haleiwa. Do not take my word for it—have a chat with Professor Provedorus. He's a harmless fellow, a bit controversial perhaps but he doesn't bite and he does have a working brain.

Can Mr. Iopa come to the rescue? I do not know but I will find out when I see him this Friday when he has graciously agreed to meet with me.

I have recently sent you (Mr. Stotesbury) a private piece of correspondence. That will remain private. But give it a close look. Please do not treat it lightly.

To the text of the Preparation Notice: Some specific issues--

Page 1, 3rd para: Deceptive. What about the distances South?—to La'ie, Hauula, Punalu'u, Ka'a'awa, Kahalu'u: the whole Ko'olauloa/Ko'olaupoko corridor?

Page 2, para. 6: Did the Court go far enough? What about a new SMA permit?

Page 2, para. 7 "...likely impacts of Proposed Action: Your disclosures so far delineated are remarkably truncated. Some examples: Groundwater taking and its impact on subterranean flow into the near shore marine ecosystem; consequential impacts on habitat and species; health of aquifers; where there are streams, impact of groundwater taking on streams, riparian corridors, biodiversity.

Page 4, para 2: in traditional times—what were these lands used for? Full historical reconstruction called for with citations.

Page 6, ref. to Turtle Bay Waste Water Treatment: Please provide full details either in the body of SEIS or as an Appendix. Does the Treatment Plant have an NPDES permit?

Page 6—ref. to Opana Wells—please provide full hydrologic details.

Page 6—references to Kuilima North Shore Strategy Planning Committee, Ko'olauloa North Shore Alliance, Turtle Bay Employee Advisory Group, Cultural Advisory Group: for each please provide complete list of members or of leaders and how many meetings have been held with spokespersons of each group. With respect to the Cultural Advisory Group please provide complete details of the qualifications of each member of the Group to be a cultural advisor.

Page 6: The whole idea of "Tomorrow's Ahupua'a" is offensieve, an indication of remarkable cultural insensitivity. It should be abandoned. "Tomorrow's Ahupua'a" seems to be part of the overall attempt to latch on to a few Hawaiian epithets inorder to give this whole enterprise (the SEIS) forced cultural legitimacy. The attempt borders on the farcical and is embarrassing besides being cheap.

Page 7—ref. to military: How precisely has the applicant's relationship with the military been "strengthened." And what kind of issues has the applicant discussed with the military and at what level?

From page 7 on to about page 15: There are many action items which have been mentioned. Nowhere is there mention of time lines when the action items are to be implemented, where the funding to implement these action items is going to come from, the matter of continuity of funding if this is relevant (for example—the Design Advisory Council, the Cultural Advisory Council, the Operations Advisory Council – p. 12). Enforceability of each action item is nowhere addressed. These issues are a major concern since they cover a very large number of promises to do this, that and the other thing. These seem like they are cotton candy proposals designed to lull the uninitiated into a false sense of security. As soon as the SEIS ia approved, these items, lacking enforceability teeth will be quickly forgotten. The matter of these promises being binding on successors in interest is left dangling, unaddressed—and, therefore, unacceptable

The general rule that ought to be followed is that wherever there is an action item, it must be followed by full disclosure as to where the money is going to come from to implement the action item, specific time lines for implementation as well as action items being

prioritized. All action items and attendant conditions must be binding on successors.. Full disclosure, full transparency are essential here with respect to these matters.

Page 14: Any stream diversions will have to be approved by CWRM after full public review.

Page 15, Shoreline Access: Must be dedicated in perpetuity and such dedication must run with the title and be binding on all successors.

Page 17—Kawela Bay as a Marine Life Conservation Area—only with full protection for native Hawaiians to exercise all of their hunting, gathering and PASH protected rights..

Page 17—any stream diversions must follow all CWRM procedures.

Several pages: from about 17 onwards—streams and their relationship to *muliwai* health is an import issue and must be fully addressed.

Page 22—24: Alternatives—look forward with interest to see what surfaces in the SEIS.

The historical notes on p. 25 will no doubt be fleshed out. We'll take a close look at that.

The details of the deal with the Trust for Public lands ought to be made very clear—full disclosure of its details.

Full disclosure of all permits and approvals is important.

The outline provided by the Prep Notice is noteworthy more for what it leaves out that what it includes. I return to the subject of sacred lands, special sense of place: Punaho'olapa Marsh, Opana-Kawela *ahupua'a*, Hanaka'oe *ahupua'a*. A clear and concise statement of what these places were in traditional time needs to be explicit so that we might have historical benchmnarks as to what these places were used for.

You say (p. 18): "The Gathering Place is at the nexus of these two rich and diverse areas ...." Why were they "rich" and "diverse"? And "rich" in what sense and from whose perspective? The built up component will be 40,000 sq. feet. "primarily in single story buildings." **You have already decided this. Some of the structures, a portion of the 40,000 sq. feet will be two stories. All that remains now is for the design to be done by the architect, And what will the design be and how will the architect make that decision? Who will he consult and if there are differences of view over the design how will that be settled? Or, if you say that you do not expect to be any differences, are you implying that the decks will be stacked—all the participants who will collaborate/consult with the architect will be 'yes' people. I fear that as a tendril that runs through the Prep Notice. This, I might add, if it is indeed the pathway that is chosen, will guarantee mediocrity and not excellence.** *People like Gladys Pualoa, Ahi Logan, Richard Paglinawan are pretty much as 'dull as ditch water' –*

unread, unlettered, uninformed, incapable of making an argument based on reason such that it might withstand careful scrutiny. None of them, to my knowledge, has ever published anything that has been peer reviewed. But you are stuck with them now. What does their selection tell me about your judgment? It tells me that you are not very adept at protecting your interests in a pricey project. Again: your albatross.

Smallish point, p. 19—Mr. Sichter does not have the right word, or has it misspelled in to places. The word is complementary, not complimentary .

Page 20—continuous trail from Laie to Haleiwa. Please provide full details.

How precisely, and in detail, will you "assist Local farmers". (p. 26). Full disclosure, please.
p. 29—climate change issues. You have said not a word about ocean acidification. I expect you to do so.

p. 30 – surface water issues are raised here. I would like to see a full and complete description of all streams within and abutting the SEIS and other lands owned by the applicant. Attendant data for all streams are part of full disclosure: flow rates, diminished flow rates as a result of groundwater pumpage, full inventory of species (*o'opu, hihiwai, opae, other).* Explanation of change that has occurred over time. Plans for stream restoration—disclosure.

p. 36: "The bay is the recipient of a large groundwater influx supplying high concentrations of both nitrogen and phosphorus." Full disclosure all empirical studies on these matters, including focus on sediments and sediment loads. Oxygen and low oxygen levels need to be fully addressed.

The '*iwi kupuna'* issue is blandly addressed in this Prep. Notice. A full listing of the 21 reports mentioned in 9.15 should be listed in the Bibliography. The range of issues drawn eloquently to the meeting sponsored by the applicant on 9/15 by **Na'u Kamali'i and Pi'ilani Smith ought to be comprehensively addressed in the SEIS.** I invoke their comments and extensive testimony by reference and splice them into this submittal. Be grateful if their concerns were fully set out in the SEIS and then addressed.

p. 41—full disclosure of all permits and appropriate approvals ought to be made in the SEIS and there is no reason why such a list ought not to be circulated to interested parties before the SEIS is officially sent to DPP.

If this Preparation Notice is the template to be followed in the making of the SEIS the result will be unabridged urban sprawl. The paw print is writ large and clearly whether the number of new units is 1,375 or any other number lower than that. The 4 mile stretch from Mormon owned agricultural lands which they seek to convert to urban use will draw no small part of its inspiration from what happens in Turtle Bay. The two projects are tied together, one feeds off of the other. If the accepting authority denies this, as I am sure they will try to, it will remain for the Courts to decide the truth of this matter—if

they can be convinced, of course, that this issue is relevant to the strictures of the General Plan and the Sustainable Communities Plan or the one that will soon be before us all in yet another dog and pony show.

To conclude: Some of us know full well how the EIS (or SEIS) review process **really** works. DPP looks the EIS over and makes its determination on the black letter of the law issues and renders its Findings of Fact, Conclusions of Law and Decision and Order. This is not done, in my view, in a sanitized, infection free environment. The developer's consultant and possibly others intervene in the process by untraceable telephonic communication and other untraceable means, The Mayor, too, does his own intervening—behind the scenes, of course. That is no difficult in this instance since David Tanoue and the Mayor are close buddies. DPP denies all of this. It must. DPP's main job is to make as sure as possible that the D & O is appellate review proof—as much as possible. No D & O is 100% water tight—beyond the reach of appellate scrutiny and possible reversal on appeal.

That leaves the 'soft issues'—those that are outside of the ambit of the black letter of the law. Many of these 'soft issues' are political in nature. It's a tough sport this SEIS review business with shifting rules and multiple uncertainties. For the more seasoned public interest spokespersons among us this whole process becomes a balancing act between what the law says and what the law and political pressure and power make possible. The whole thing is a witch's brew. With respect to this project and the Mormon Church one down the road huge amounts of money are involved and more often than not, big money trumps everything. We'll see, I suppose,

Keep in mind—and once again the Prep. Notice fails to address this: that what happens on the TB property has consequential impacts for both the north and the south—and it isn't just traffic. To embrace 'holism' selectively is dishonest. What happens on such a large scale in Kahuku spills over into the Mormon Church domain in La'ie, and La'ie, in turn, feeds Kahuku's baser appetites as well as the lands in between. What we are in for is a double dose of urban sprawl and the most thumping lesson we have to learn from is what happened in Waikiki. Not much more then a century ago Waikiki was a small fishing village. Once it was urbanized the virus of urban sprawl spread from Waikiki to the area around Diamond Head to Kahala to Aina Haina, to Kuliouou to Port Lock and to what is now Hawaii Kai. And from Hawaii-Kai to Waimanalo (where the knife has so far slipped) on into urban sprawl infected Enchanted Lakes, Kailua and Kan'eohe. With rising property taxes and other pressures on many local people of limited means, many of them and their children got pushed out, displaced—forever. I know the 'progress' argument full well. What I wonder about is whether planners, planning consultants and developers read any history. Mark my words: The windward corridor from Kane'ohe to Kahuku and beyond is about to have urban sprawl shoved down its throat—all of the syrupy drivel notwithstanding. Chapter 343 will not save us, The protections built into the Community Sustainability Plan and the General Plan are in danger of having their guts ripped out of them. The uneven playing field is being made more uneven. Gun emplacements are being positioned to drive communities into submission. Hope for compromise through honorable negotiations is diminished. Developer interests, as in

La'ie, for example, want pliant communities firmly in their control and in their pockets and fully intimidated by the threat of sanctions to don their company supplied blue t-shirts and march to their drumbeat. The applicants in the TB case might perhaps be a bit more subtle. So far, it seems to me, that the TBR applicant's are possessed of a greater sense of honor. It is an attribute that community stakeholders need to (a) recognize, and (b) embrace in a modality conducive to finding common ground. I. do not think that communities opposed to the Laie and TBR developments are going to approach them for negotiations carrying white flags. Olive branches, perhaps—but not white flags.

The Prep Notice invited critique, comments and questions. We have tried to do our best in being as comprehensive as possible. This word product might have benefited a tad more from more editing but time and an approaching deadline foreclose the possibility of that. As with all writing there is a point in the writing process when the writer has to say: "It is done as much as it is going to be done." We have reached that point and offer this document for you to read and submit to your own scrutiny. ***Should any of you have any questions we should be happy to sit with you and answer them , comment on your comments, and/or entertain the dignity of any critique you may have to offer.***

One thing is certain: the scaffolding sketched here is avoided like the plague in the Prep. Notice and will, in all likelihood, receive not a word in the Draft or Final SEIS. Par for the course. This, after all, is ***Chinatown***., perhaps now on the cusp of ***becoming Milagro Beanfield War*** **territory. We'll see.**

Aloha

Submitted on behalf of:

HAWAI'I—LA'IEIKAWAI ASSOCIATION, Inc. and

MALAMA IA KO'OLAULOA

J.M. Anthony, Ph.D.

Marvin Iseke

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LEE SICHTER LLC

45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Jim Anthony

I am writing in response to the email you sent on September 21, 2011 at 5:40pm commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are responses to your comments in the order they were presented.

1. It is an undisputed fact that the area now occupied by the Turtle Bay Resort has been the subject of a series of transforming land uses since the mid 1800s.
2. The capacity of the existing wastewater treatment plant will be disclosed in the SEIS.
3. The square foot of the proposed development has not yet been determined. As the proposed project is presently in its conceptual planning stage, it is unlikely that the information will be available for inclusion in the SEIS.
4. A socio-economic analysis of the Proposed Action will be included in the SEIS. It will disclose the number of jobs that the Proposed Action is anticipated to create.
5. You are correct in your summary of the resort owners' discussions pertaining to the preservation of the agricultural lands mauka of Kamehameha Highway.
6. We regret that the content and quality of the SEIS Preparation Notice did not meet your standards.
7. The public's appeal rights are presented in Chapter 343-7, Hawaii Revised Statutes as amended.
8. We believe that you will find the SEIS to be closer to your desire that the document be something different than the "...usual canned approach..."
9. The SEIS will clearly present the resort owners' commitments to the development of the property.
10. We acknowledge your concerns about cultural insensitivity and regret that the proposed project offends you.
11. The SEIS will be an objective disclosure of the project's impacts.
12. The List of References in an EIS is not required to disclose the books that form the educational experience of the EIS author. Your lack of confidence in my abilities is acknowledged.
13. Distances to other geographic points with the Ko`olau Loa corridor will be provided in the SEIS.

14. To our knowledge, the court did not require the resort owner to seek a new Special Management Area permit.
15. We apologize for the brevity of the statement.
16. The SEIS will include a cultural impact assessment that discloses archival research about the historical use of the property.
17. While the existing wastewater treatment plant is beyond the scope of the SEIS in that it is not situated on lands specifically addressed in the Proposed Action, the SEIS will present an overview of its function and how it supports the existing and proposed development.
18. The SEIS will provide additional information about the Opana wells.
19. The resort owners cannot provide the information you request.
20. We apologize for your being offended by the Tomorrow's Ahupua`a concept. No offense was intended.
21. The owner's relationship with the military has been strengthened through communication about regional land use issues.
22. Timelines for action items pertaining to the implementation of the stewardship guidelines have not yet been developed. The representative of the owners has discussed publicly the creation of Conditions, Covenants and Restrictions (CC&Rs) to provide a means of enforcing commitments that have been made.
23. The resort owners will be as transparent as is practicable.
24. If implemented as a mitigation measure, the restoration of the Kawela stream alignment will conform to all regulatory requirements.
25. That is the intention of the resort owners.
26. The resort owners affirm their commitment to the preservation of PASH rights at Kawela Bay.
27. The alternatives presented in the SEIS will reflect the results of the public outreach program.
28. They will.
29. Details regarding an agreement with the Trust for Public Land will be disclosed to the extent required by law.
30. All necessary permits and approvals will be disclosed in the SEIS.
31. See comment response #16.
32. These statements regarding the Gathering Place were intended to give the reader a general sense of what is being considered. The SEIS will provide additional design information if it is available.
33. Thank you for the spelling correction.
34. This statement references a possible bike trail. The SEIS will address this to the extent that more information is available.
35. The statement regarding "assist local farmers" appears on page 28. It was intended to describe how a Farmers Market would assist them by providing a location to market their produce.
36. The SEIS will discuss ocean acidification to the extent that it is relevant to the Proposed Action.
37. A discussion of the streams will be included in the SEIS.
38. The information you request will be presented in the SEIS.
39. The reports will be identified in the Supplemental Archaeological Inventory Survey. The purpose of the September 15th was to explain the SEIS process to the community. As an open house and informational meeting, it was not intended to receive formal testimony.
40. The SEIS will include a list of all required permits and approvals.
41. The SEIS will address the cumulative impacts of the Proposed Action and the development proposed at Laie.
42. There is no Decision and Order associated with the approval of an EIS. Rather, it takes the form of a Notice of Acceptance that is transmitted by the Accepting Agency (in this case, DPP) to the Office of Environmental Quality Control for publication in the Environmental Notice.
43. Mahalo for your invitation to follow up with you on your comments.

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Lee Sichter <leesichter@gmail.com>

FW: Turtle Bay

2 messages

ccComments <ccComments@honolulu.gov> **Wed, Sep 21, 2011 at 10:03 AM**
To: "leesichter@gmail.com" <leesichter@gmail.com>, "drew@replayresorts.com" <drew@replayresorts.com>

From: ccComments
Sent: Tuesday, September 20, 2011 7:19 AM
To: 'sightpacific@hawaii.rr.com'
Subject: RE: Turtle Bay

Your comments for the Supplemental Environmental Impact Statement Preparation Notice for Turtle Bay resort have been received by the Department of Planning and Permitting. Please note that any further email comments to the department should be directed to ccComments@honolulu.gov.

Your comments were also sent to the Consultant and Applicant. Their contact information is:

Consultant:

Lee Sichter LLC

45024 Malulani Street #1

Kaneohe, Hawaii 96744

Contact – Lee Sichter, (808) 382-3836

leesichter@gmail.com

Applicant:

Turtle Bay Resort, LLC

57-091 Kamehameha Highway

Kahuku, Hawaii 96731

Contact – Drew Stotesbury, (808) 447-6951

drew@replayresorts.com

Lee Sichter <leesichter@gmail.com>

Turtle Bay/Envision La'ie

1 message

sightpacific@hawaii.rr.com <sightpacific@hawaii.rr.com> **Wed, Sep 21, 2011 at 6:12 PM**
To: leesichter@gmail.com
Cc: pbdocberry@gmail.com, michaelhercher@gmail.com

These two "Plans" must be considered as one. They predicate a 4 Lane Highway, though this issue is understated. Water and sewage are getting attention now that City Council has fallen for development as an inevitability. The North Shore, like Waikiki, Ko'olina, Lahaina will become subject to investment and short term visitors, and maybe a California development like Kailua. It will emotionally and financially swamp local culture, still alive and OK on the "historical" North Shore. People come here weekends in droves just to be with that quiet,funky sense of life. It is not the sense of life of Turtle Bay or Marriott. They respect the bottom line exclusively, no matter how much sweet talk. The jobs will be low wage. Construction farmed out.I say give O'ahu a break and leave some of it alone, let it be to evolve very slowly, as slow as the life people like to visit weekends and take a little bit of home.
Hotels breed; that form of life is invasive. Paul and Judy Nelson, Waialua

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October 26, 2012

To Paul and Judy Nelson @ sightpacific@hawaii.rr.com

I am writing in response to the email you sent on Wednesday, September 21, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

1. The resort's owners acknowledge your recommendation that the proposed expansion plan evolve slowly over time. As discussed in the SEIS, the project has an 11-year planning horizon, meaning that will be completed in the year 2025.
2. The SEIS will evaluate the cumulative impacts of development at the Turtle Bay Resort and in Laie.
3. The resort's owners share your concerns about traffic. The SEIS will include a traffic study that evaluates the impacts of the proposed project on Kamehameha Highway.
4. The SEIS will also evaluate the project's impacts on water and wastewater treatment.
5. In 1977, an amendment to the Oahu General Plan, voted on by the residents of the City and County of Honolulu, designated the Kuilima Hotel property to be reclassified as a Visitor Destination Area. Several years later, the Ko`olauloa Development Plan was adopted by the City as a means of implementing the General Plan. It depicted the Kuilima property as a resort. In 1986, the City Council approved an expansion plan for the resort that allows the development of five new hotels. It was decided at that time, that the development was needed to create new jobs in the region and to support the continuing health of the visitor industry.

   In 1999, the Ko`olualoa Development Plan was replaced with Ko`olau Loa Sustainable Communities Plan. The principal difference between the two plans is that the latter established an urban growth boundary that was intended to limit development and protect the rural character of the region. Because the Turtle Bay Resort property was reclassified to the Urban district about 14 earlier, it is fully contained within the Urban Growth Boundary.

   Together, these plans and policies are intended to ensure that the rural character of the North Shore is preserved for future generations.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

The official review and comment period will last 45 calendar days from the date that the OEQC publishes the Notice of Availability in its *Environmental Notice*. You can find the *Environmental Notice* on-line at the OEQC website:

http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

DEPARTMENT OF PLANNING AND PERMITTING
CITY AND COUNTY OF HONOLULU
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PETER B. CARLISLE
MAYOR

DAVID K. TANOUE
DIRECTOR

JIRO A. SUMADA
DEPUTY DIRECTOR

2011/ED-7(sn)

September 21, 2011

Mr. Lee Sichter
Lee Sichter LLC
45024 Malulani Street #1
Kāne'ohe, Hawai'i 96744

Dear Mr. Lee:

Subject: Environmental Assessment and Supplemental Environmental Impact Statement Preparation Notice
Turtle Bay Resort
Kahuku, Ko'olau Loa, Hawai'i

We reviewed the Environmental Assessment and Supplemental Environmental Impact Statement Preparation Notice (SEISPN) and offer the following comments:

1. The Draft Supplemental Environmental Impact Statement (SEIS) should discuss the project improvements (e.g., Punaho'olapa Marsh, golf course, infrastructure) which were completed since the 1985 Environmental Impact Statement (EIS).

2. Introduction and Purpose. The SEISPN explains that the Unilateral Agreement (UA) provided that a total of 4,000 units could be developed, which includes the existing Kuilima Resort. Identify the number of units in the existing Kuilima Resort.

3. The "SEIS Lands".

   a. Clarify why 11 acres of land were excluded in this SEISPN that were part of the 1985 EIS.

   b. The SEISPN indicates that the SEIS Lands total about 786 acres while the 1985 EIS indicates an expansion area of about 808 acres (page 1 and 3 of the EIS). Clarify the difference in acres.

4. Description of Proposed Action.

   a. Shoreline Access. Provide additional details on the shoreline parks including whether the parks will be dedicated to the City or privately owned, the provision of off-street parking for the public, and whether hours of access by the public will be imposed.

   b. Section 7.5 Development Program: Hanaka'oe Ahupua'a. The SEISPN indicates that 625 hotel and/or timeshare units are planned for Sites H-1 and H-2.

However, individual lock-off suites or "keys" within a unit are mentioned. They may be rented or occupied separately, which may increase the number of hotel keys to 1,000. The potential for 375 more units should be evaluated as part of the proposed expansion project.

   c. Section 7.10 Circulation. The Marconi Road ROW Lands were included in the description of the SEIS Lands in Section 3.1. However, this section appears to indicate that the Marconi Road ROW Lands are located east of the SEIS Lands and not part of the SEIS Lands. Clarify and revise accordingly.

   d. Section 7.14 East and West Main Drains. Figure 8 Reduced Density (Proposed Action) identifies the East Main Drain but not the West Main Drain. Clarify and revise accordingly. Also, the word "widened" appears twice in the last sentence of the last paragraph of the section.

5. Drainage. The reference list should include all applicable City and County of Honolulu standards, i.e., Rules Relating to Storm Drainage Standards, Revised April 8, 2011 and Rules Relating to Soil Erosion Standards and Guidelines, April 1999.

6. Socio-Economic. This section includes the number of employees at Turtle Bay Resort and the number of residents in Kuilima Estates. The Draft SEIS should also estimate the number of visitors and residents which could be generated from the proposed expansion project.

7. Governmental Plans and Policies. Update the project's compliance with current applicable governmental plans and policies, including the General Plan and the Ko'olau Loa Sustainable Communities Plan (SCP). The five-year update of the Ko'olau Loa SCP is underway and a public review draft was circulated for review and comment in October 2010. As such, we recommend that the Draft EIS also discuss the project's compliance with the public review draft.

8. Zoning. Provide additional details on the zoning amendments and zoning changes referenced in Section 9.5 and Figure 14.

Should you have any questions, please contact Sharon Nishiura of my staff at 768-8031.

Very truly yours,

David K. Tanoue, Director
Department of Planning and Permitting

DKT:bkg
877367

cc: Mr. Drew Stotesbury - Turtle Bay Resort, LLC

LEE SICHTER LLC
45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

Mr. Jiro Sumada
Acting Planning Director
Department of Planning and Permitting
City and County of Honolulu
650 South King Street, 7th Floor
Honolulu, Hawai'i 96813

Dear Mr. Sumada:

I am writing in response to the letter your predecessor, David Tanoue, sent on October 14, 2011 concerning on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate him taking the time to write. Following are our responses to his comments in the order they were presented in your letter.

1. The Draft SEIS includes a discussion and descriptions of the project improvements that have been completed since the 1985 Revised Final EIS.
2. The Draft SEIS clarifies the number of existing units at the resort (500 hotel units and 366 condominium units (plus two manager's units).
3. We regret the your staff may have misread the statement in the SEIS Preparation Notice concerning the acreage of the SEIS Lands. As discussed in the definition section on page VI, the SEIS Lands include all the lands discussed in the 1985 EIS plus 11 acres that were excluded in 1985. The 1985 EIS excluded the existing hotel because it was not part of the expansion plan. However, when we compare the map of the existing hotel grounds presented in the 1985 EIS with the map of the existing hotel property today, we noted that the property attributed to the hotel in 1985 was approximately 11 acres larger than it actually is. Thus, it was excluded then, and is now added back. A full accounting of the acreage of the resort and the SEIS Lands will be presented in the Draft SEIS.

   Additionally, the estimate of the current expansion area is based on metes and bounds descriptions. We do not know how the acreage in 1985 was calculated. We believe that the difference may be attributable to a number of reasons including mapping error and coastal erosion.

4. The Draft SEIS will provide details on each of the proposed shoreline parks as requested.

   The total number of units, including possible lock-offs will be described and evaluated as part of the proposed expansion project in accordance with City & County of Honolulu Land Use Definitions and practices.

5. The Draft SEIS will include reference to all applicable drainage standards.
6. The Draft SEIS will include estimates of the number of visitors and residents that will be generated from the proposed expansion project.
7. The project's compliance with applicable government plans and policies will be updated as requested.
8. Additional information concerning any needed zoning amendments and zoning changes will be provided to the degree that they are known at the time the Draft SEIS is prepared.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. We will be providing your department three printed copies and eight digital copies of the document as requested by your staff.

The official review and comment period will last 45 calendar days from the date that the OEQC publishes the Notice of Availability in its *Environmental Notice*. You can find the *Environmental Notice* on-line at the OEQC website:

http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

First Hawaiian Bank
Kahuku Branch

September 21, 2011

Lee Sichter LLC
45024 Malulani Street #1
Kaneohe, Hawaii 96744

Draft Comment by Sarah Cadiz

I read the Environmental Assessment and Supplemental Environmental Impact Statement Preparation Notice. I believe the document adequately considers the anticipated impacts of the Turtle Bay Resort Comprehensive Plan and respects the environmental, cultural, social, and economic elements as noted in the report.

I am the Manager of First Hawaiian Bank's Kahuku Branch. My staff and I live and work on the North Shore of Oahu. We support the process and would like to see it move forward in a timely manner. Ultimately, we believe Turtle Bay's development and management plan will bring needed jobs, hotel rooms, and tourist dollars to the North Shore. We discussed our support for this project with First Hawaiian Bank senior management. We all agree that implementation of the plan will help energize the North Shore economy.

Mahalo for the opportunity to comment on this report.

Respectfully,

Sarah I. Cadiz

LEE SICHTER LLC
45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

Sara Cadiz
First Hawaiian Bank
P.O. Box 207
Kahuku, Hawaii 96731-0207

Dear Ms. Cadiz

I am writing in response to the email you sent on September 21, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

We appreciate your support for the project. The Proposed Action represents the result of a two-year long public outreach program (that continues today) to open a dialog with the community about the future of the Turtle Bay Resort.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com.

However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

The official review and comment period will last 45 calendar days from the date that the OEQC publishes the Notice of Availability in its *Environmental Notice*. You can find the *Environmental Notice* on-line at the OEQC website:

http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

Fwd: Comments on the SEISPN for the Turtle Bay Resort

1 message

Lee Sichter <leesichter@me.com> **Mon, Sep 26, 2011 at 1:18 PM**
To: Lee Sichter <leesichter@gmail.com>

Sent from my iPad

Begin forwarded message:

From: Lucky Cole <lucky@hawaii.rr.com>
Date: September 21, 2011 1:16:00 PM HST
To: Sharon Nishiura <snishiura@honolulu.gov>
Cc: Drew Stotesbury <drew@replayresorts.com>, Lee Sichter <leesichter@me.com>, Gil Riviere <gilorama@hawaii.rr.com>, Kathleen Pahinui <pahinuik001@hawaii.rr.com>, Sally and Peter Cole <colep002@hawaii.rr.com>, Rory Wicks <RWicks@CoastLawGroup.com>
Subject: Comments on the SEISPN for the Turtle Bay Resort

September 21, 2011

Sharon Nishiura snishihara@honolulu.gov;
Department of Planning and Permitting
City and County of Honolulu
650 South King Street 7th floor
Honolulu HI 96813

Dear Ms. Nishiura,

I was on the North Shore Neighborhood Board and possibly the Chair at the time of the original approvals; the City deemed the project to be in the Kootauloa NB even though much of the traffic flows to the west. The Resort property lies about mid way between the town of Kahuku and the community of Sunset Beach/Pupukea. I spent a number of years on the Neighborhood Board with several tours as its chair. I've also been an officer and president of the Sunset Beach Community Association. Most recently, I've been on the board and Treasurer of Keep the North Shore Country (KNSC). I've also been an active member of the Koolauloa North Shore Alliance which is an alliance of community and environmental organizations opposed to the full build out of the Turtle Bay Resort.

KNSC won its lawsuit to require an SEIS due in large part to the long time since the original EIS; to place it in perspective, the original decision and EIS occurred prior to the Internet, cell phones, surf industry, the Ko Olina Resort and of most significance the revival of the Hawaiian language and culture. These are my personal views but are similar to the view which will be forthcoming from KNSC. We have sought opinions from our supporters as well as our advisers.

We appreciate Drew Stotesbury and the Replay Resorts open approach to the SEIS process. Often Drew has asked us what will be acceptable to the community. Many of our supporters prefer the no build alternative. However, the message has been consistent that we want to keep the majority of the property in open space. For this reason, we are requesting the evaluation of a "Focused Low Rise" alternative to replace the "Kawela Conservation" Alternative.
I have also addressed, see attached, the definition of "units" and scope of the traffic analysis in my individual comments.

Sincerely,

Schuyler "Lucky" Cole
59-229C Ke Nui Road, Haleiwa HI 96712
808-554-8113;

2011 0921 SEISPN SE Lucky Cole comments.pdf
17K

Turtle Bay Expansion SEISPN comments by Schuyler "Lucky" Cole

Definition of a unit?

The SEIS must use a 21st century system of counting and measuring impacts both positive and negative from this expansion. Clearly a hotel unit which is one room (studio) is different from one which is a two bedroom suite or an Ocean Villa resort unit or a lock out unit which can be converted into two rooms. A lower cost smaller unit might have higher occupancy than a higher cost larger unit but when occupied it will have fewer visitors and less demand on resources. A hotel unit, lock out, which consists of two rentable suites, will have more visitors than a unit which can't be booked separately; a lockable unit which becomes two studio rooms of 140sf is quite different from a unit which becomes a 2 bedroom suite and a studio hotel room with a total of 1,500sf. A residential condo unit with 1 bedroom and 1 bath in 600sf has a different environmental impact than a 3 bedroom 2 bath unit of 1,400 sf.

A method used when evaluating real estate alternatives is to define a base unit and then add to it; for example, base units might be a standard hotel room in the Turtle Bay Hotel; a studio or A model unit (1/1) in the Kuilima Estates; and a Kuilima B model for the lock out base unit. When determining incremental impacts one could add square feet and bedrooms to these base units to arrive at an effective density. This method would enable us to understand the relative size of the expansion in familiar terms, e.g. the existing resort and Kuilima units which were in place when the expansion was approved.

What is the effective density of the "preferred alternative" for expansion of the Turtle Bay Resort relative to the existing Turtle Bay Resort?

Traffic

Traffic analysis must consider impact on Kamehameha Hwy. from Haleiwa Town to Kahaluu.

Replace the "Kawela Conservation" with a "Focused Low Rise" Alternative defined as:

1. All resort expansion is to occur in, or adjacent, to the existing resort (called Ahupua'a O Hanaka'oe in the SEISPN); expansion will utilize the existing infrastructure wherever possible. Benefit: This leaves the Kawela and Kahuku Point lands in open space, conservation, golf course and recreational use.
2. The extent of the expansion as measured in rooms, units and living area is **not** to exceed **half** the existing resort. Benefit: this resort expansion alternative results in only a 50% increase in units and hence environmental, cultural and traffic impacts.
3. Limit resort road development to the existing intersection and road plus access roads to housing and hotels. Benefit: this minimizes the investment in road and utility infrastructure.
4. Limit building height to 60' for hotels and 30' for resort residential. Benefit: Building height is a significant factor in maintaining rural character and keeping the country, country.
5. The Community Housing requirement of the project will be met either as planned adjacent to the existing Marconi Road intersection or via land exchange in Kahuku Town or via other land exchange options. Benefit: TBR Community housing will be integrated with the existing and planned community housing of the City and County of Honolulu.

Submitted on Wednesday, September 21, 2011 to the City and County of Honolulu and Replay Resorts.

LEE SICHTER LLC

45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Lucky Cole @ lucky@hawaii.rr.com

I am writing in response to the email you sent on Monday, September 26, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

1. In its Alternatives Analysis, the Draft SEIS includes a Conservation Partner Alternative that proposes to withdraw development from much of the coastline and centralize it around the existing hotel as you recommend. This alternative was developed in direct response to concerns raised by the Koolauloa North Shore Alliance. The implementation of the Conservation Partner Alternative is subject to the participation of a third party or parties who would provide economic consideration in lieu of the foregone development rights.
2. The SEIS will evaluate the Proposed Action that includes 625 resort units and 750 residential units. The 625 resort units may include as many as 375 lock-off units, bringing the total base number of proposed rentable units to 1000. The impact analysis in the SEIS will assess the impacts of the 1000 units.
3. The traffic analysis being conducted for the SEIS addresses the region from Kahalu`u to Hale`iwa.
4. The proposed unit count of the two hotels included in the Conservation Partner alternative is 440 units, which is less than the current number of hotel units at Turtle Bay, but more than the half you request.
5. The Conservation Partner alternative generally limits new roadway development to the Hanakao`e area.
6. The Conservation Partner alternative limits the height of the proposed hotels to 70 feet; 10 feet higher than you request. The trade-off here relates to building footprint; the higher the building, the smaller the footprint.
7. The Conservation Partner alternative proposes the community housing at the intersection of Marconi Road and Kamehameha Highway.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

The official review and comment period will last 45 calendar days from the date that the OEQC publishes the Notice of Availability in its *Environmental Notice*. You can find the *Environmental Notice* on-line at the OEQC website:

http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

JEAN + MARK MARTINSON
59-341 KE NUI RD, HALEIWA HI
96712

DEPT. OF PLANNING & PERMITTING
HONO. HI

MS SHARON NISHIMURA

ALOHA! AS KAMA'AINA OF THE NORTH SHORE OF OAHU AND PROPERTY OWNERS SINCE 1975 WE ARE VERY CONCERNED ABOUT THE EXPANSION DEVELOPMENT PLANS OF TURTLE BAY RESORT. WE RESPECTFULLY SUGGEST THEY MAINTAIN 300 SET BACKS FOR ALL THEIR SHORELINE DEVELOPMENTS. THOUGH NON-NATIVE THE FORESTS ALONG THEIR BEACHES ARE 50 YEAR OLD MARITIME ECOSYSTEMS, BEAUTIFUL + UNIQUE AND THEY ARE WORTHY OF PRESERVATION!

AS A 35 YEAR EMPLOYEE OF TURTLE BAY (JEAN) I KNOW A SMALL HOTEL - 300 ROOMS - COULD BE ADDED INTO THE EXISTING INFRASTRUCTURE BUT ANYTHING MORE (1,500 UNITS?) WOULD SEVERLY STRESS OUR PHYSICAL NATURAL ENVIRONMENT — THE OCEAN (THE POLLUTION FROM BUILDING AND RUNOFF FROM PARKING LOTS, THE COUNTRYSIDE - ADDING THOUSANDS OF PEOPLE AND HUNDREDS MORE CARS TO OUR TWO LANE HIGHWAY IS A TRAFFIC NIGHTMARE!) OUR NORTH SHORE BEACHES ARE ALREADY SUFFERING FROM BROKEN FROM [redacted] TOURIST TRAFFIC FOOT ERASION! DISTURBING OUR ENDANGERED SPECIES — THE EIS DOESN'T MENTION THE MONK SEAL HABITAT + BREEDING AREA ALONG THE TURTLE BAY PROPERTY. AS A LONGTIME OAHU MONK SEAL RESPONSE TEAM MEMBER I'VE WITNESSED FOUR HIGHLY ENDANGERED MONK SEAL PUPS BORN ON TURTLE BAY BEACHES AND YEAR LONG SEVERAL FEMALE SEALS LIVE ON THESE BEACHES. ADDING HUNDREDS OF VISITORS TO THESE BEACHES WOULD DISTURB THESE SEALS FORCING THEM AWAY FROM THEIR PREFERRED CHOSEN HABITAT!!

TURTLE BAY LEGAL TO CHANGE KAWELA BAY'S ECOSYSTEM (FRESH WATER) BY DIVERTING STREAMS IN UNDERGROUND KAWELA WILL ALWAYS HAVE FRESH WATER. TRYING TO CLEAN UP THE WATER FOR TOURISTS IS DISRESPECTFUL TO THE AHUPUA'A!

THIS OVER DEVELOPMENT WOULD CHANGE OUR LIVES! DOUBLING OUR TRAFFIC, POLLUTING OUR AIR AND OCEAN, STRESSING OUR NATURAL RESOURCES - OUR WATER AND SEWER SYSTEMS! PLEASE DENY THE CURRENT APPLICATION FROM TURTLE BAY FOR THIS HUGE AND UNREASONABLE EXPANSION.

WHY SHOULD THE NEIGHBORING COMMUNITIES SUFFER A DRASTIC CHANGE IN OUR COUNTRY LIFE STYLES DUE TO THE BAD INVESTMENT MISTAKES OF FOREIGN COMPANIES WHO WANT TO EXPLOIT OUR BEAUTIFUL COMMUNITY FOR THEIR FINANCIAL GAIN?!

SINCERELY, MAHALO,
Jean Martinson
Mark Martinson

LEE SICHTER LLC
45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Jean and Mark Martinson
59-291 Ke Iki Road
Haleiwa, HI 96712

Dear Jean and Mark:

I am writing in response to the letter you sent on September 21, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

1. The resort owners propose to implement shoreline setbacks that are required by the Unilateral Agreement that was approved at the time the property was rezoned. However, in the area of Kawela Bay, the owners propose to increase the setbacks to 300 feet.
2. A botanical analysis has been conducted for the property and will be included in the SEIS. It concludes that while there is a fragile strip of native vegetation along portions of the shoreline that must be preserved, the ironwood trees constitute a significant environmental threat. Specifically, the volume of needle-litter they produce carpets the ground and prevents all other plants from growing. The result is no healthy understory in ironwood tree forests. The study recommends the selective thinning of the ironwoods in an effort to promote the restoration of native beach plants. No one is suggesting that all the ironwoods be removed. Rather, selective thinning may be employed to produce a much healthier plant environment along the shore.
3. The current plan proposed the addition of two new hotels, one with 375 units and the other with 250 units. While this is twice as much as you suggest, it is still far fewer than the 3,500 units allowable under the current zoning for the property.
4. The resort owners share your concerns about the project's impacts on Kamehameha Highway. A traffic impact analysis report (TIAR) for the Turtle Bay Resort was approved by the State Department of Transportation in 2009. It is now being updated for the Draft SEIS and its findings and recommendations will be included in the document. The study will address ingress and egress issues. The scope of the update extends from Kahalu'u to Hale`iwa. We understand that the future widening of Kamehameha Highway for the purpose of adding lanes is not under consideration by either DOT or the City. Therefore, measures to mitigate traffic impacts must focus on transportation demand management (TDM); how to better utilize existing resources. To that end, the resort owners have commissioned a TDM study. The TDM recommendations will be included in the Draft SEIS.
5. A marine resources study is being prepared for inclusion in the Draft SEIS. It will specifically address existing conditions pertaining to monk seals and turtles. The resort owners share your concerns about protecting both species and will address this issue in the SEIS.
6. The restoration of Kawela Stream to its original course is not an attempt to limit the introduction of fresh water into Kawela Bay. You are correct that there are sources of groundwater that enter the bay in addition to the stream. The stream restoration program is intended to eliminate the stream's ability to deposit silt into the bay. As a long-time resident, we are sure you will agree that turbidity in the bay dramatically increases after heavy rain events. That turbidity is the result of silt being deposited in the bay by Kawela Stream. The project's marine biologists and engineers recommend that restoring the stream to its original course east of Kawela Point will improve the water quality of the bay. Thus, it is proposed as a measure to mitigate regional drainage impacts on the bay.
7. We respectfully request that you suspend your conclusions about the possible impacts of the proposed expansion project until you have had an opportunity to review the SEIS. The purpose of that document is to disclose the project's impacts in an objective manner. For example, a traffic study presently being prepared for the project will determine the volume of traffic that will be generated. It is not possible to conclude whether the project will double the traffic on the highway and pollute the air and the water. The resort owners share your concerns and are committed to ensuring that they do not come to fruition.
8. Please understand the proposed project does not involve an application for a discretionary permit. The Hawaii Supreme Court required that a Supplemental Environmental Impact Statement be prepared before the City can process the project's subdivision application, which is an administrative approval requiring no decision-making by an elected or appointed body.
9. Finally, the resort owners do not agree that implementation of the proposed project will result in a drastic change in your country lifestyle. As will be discussed in the SEIS, the project is intended to improve the relationship between the resort and the surrounding community to the benefit of all. We hope that after viewing the SEIS, your opinion of the project will change.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will

be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

The official review and comment period will last 45 calendar days from the date that the OEQC publishes the Notice of Availability in its *Environmental Notice*. You can find the *Environmental Notice* on-line at the OEQC website:

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Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

No More Developement out at Turtle Bay

1 message

eric burton <burtonrides@hotmail.com> **Thu, Sep 22, 2011 at 7:05 AM**
To: leesichter@gmail.com

Keep it Country,
No to further developement out at Turtle Bay.

It's big enough, there are always rooms and condo's on the property for rent.
I don't think the existing properly ever runs at full capcity, why develope more land. It's only greed.
Everytime i look to rent a room there are plenty.

LEE SICHTER LLC
45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Eric Burton @ burtonrides@hotmail.com

I am writing in response to the letter you sent on Thursday, September 22, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

We acknowledge your opposition to the proposed expansion of the Turtle Bay Resort. However, once you have viewed the Draft SEIS we would hope that view of the proposed expansion plans might change.

Contrary to your experience, the existing hotel operates at full occupancy much of the year and visitors seeking reservations are turned away regularly. The proposed expansion plan responds to this demand.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party.

In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com.

However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

Comments on Turtle Bay Resort SEIS PN

1 message

info1@keepthenorthshorecountry.com <info1@keepthenorthshorecountry.org> **Thu, Sep 22, 2011 at 10:01 AM**
To: snishiura@honolulu.gov, Drew Stotesbury <drew@replayresorts.com>, leesichter@gmail.com
Cc: pahinuik001@hawaii.rr.com, Lucky Cole <lucky@hawaii.rr.com>, Sally Cole <colep002@hawaii.rr.com>

Aloha, Ms. Nishiura.

Here are comments that Keep the North Shore Country has regarding the Turtle Bay Resort SEIS Preparation Notice. The original is in the mail to you and copies are being sent to Messrs. Stotesbury and Sichter.

Mahalo.

Gil Riviere

Keep the North Shore Country.org

808-220-2280

PrepNoticeComments-Final.pdf
23K

Keep the North Shore Country

September 22, 2011

RECEIVED
SEP 23 2011
TBR DEVELOPMENT

Sharon Nishiura
Dept. of Planning and Permitting
650 S King St, 7th Fl
Honolulu, HI 96813

RE: Turtle Bay Resort SEIS Preparation Notice

Dear Ms. Nishiura:

Keep the North Shore Country is very interested in process, impacts and mitigation measures that will be considered in the Turtle Bay Resort Supplemental Environmental Impact Statement. We offer the following comments on the SEIS Preparation Notice of August 23, 2011.

First and foremost, we are very disappointed that the developer proposes to build out the entire coastline and property in much the same fashion as the previous developer had proposed. Indeed, **the area to be developed for hotel, residential and retail would decrease by a mere 2.4 acres,** as illustrated in the Full Build Out Alternative (Fig. 10) and the Proposed Action (Fig. 8).

Where is the land preservation that was so clearly and passionately promoted by the local community, state residents, world-wide visitors and the Governor's task force chaired by Bill Paty?

Based on the clear sentiment of so many interested parties, we propose the SEIS replace the "Kawela Conservation" alternative with a **"Focused Low Rise" Alternative defined as:**

1. All resort expansion is to occur in, or adjacent, to the existing resort (Ahupua'a O Hanaka'oe in the SEISPN); expansion will utilize the existing infrastructure wherever possible. Benefit: Kawela and Kahuku lands remain in open space, conservation, golf course and recreational use, resulting in less infrastructure and disturbance of land.
2. The extent of the expansion as measured in rooms, units and living area is **not to exceed half** the existing resort. Benefit: reduced environmental, cultural and traffic impacts; more appropriate for rural character of the North Shore.
3. Limit resort road development to the existing intersection and road plus access roads to housing and hotels. Benefit: Minimizes the investment in road and utility infrastructure resulting in fewer environmental impacts and less disturbance of land.

4. Limit building height to 60' for hotels and 30' for resort residential. Benefit: Building height is a significant factor in maintaining rural character and keeping the country. country.
5. The Community Housing requirement of the project will be met either as planned adjacent to the existing Marconi Road intersection or via land exchange in Kahuku Town or via other land exchange options. Benefit: TBR Community housing will be integrated with the existing and planned community housing of the City and County of Honolulu.

This "Focused Low Rise" alternative removes the need for new roadway and intersection upgrades, concentrates development near the existing hotel complex and preserves irreplaceable and priceless natural and cultural resources west to Kawela Bay and east to Marconi Rd.

Whereas "the Proposed Action will require zoning amendments (p.28)," now is the appropriate time to make additional zoning amendments to enhance the long range value of the property through preservation rather than continue with an obsolete vision and development scheme. The value of this property - now and even more so in the future - is the open space, not the concrete!

The number of units must not be the only consideration regarding density and intensity of use and impacts. The size and design of the proposed units should be compared between the current alternatives and those considered in 1985. Are more vehicles used and would more people reside in today's larger units than the smaller units proposed years ago?

We remain terribly concerned about the regional traffic impacts, effects on endangered species and potential harm to *iwi kupuna* if this project moves forward. The traffic study must comprehensively study the entire corridor from Haleiwa to Kahuku and provide specific mitigation measures and estimated costs. No corners may be cut in preserving cultural resources and impacted wildlife.

The Turtle Bay Resort is an important part of our community. We are pleased that it is now successful and we wish it continued success. We remain, however, extremely concerned about adverse impacts the proposed development may have on our daily lives and on the character of our rural community, which is globally valued.

Respectfully,

Gil Riviere
President

CC: Drew Stotesbury; Turtle Bay Resort, LLC.
Lee Sichter; Lee Sichter, LLC

LEE SICHTER LLC

45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Gil Riviere @ info1@keepthenorthshorecountry.com

I am writing in response to the letter you sent to the City's Department of Planning and to Turtle Bay Resort on September 22, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

1. Regarding the area to be built, please be assured that the proposed expansion project does not intend to "build out the entire coastline..." In fact, the proposed plan increases the development setbacks from portions of the coastline over what is required in the Unilateral Agreement.
2. The maps presented in the SEIS Preparation Notice are not detailed development maps. Rather, they are generalized land use maps showing the development parcels on the property. We agree that those development areas of the Full Build-Out Alternative and the Proposed Action are very similar. However, the footprints of the actual development within each parcel have not yet been determined. It is, therefore, premature to conclude the physical area of development.
3. The resort owners have included a new alternative in the SEIS that we believe will address your concerns concerning land preservation. The Conservation Partner alternative proposes that the development be centralized around the existing hotel and that much of the remaining coastline be preserved as open space. To be implemented, it will require the participation of a third party or parties who would provide economic consideration in lieu of the foregone development rights.
4. The proposed unit count of the two hotels included in the Conservation Partner alternative is 440 units, which is less than the current number of hotel units at Turtle Bay, but more than the half you request.
5. The Conservation Partner alternative generally limits new roadway development to the Hanakao`e area.
6. The Conservation Partner alternative limits the height of the proposed hotels to 70 feet; 10 feet higher than you request. The trade-off here relates to building footprint; the higher the building, the smaller the footprint.
7. The Conservation Partner alternative proposes the community housing at the intersection of Marconi Road and Kamehameha Highway.
8. The Conservation Partner alternative does not eliminate intersections with Kamehameha Highway. The Unilateral Agreement requires a new

intersection, and the State Department of Transportation also supports a new intersection for purposes of public safety.

9. Applications for the zoning amendments that may be necessary cannot be submitted until the SEIS process is completed and subdivision of the property is approved.
10. An Urban Design Plan has already been approved for the resort as part of the Unilateral Agreement process. The resort owners have not yet determined whether that plan remains appropriate to current market needs or must be revised.
11. An updated Traffic Impact Analysis Report is being prepared. It addresses the region from Kahalu`u to Hale`iwa. A Transportation Demand Management analysis is also being prepared to identify specific mitigation measures to address regional traffic impacts. The estimated costs of improvements to the resort's intersections with Kamehameha Highway have been included in the cost of overall infrastructure improvements that will be required and will be presented in the socio-economic report for the project. With regard to the estimated costs of other traffic mitigations, the owners are committed to a continuing collaboration with the State Department of Transportation to identify the resort's incremental fair share of regional mitigation costs.
12. A new archaeological inventory survey to supplement the previous study has been approved by the State Historic Preservation Office and has recently been completed to ensure that the proposed development does not disturb *iwi kupuna*.
13. A marine resources report has been prepared to identify the anticipated impacts upon endangered species. This and all of the above mentioned reports will be included in the Draft SEIS.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

The official review and comment period will last 45 calendar days from the date that the OEQC publishes the Notice of Availability in its *Environmental Notice*. You can find the *Environmental Notice* on-line at the OEQC website:

http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

KEEP THE COUNTRY COUNTRY!

1 message

Ritter, John <John.C.Ritter@uscg.mil> **Thu, Sep 22, 2011 at 3:05 AM**
To: ccComments@honolulu.gov, leesichter@gmail.com

Please do not develop at all. Hawaii is developed enough. People come to Hawaii for its beautiful land, and pristine beaches. I have lived there before, and I have seen the impact it makes on the environment, and the community. There has to be a certain point where development stops. Oahu has enough developments as it is. Local people, who have been born and raised on the island, can't afford to buy a home, because of outside money driving up home prices. This project will only add to an already out of control problem, and it is unacceptable. This project will not only hurt environmentally, but will also hurt locals as well. This expansion will bring more crowds to already crowded North Shore. Stop being greedy, and think about Oahu, if tourists want to see big buildings and resorts, go to Waikiki. I am not a born local, but spent a part of my youth in Hawaii, and continue to visit friends regularly. Hawaii is in my heart, and is absolutely without a doubt the most beautiful place on God's earth. Leave it the way it is, KEEP THE COUNTRY COUNTRY!

Respectfully,
John Ritter

LEE SICHTER LLC

45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To John Ritter @ John.C.Ritter@uscg.mil

I am writing in response to the mail you sent on Thursday, September 22, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

1. We acknowledge your opposition to the proposed expansion plan.
2. The resort expansion project was originally approved in the mid-1980s to provide new employment opportunities for the community and the region. That need has not changed. It is the official policy of both the State of Hawai`i and the City and County of Honolulu that the Turtle Bay Resort be expanded to support the continuing vitality of Hawai`i's visitor industry.
3. The City and County of Honolulu through its Ko`olau Loa Sustainable Communities Plan has delineated growth boundaries to preserve the rural character of the region. The Turtle Bay Resort is fully contained with one such boundary.
4. Housing affordability is a continuing problem throughout the state because there will always be people who desire to live here and the resulting competition for a limited number of homes drives the prices up. The Unilateral Agreement that was adopted as part of the project's rezoning in the mid-1980s requires the provision of 90 units of affordable housing at the resort. The resort's owners are now proposing to increase that number to 160 units.
5. The SEIS will disclose the extent of environmental impacts that will result from the Proposed Action.
6. The SEIS will include a socio-economic impact analysis to evaluate the extent of the project's impacts upon the social well being of the community and the region.
7. Even if there was no further development between Kahalu`u and Hale`iwa, there would still be people coming to the North Shore. So long as the famed beaches of the North Shore remain an attraction for O`ahu's residents and visitors, people from Honolulu, Hawaii Kai, Kailua, Kane`ohe, Aiea, Pearl City, Waipahu, Ewa, Kapolei, Waianae and Wahiawa will come.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

SURFRIDER FOUNDATION

Mr. Tanoue, Director
Department of Planning and Permitting
650 S. King St., 7th Floor
Honolulu, HI 96813

cc: Gary Hooser, Director, Office of Environmental Quality Control

RE: Turtle Bay Resort Expansion Supplemental Environmental Impact Statement Preparation Notice (SEISPN).

Aloha, Mr. Tanoue,

The O'ahu Chapter of the Surfrider Foundation appreciates the opportunity to express our concerns about the proposed expansion of the Turtle Bay Resort. The Surfrider Foundation is a grassroots environmental non-profit with over 60,000 members across the country and five chapters and several thousand supporters throughout the Hawaiian Islands. We have prepared comments on the SEISPN as a public stakeholder as included in this letter.

Although we appreciate the notion of establishing a resort based on the Ahupua`a concept, we feel that the SEISPN provided by Lee Sichter LLC falls short of the authentic native Hawaiian concept and instead proposes a common commercial resort. In fact, we feel that the proposed development and its additional roads and hardened surfaces would likely worsen water quality rather than nurture it. Furthermore we feel the development would cause irreversible damage to the current country culture of the North Shore through increased traffic and tourism infrastructure.

The development would certainly put a greater strain on the public resources of the North Shore. The current infrastructure is already overloaded by the development that exists in the region. The resort is requesting a greater supply of water from our limited resources, which will be taxed by the expansion and tainted as it returns to the ocean through its treatment plant. Furthermore, current road conditions are already poor and overcrowded without the additional development. Additional strain on the existing roads will undoubtedly cause issues for emergency services to the existing communities.

The Surfrider Foundation is very concerned about the options for expansion left on the table with this SEISPN and questions whether the reduced number of rooms would translate to a reduced impact on the environment. Although options are stated with fewer hotel rooms, the door is left open for increasing the number of apartments and time shares. These options would likely lead to a much greater population impact as non-hotel residence structures generally house greater numbers of people. Guests at hotels tend to stay for relatively short periods of time with smaller average occupancy sizes. The public needs clarification from the developer on the estimated number of persons the development intends to house on the property.

It is the position of Surfrider Foundation that this SEISPN is an attempt to convince the public that Turtle Bay is improving its plan for expansion with the public and environment in mind. We do not see the substance of how it intends to achieve this goal and remain concerned that conditions have changed enough since the original EIS of 1985 was accepted and that an expansion of this resort is not feasible without large sacrifices to public resources.

Thank You,

Tim Tybuszewski and Rob Barreca, Co-Chairs
Surfrider Foundation O'ahu Chapter

LEE SICHTER LLC
45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

Tim Tybuszewski and Rob Barreca, Co-Chairs
Surfrider Foundation of O`ahu Chapter
P.O. Box 283092
Honolulu, Hawai`i 96828

Gentlemen:

I am writing in response to your letter commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

1. As the SEIS Preparation Notice was intended to provide a preliminary assessment of conditions to be studied in detail, we believe you will find the SEIS to contain a much more detailed discussion of the Tomorrow's Ahupua`a concept plan that is guiding the proposed project.
2. A marine resources study is being prepared for inclusion in the SEIS. The resort owners share your concerns about protecting the area's coastal resources and water quality. The SEIS will include an evaluation of the resort's wastewater treatment system and drainage system and will determine what measures need to be taken to ensure that the water quality of the coastal area is not adversely affected.
3. The resorts owners share your concerns about traffic impacts resulting from the proposed project. A traffic study will be included in the SEIS that will address the anticipated impacts and recommend measures to mitigate them.
4. The proposed plan focuses on integrating the scaled-down resort into the larger community, and as such, the owners believe it will eventually be recognized as an asset rather than a liability.
5. A socio-economic analysis will be included in the SEIS to disclose the project's potential impacts upon public facilities and services.
6. Drinking water is provided by the resort's own system of water wells and transmission lines. The system will be able to accommodate the proposed expansion <u>and</u> contribute new drinking water to the Board of Water Supply's regional system to the benefit of the greater community.
7. The project's impact on emergency systems will be discussed in the SEIS.
8. The resort owners have included a new alternative in the SEIS that we believe will address your concerns the need for a further reduction in the size of the proposed expansion. The Conservation Partner alternative proposes that the development be centralized around the existing hotel and that much of the remaining coastline be preserved as open space. To be implemented, it will require the participation of a third party or parties who would provide economic consideration in lieu of the foregone development rights.
9. The purpose of the SEIS is to disclose the anticipated impacts of the proposed project. The document is obligated to address the conditions that have changed since 1985.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

SEIS Comment

1 message

Kent Fonoimoana <kent@trisland.com> **Thu, Sep 22, 2011 at 2:33 PM**
Reply-To: Kent Fonoimoana <kent@trisland.com>
To: "ccComments@honolulu.gov" <ccComments@honolulu.gov>, "leesichter@gmail.com" <leesichter@gmail.com>

Aloha,

I found it interesting that two significant items were left out in the SEIS prep notice document.

1- The prep notice fails to mention the fact that the coastline fronting Turtle Bay is an important habitat for endangered Hawaiian Monk seals who often give birth here. No mention regarding the developers plans to ensure that this critical habitat will remain undisturbed.

2- The prep notice makes no mention of the Turtle Bay Advisory Working Group (TBAWG) recommendations for the property. The wider community supported this plan and therfore I do as well. This plan should be strongly considered as the best alternative.

Aloha,

Kent Fonoimoana
PO Box 122
La'ie, Hi. 96762
808-294-9991

LEE SICHTER LLC
45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Ken Fonoimoana @ kent@trisland.com

I am writing in response to the email you sent on Thursday, September 22, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

1. The marine resources analysis being conducted for the SEIS by a respected expert in the field and will include an evaluation of the proposed project's potential impacts upon monk seals (and green sea turtles as well); and recommendations on mitigation. The report and its findings will be included in the SEIS.
2. The SEIS Preparation Notice was not intended to be an exhaustive analysis of the Proposed Action and Alternatives. Rather, it was an announcement of the intent to prepare a supplemental EIS. It is our understanding that there has been no significant progress on the recommendations put forward by the Turtle Bay Advisory Working Group (TBAWG). In its Alternatives Analysis, the Draft SEIS includes a Conservation Partner Alternative in response to TBAWG and others that proposes to withdraw development from much of the coastline and centralize it around the existing hotel as you recommend. This is essentially a modification of the TBAWG recommendation. The implementation of the Conservation Partner Alternative is subject to the participation of a third party or parties who would provide economic consideration in lieu of the foregone development rights.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

FW: Turtle Bay

ccComments <ccComments@honolulu.gov> Thu, Sep 22, 2011 at 3:41 PM
To: Raymond Beatty <sailing@hawaii.rr.com>
Cc: "leesichter@gmail.com" <leesichter@gmail.com>, "drew@replayresorts.com" <drew@replayresorts.com>

Your comments for the Supplemental Environmental Impact Statement Preparation Notice for Turtle Bay resort have been received by the Department of Planning and Permitting. Your comments were also sent to the Consultant and Applicant. Their contact information is:

Consultant:

Lee Sichter LLC
45024 Malulani Street #1
Kaneohe, Hawaii 96744
Contact - Lee Sichter, (808) 382-3836
leesichter@gmail.com

Applicant:

Turtle Bay Resort, LLC
57-091 Kamehameha Highway
Kahuku, Hawaii 96731
Contact - Drew Stotesbury, (808) 447-6951
drew@replayresorts.com

Thank you.

----Original Message----
From: Raymond Beatty [mailto:sailing@hawaii.rr.com]
Sent: Thursday, September 22, 2011 1:14 PM
To: ccComments
Subject: Turtle Bay

I am definitely opposed to any more development in the Turtle Bay area,
There is no way that the roads can handle any more traffic.
Thank you,
Ray Beatty
Retired, Honolulu Fire Dept.

LEE SICHTER LLC
45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Ray Beatty @ sailing@hawaii.rr.com

I am writing in response to the email you sent on Thursday, September 22, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

The owners of the Turtle Bay Resort acknowledge your opposition to the proposed expansion plan.

The owners share you concerns about existing and future traffic volumes on Kamehameha Highway. The resort is part of the North Shore and Ko`olau Loa communities and is committed to finding workable traffic solutions.

As a two-lane highway serving nearly half the island extending from Kahalu`u to Hale`iwa, Kamehameha Highway has to accommodate local and regional traffic. Extending along a relatively narrow plain between the coastline and the base of the mountains, the highway cannot easily be widened, even if this was what the community wanted. And selective widening along limited straightaways would only exacerbate traffic conditions; eventually the widened roadway segment would have to narrow back to two lanes. Thus, we all have to work together to find alternate solutions.

Limiting development on the North Shore is neither a practical nor realistic answer. Even if there was no further development between Kahalu`u and Hale`iwa, there would still be traffic congestion on the highway. So long as the famed beaches of the North Shore remain an attraction for O`ahu's residents and visitors, people from Honolulu, Hawaii Kai, Kailua, Kane`ohe, Aiea, Pearl City, Waipahu, Ewa, Kapolei, Waianae and Wahiawa will come. As a community, we each must do our part to help reduce traffic and work together to address transportation issues. That means driving smarter, consolidating trips, ride-sharing, and using transit alternatives when possible, to name a few.

To reduce the impacts of the proposed resort expansion, new left-turn lanes and traffic signals will be funded by Turtle Bay Resort where the roads that will access the resort intersect with Kamehameha Highway. This should help to mitigate the impact of vehicles entering and leaving the resort. According to our recently completed traffic study, on an annual average basis the proposed resort expansion will increase traffic on the highway by about 4.5% during the morning peak hour and 3.0% during the afternoon peak hour.

In addition, the resort will implement a number of measures designed to reduce resort-related traffic. These will include van shuttle service for employees and guests. The resort is also exploring ways to extend the successful bike path at Malaekahana all the way to Hoalua Street and beyond to Ke Nui Road.

The owners of the resort are also committed to paying their fair-share of the cost for regional traffic improvements to help reduce traffic congestion, as determined by the State Department of Transportation. ("Fair-share" is calculated by the State DOT as a developer's portion of the total cost of new improvements based upon the percentage of new traffic generated by the developer's project.)

The traffic study and mitigation measures mentioned above will be presented in the Draft Supplemental Environmental Impact Statement for the resort. Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

SEIS Turtle Bay

1 message

Barbara Fisher <ki-fish@hotmail.com> **Thu, Sep 22, 2011 at 5:32 PM**
To: leesichter@gmail.com

Dear Mr Sichter and all those concerned,

I would imagine you have already heard all the issues regarding the Turtle Bay expansion but I feel like I need to say something as well. I have spent a great deal of time on the property in question over the years, have worked at the hotel and am currently living at Kuilima Estates West.

I think it would be a tragedy if any more development were to occur on this property. I don't believe it would be a good thing for anyone except maybe a few greedy hands that stand to make a profit. It would not improve the quality of the tourist's experience as well as the local residents. People go to Turtle Bay for its unusual location and wilderness. If they are lucky they may witness the feeding of a baby seal, swim with turtles, catch a few waves and take long beautiful hikes along near deserted beaches or utility roads for the existing golf courses.

If more buildings are put in and more people are brought into the area there won't be any room for these other joys that make it so special. I do not believe any development beyond the existing fingerprint is a good idea for anyone. I think the owners of the resort will be shooting themselves in the foot if they think this will be an improvement to their property. I think the residents of Oahu do not want more development in this corner of their world. I believe this property should be left as it is. I personally want to be able to take a walk and not have to say hello to 100 other people on my evening stroll. If buildings go up along the coastline and the golf courses run in the center of the property there really is no where else for people to go other than getting in their cars and driving down the highway. It doesn't sound like a quality vacation or way of life for those of us that live here.

Besides the projected traffic once all the development is finished I am also wondering about the impact the construction crews are going to make on the north shore while under development. Large trucks carrying dirt and ribar etc. driving up and down Kam Highway for how long???? Years?
And what about all the extra employees that are going to need to come in and out of the area every day? They are not all going to want to live on the property in inflated housing. They may already have homes elsewhere. The general public on the north shore doesn't want bigger fancier highways we just want less people. Help us to keep the country country and have a more sustainable environment. Perhaps they can grow some papayas instead of buildings.

Thank you for considering these points and please choose your words wisely in creating your report. You may be impacting the future in a way greater than you could ever imagine.

Sincerely,

Barbara Fisher

LEE SICHTER LLC

45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Barbara Fisher @ ki-fish@hotmail.com

I am writing in response to the email you sent on Saturday, September 3, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are responses to your comments in the order they were presented in your email.

1. The proposed resort expansion will benefit a great many people, including the North Shore and Ko`olau Loa residents who may become employed there and who will no longer have to commute to Honolulu for work; area residents who will have the opportunity to enjoy the resort's new amenities in the form of restaurants, a farmers' market, and cultural performances; and the taxpayers of the City and County of Honolulu will see revenues in the form of real property tax that will benefit the entire island, to name but a few.
2. We believe the proposed expansion plan that would add two new hotels to the property, one on each side of the existing hotel, will, in fact, improve the visitor's experience whether they are from the mainland, a neighbor island, or a community down the road. An increase in the resident population of a resort results in new business opportunities and attractions that will make Turtle Bay Resort a much more vibrant destination than it is today.
3. We agree that the unique setting of Turtle Bay is important asset of the resort and the proposed expansion plan is mindful of the need to preserve that asset. The proposed plan preserves the rural character of the resort beyond its centrally located hotels. By limiting the proximity of development to the central resort area, the rural character of the shoreline will be preserved. As to the near-deserted beaches that exist today, we agree that the proposed development will result in more people on the beach, but we feel it is important to note that the Turtle Bay Resort has five miles of coastline and over 840 acres of land, making it larger than Waikiki. But at the full build-out of the proposed expansion plan, the overall resident population will expand only about two-fold over present conditions, resulting in an extremely low population density.
4. We understand your desire for privacy and hope that your can find it in your heart to share the special quality of Turtle Bay Resort with others. Yes, the proposed expansion plan will result in more traffic on the highway from resort visitors and construction vehicles. However, the

resort owners are committed to implementing measures that will help to mitigate the negative consequences of increased traffic. As a two-lane highway serving nearly half the island extending from Kahalu`u to Hale`iwa, Kamehameha Highway has to accommodate local and regional traffic.

Unfortunately, it is not realistic to hope for less people visiting the North Shore. Even if there was no further development between Kahalu`u and Hale`iwa, there would still be traffic congestion on the highway. So long as the famed beaches of the North Shore remain an attraction for O`ahu's residents and visitors, people from Honolulu, Hawaii Kai, Kailua, Kane`ohe, Aiea, Pearl City, Waipahu, Ewa, Kapolei, Waianae and Wahiawa will come. As a community, we each must do our part to help reduce traffic and work together to address transportation issues. That means driving smarter, consolidating trips, ride-sharing, and using transit alternatives when possible, to name a few. While the resort's new employees will contribute to some increased traffic, the resort's provision of 160 community homes onsite priced for local residents means that some employees may be able to live and work within the resort area.

I understand that you oppose the proposed resort expansion plan. However, we hope that once you have had an opportunity to review the project's Draft SEIS that discusses the project in detail, you might decide that the project is worthy of your support.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

The official review and comment period will last 45 calendar days from the date that the OEQC publishes the Notice of Availability in its *Environmental Notice*. You can find the *Environmental Notice* on-line at the OEQC website:

http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

From: Stanley May [mailto:stanleym@hawaii.edu] **Sent:** Thursday, September 22, 2011 3:02 PM **To:** Nishiura, Sharon N. **Subject:** TURTLE BAY SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

I would like to state my strong opposition to the current plan of the developers of Turtle Bay Resort. It is much too large of a development, and leaves very little of the property in an undeveloped natural state.

Turtle Bay is one of the last, undeveloped oceanfront areas on Oahu and should be preserved as open space for future generations. It is an important habitat for turtles and monk seals. Thorough archeological studies must be completed to make sure that any development does not disturb ancient burials.

The existing infrastructure on the North Shore, especially a narrow two lane Kamehameha Highway, cannot possibly handle a development of this size. Every place that I have lived, developers are required to pay for the impact of their projects, by building new roads, new schools and new parks. With the current Turtle Bay Resort plans, all those costs will be shifted onto the taxpayers. The developer must agree to pay for the widening of Kamehameha Highway and all other impacts of the development before they should be allowed to proceed with any project. Since Turtle Bay has refused to pay for these impact costs, and chooses to add those monies to its own profits instead, this project should not be allowed to go forward.

Koolina is an example of a good project. Existing infrastructure is suitable for a resort of that size, and employees live relatively close. For Turtle Bay, employees would face long commutes and add to our traffic nightmare on the North Shore. Turtle Bay was able to obtain resort zoning because of the promise of jobs for displaced Kahuku sugar workers. The plantation closed down decades ago, and Turtle Bay never followed through with the promise of jobs. Now, decades later, Turtle Bay should not be allowed to follow through with this massive development.

Sincerely,

Stanley K. May 59-008 Holawa St. Haleiwa, HI 96712 (808) 638-7904
stanleym@hawaii.edu

LEE SICHTER LLC
45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Stanley May @ stanleym@hawaii.edu

I am writing in response to the email you sent on Thursday, September 22, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

1. We acknowledge your opposition to the proposed expansion of the Turtle Bay Resort. Although the Turtle Bay Resort property is largely undeveloped, it was reclassified to the State's Urban District in the mid-1980s and subsequently rezoned by the City for expansion as a visitor destination area.

2. The expansion plan that is presently proposed will preserve the undeveloped character of the coastal area. Development will be set back from 150 to 300 feet from the shoreline. The project's potential impacts upon turtles and Hawaiian monk seals will be fully addressed in the Draft SEIS.

3. An entirely new archaeological inventory survey has been conducted on the resort property with a special focus on all proposed development areas to determine whether any burials are present.

4. The owners of the Turtle Bay Resort share you concerns about existing and future traffic volumes on Kamehameha Highway. The resort is part of the North Shore and Ko'olau Loa communities and is committed to finding workable traffic solutions.

Traffic conditions on Kamehameha Highway will be impacted by the proposed expansion. At issue is what is the extent of the impact and what can the resort owners do to mitigate it. The traffic study presently being prepared as part of the SEIS to address this issue must be reviewed and approved by the State Department of Transportation. Once the project's impacts are quantified, the State DOT will determine the 'fair-share' cost of improvements that must be borne by the resort. The subsequent issuing of building permits is then linked directly to the developer providing proof that the required improvements have been implemented. Under this process, there is no need for an escrow fund.

To reduce the impacts of the proposed resort expansion, new left-turn lanes and traffic signals will be funded by Turtle Bay Resort where the roads that will access

the resort intersect with Kamehameha Highway. These improvements are required pursuant to a Unilateral Agreement attached to the property title. This should help to mitigate the impact of vehicles entering and leaving the resort. According to our recently completed traffic study, on an annual average basis the proposed resort expansion will increase traffic on the highway by about 4.5% during the morning peak hour and 3.0% during the afternoon peak hour.

In addition, the resort will implement a number of measures designed to reduce resort-related traffic. These will include van shuttle service for employees and guests. These actions are also required by the existing Unilateral Agreement. The resort owners are also exploring ways to extend the successful bike path at Malaekahana all the way to Hoalua Street and beyond to Ke Nui Road.

The owners of the resort are also committed to paying their fair-share of the cost for regional traffic improvements to help reduce traffic congestion, as determined by the State Department of Transportation. ("Fair-share" is calculated by the State DOT as a developer's portion of the total cost of new improvements based upon the percentage of new traffic generated by the developer's project.)

The Unilateral Agreement also includes requirements for the provision of affordable housing, parks, and public beach accesses, all funded by the developer. Please be assured that the owners of the resort are not refusing to meet these obligations or in any way avoid them. The project cannot proceed unless these obligations are fulfilled.

Finally, the majority of Turtle Bay Resort's employees come from the surrounding region. As discussed above, the resort owners' are obligated under the Unilateral Agreement to provide ways to reduce the employees' traffic-related impacts. The provision of new jobs is related directly to the ability of the project to move forward. Changes in property ownership and economic downturns have delayed implementation of the project, but its commitment to the provision of jobs remains.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the two-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

The official review and comment period will last 45 calendar days from the date that the OEQC publishes the Notice of Availability in its *Environmental Notice*. You can find the *Environmental Notice* on-line at the OEQC website:

http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

Turtle Bay Development Proposal

1 message

Nimboy44@aol.com <Nimboy44@aol.com> **Thu, Sep 22, 2011 at 9:39 PM**
To: leesichter@gmail.com

It is disappointing at best when the "revised and downsized plan" uses all of the available land, and, effectively, provides for as much square footage of buildings as the proceeding plan.

The developers are either dishonest, regard us as idiots, or both.

There could be a "reasonable" compromise that would allow the investors a good return but that won't happen until the developers treat us with respect.

Before retiring to Hawaii I was the CEO of a $500 million company.

Normally I would be a supporter of a "sensible" development.

The investors are treating us with total disrespect and leave us no choice but to totally oppose the development.

We are the ones who vote in the elected officials who want to be reelected. They will listen to us, despite the $$ on the table.

It is time for Drew to sit down with us and have a dialogue, not just a one sided presentation.

I am available.

Bill Quinlan.

LEE SICHTER LLC

45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Bill Quinlan @ Nimboy44@aol.com

I am writing in response to the follow-up email you sent on Thursday, September 22, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice.

I believe there may be some confusion with interpreting the site plan for the Proposed Action presented in the SEIS Preparation Notice. That plan depicts the general proposed land uses, but does not depict density or building square footages. To conclude from the site plan that the downsized plan utilizes "...all the land and effectively provides the same, if not more, square footage of buildings..." is erroneous. While the construction plans that would determine the actual footprints of buildings have yet to be prepared, the proposed replacement of hotel sites with very low-density resort-residential development ensures that there will be considerably more open space than what was provided in the Full Build Out Plan.

The resort owners' responsiveness to concerns such as yours is evidenced by the alternatives analysis contained in the Draft SEIS. This analysis includes a Conservation Partner alternative to the project that would preserve the entire area fronting Kawela Bay and the coastal area on both sides of Kahuku Point in open space increasing the amount of open space by approximately 100 acres when compared to the Proposed Action (the current expansion plan). The Conservation Partner Alternative represents exactly the sort of compromise to which you refer in your email.

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

RE: Turtle Bay SEIS

1 message

ccComments <ccComments@honolulu.gov> **Fri, Sep 23, 2011 at 9:00 AM**
To: mark manley <mkmkbay@yahoo.com>
Cc: "leesichter@gmail.com" <leesichter@gmail.com>, "drew@replayresorts.com" <drew@replayresorts.com>

Your comments for the Supplemental Environmental Impact Statement Preparation Notice for Turtle Bay resort have been received by the Department of Planning and Permitting. Your comments were also sent to the Consultant and Applicant. Their contact information is:

Consultant:

Lee Sichter LLC

45024 Malulani Street #1

Kaneohe, Hawaii 96744

Contact – Lee Sichter, (808) 382-3836

leesichter@gmail.com

Applicant:

Turtle Bay Resort, LLC

57-091 Kamehameha Highway

Kahuku, Hawaii 96731

Contact – Drew Stotesbury, (808) 447-6951

drew@replayresorts.com

Thank you.

From: mark manley [mailto:mkmkbay@yahoo.com]
Sent: Friday, September 23, 2011 8:32 AM
To: ccComments
Subject: Turtle Bay SEIS

I strongly oppose any more developement on th Turtle Bay property.

They have already disrupted Iwi there and will continue to do so.

Leave our ancestors in peace.

NO MORE DEVELOPEMENT !

Mahalo, Mark Kahuokapono Manley

LEE SICHTER LLC
45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Mark Manley @ mkmkbay@yahoo.com

I am writing in response to the email you sent on Friday, September 23, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

We acknowledge your opposition to the proposed expansion of the Turtle Bay Resort and your preference for improving what is already there. However, once you have viewed the Draft SEIS we would hope that view of the proposed expansion plans might change.

A new archaeological inventory survey has been conducted on the property to ensure that the proposed development will not disturb *iwi kupuna*. The SEIS will include the report and an evaluation of the impacts that the project will have on cultural resources, including burial sites.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

DEPARTMENT OF ENVIRONMENTAL SERVICES
CITY AND COUNTY OF HONOLULU
1000 ULUOHIA STREET, SUITE 308, KAPOLEI, HAWAII 96707
TELEPHONE: (808) 768-3486 • FAX: (808) 768-3487 • WEBSITE: http://envhonolulu.org

PETER B. CARLISLE
MAYOR

TIMOTHY E. STEINBERGER, P.E.
DIRECTOR

MANUEL S. TANUEVO, P.E., LEED AP
DEPUTY DIRECTOR

ROSS S. TANIMOTO, P.E
DEPUTY DIRECTOR

IN REPLY REFER TO:
PRO 11-105

September 22, 2011

Mr. Lee Sichter
Lee Sichter LLC
45024 Malulani Street, Unit #1
Kaneohe, Hawaii 96744

Dear Mr. Sichter:

Subject: Turtle Bay Resort Expansion: Environmental Assessment and Supplemental Environmental Impact Statement Preparation Notice

We have reviewed the subject report as transmitted to us by your letter dated August 19, 2011, and have the following comments:

1. The report mentions a high level of nutrients and sediment observed in the bay associated with storm water runoff coming from Kawela Stream and both the East and West Main Drain outlets. We recommend that additional measures be taken upstream of these stream/drain outlets to address these pollutants specifically targeting the larger landowners and other stakeholders to highlight the problems associated with the bay. Education and stakeholder involvement should be a priority in restoring the water quality benefits within Kawela Bay. Proposed retention basins mentioned in the plan may not provide the necessary treatment for larger storm events considering the size of the respective drainage areas.

2. Considerations should be given to incorporate Low Impact Design (LID) or green infrastructure type designs when addressing storm water runoff from impervious surfaces such as parking lots, buildings, roofs, etc. Designs to protect water quality via infiltration, evapotranspiration, or reuse should be implemented.

Should you have any questions concerning storm water quality issues, please call Gerald Takayesu, Storm Water Quality Branch Head, at 768-3287. Other questions may be directed to Liz Ngo, Civil Engineer, at 768-3470.

Sincerely,

David I. Nagamine
Executive Assistant

LEE SICHTER LLC

45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

David Nagamine
Executive Assistant
Department of Environmental Services
City and County of Honolulu
1000 Uluohia Street, Suite 308
Kapolei, Hawai`i 96707

Dear Mr. Nagamine:

I am writing in response to the letter you sent on September 22, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

1. The resort owner's have initiated discussions with land owners and tenants in the region in an effort to reduce the levels of nutrients and sediment that enters Kawela Stream. They agree that education and stakeholder involvement is an important part of restoring water quality within Kawela Bay.
2. The project's engineers have been directed by the owners to incorporate Low Impact Design oriented infrastructure into the resort expansion.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

CITY COUNCIL

CITY AND COUNTY OF HONOLULU
HONOLULU, HAWAII 96813-3065

ERNEST Y. MARTIN
COUNCIL CHAIR
COUNCIL DISTRICT 2
TELEPHONE: (808)768-5002
FAX: (808) 768-1222
EMAIL: emartin@honolulu.gov

September 22, 2011

Mr. Drew Stotesbury, Asset Manager
Turtle Bay Resort, LLC
57-091 Kamehameha Hwy.
Kahuku, Hawaii 96731
Dear Mr. Stotesbury:

RE: Comments on Supplemental Environmental Impact Statement Preparation Notice for Turtle Bay Resort Expansion

Thank you for allowing our office the opportunity to comment on the proposed Supplemental Environmental Impact Statement for the Turtle Bay Resort Expansion.

At this juncture, we have identified the following concerns for your consideration:

1) Section 3.2 OTHER LANDS
   a. Please clarify the math discrepancy in the number of "Other Lands" totaling 524 acres and the properties (Agricultural Lands, TBWT, existing hotel property and Opana Wells) listed further in the section totaling 520 acres?

2) Section 7.2 KAWELA BAY MARINE LIFE CONSERVATION AREA (MLCD)
   a. Please state whether or not the local residents and community are in favor of the MLCD and how the applicant will ensure fishing and gathering rights are preserved.

3) Section 7.5 DEVELOPMENT PROGRAM: HANAKA'OE AHUPUA'A
   a. Please provide a breakdown of the total number of timeshare units that can be converted to individual lock-off suites for use as rentals.

4) Providing the breakdown of total units will ensure the public is aware of the potential number of visitors/users of the individual units and resort property. This increase in potential users of timeshare units will need to be reflected in the local and regional traffic analysis.

5) Section 7.9 DEVELOPMENT PROGRAM: KAHUKU AHUPUA'A
   a. It is our preference that all 160 Resident Housing Units proposed by the applicant comply with U.S. Department of Housing and Urban Development (HUD) affordable housing guidelines and remain in the affordable housing stock in perpetuity.

6) Section 9.15 & 9.16 ARCHAEOLOGICAL & CULTURAL RESOURCES
   a. The community requests a cultural specialist to be on-site during all phases of construction to assist in identifying all cultural findings and iwi.

7) Section 9.2 PEDESTRIAN AND VEHICULAR CIRCULATION
   a. The regional traffic analysis will need to take into consideration the impact of the recently approved Shoreline Management Area Permit for the 222-room Laie hotel. The cumulative impact of this proposed project within the region will have an impact on traffic coming to and from the North Shore and Windward coastline to Turtle Bay.

Please be advised that we reserve the right to make additional detailed comments on the Draft Supplemental Environmental Impact Statement when issued in 2012. Should you require any additional information or have questions, please feel free to call me or my Legislative Aide, Reed Matsuura, at 768-5038.

Again, thank you for the opportunity to respond to your Supplemental Environmental Impact Statement Preparation Notice .

Sincerely,

Ernest Y. Martin
Council Chair
District II

EYM: rhm
(TB – EIS prep notice)

LEE SICHTER LLC
45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
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WWW.LEESICHTER.COM

October 26, 2012

Ernest Martin
Council Chair
Honolulu City Council
Honolulu Hale
530 South King Street
Honolulu, Hawai`i 96813

Dear Council Chair Martin:

I am writing in response to the letter you sent on September 22, 2011 concerning the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

1. The term "Other Lands" has been dropped from the SEIS. The Draft SEIS will provide a full accounting of all acreage impacted by the Proposed Action.
2. The Unilateral Agreement adopted as part of the Conditional Zoning for Kuilima in 1986, requires the owners of Turtle Bay Resort to use their "...best efforts to promote the creation of a Marine Life Conservation District at Kawela Bay." As will be discussed in the SEIS, the owners will seek community input to address the issue, as well as the preservation of fishing and gathering rights. They feel that this would be the best mechanism to guide decision making that impacts coastal resources including Kawela Bay.
3. The applicant's Proposed Action in the SEIS contemplates development of up to 625 new hotel units on Hotel Sites H-1 and H-2 adjacent to the existing hotel. Current market trends indicate that full-service, timeshare or condo-hotel units are the most feasible product to build on these sites. The applicant has committed to building no more than 375 of the hotel units with traditional lock-out units. With respect to the other 590 resort residential units, these are currently planned in varying forms of resort single or multi-family residential units. Although timeshare use is allowed the applicant has no current plans for such and has not forecasted these units on a timeshare ownership basis. This will be reflected in the SEIS.
4. We agree that providing accurate information on forecasted breakdown of ownership and user profiles for the proposed new units is helpful to inform all parties of potential impacts. The applicant has worked closely with their Traffic Consultant and DOT to agree on conservative assumptions for the Traffic Impact Assessment Report (TIAR) update. These assumptions incorporate reasonable assumptions for all relevant uses including timeshare.
5. Your preference is acknowledged. The SEIS will discuss a broad vision and plan for providing housing that is affordable to the community. The applicant desires and plans to work closely with the local community representatives and the City Housing Authority to develop meaningful community/ workforce housing that is affordable.
6. The applicant has been working closely with the Kahuku Burial Council, State Historic Preservation Department and our highly respected consultants on preparing a specific Cultural Management Plan to address protocols for preventive care and preservation of historical and cultural resources. This includes, of course, compliance with all relevant laws, rules and regulations such as the presence of a cultural specialist in the form of an archaeologist is required by the State Historic Preservation Division of DLNR to be on-site during all construction activity.
7. The traffic study being prepared for the SEIS will address the cumulative impacts of other contemplated development projects between Kahalu`u and Hale`iwa, including the 222-room Laie Hotel.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

From: Nimboy44@aol.com [mailto:Nimboy44@aol.com]
Sent: Thursday, September 22, 2011 9:50 PM
To: ccComments
Subject: Turtle Bay Project

It is very disappointing that the developers are presenting a "downsized" plan that still utilizes all of the land and, effectively, provides the same, if not more, square footage of buildings that the previous plan had, and all of the traffic problems that residents have the right to be concerned about.

One could complement Drew for his smooth positioning of the new plan as downsizing.

One could also be offended, as I am, that he treats us with such disrespect, expecting is to be too stupid (I use the word advisedly) to look past the rhetoric and into the details.

There can be a sensible compromise that would allow the developers to make a fair return on their investment if they would talk with us instead of at us.

I would be willing to participate in the process. (I am a retired CEO of a $500 million company, and think I could help facilitate a sensible compromise.)

If the current plan is the "best and final offer" it should be rejected.

Bill Quinlan.

Velzyand.

LEE SICHTER LLC
45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Bill Quinlan @ Nimboy44@aol.com

I am writing in response to the email you sent on Thursday, September 22, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice.

Please be assured that the proposed expansion plan represents an approximate sixty percent decrease in the number of proposed units, which translates into a much lower density than what was originally proposed with the project received its approvals in the 1980s. For the past two years, the resort owners' representative and his team have been meeting with the community to discuss the proposed expansion plan. The current plan is a result of those discussions. We hope that once you have had an opportunity to review the project's Draft SEIS that discusses the project in detail, you might decide that the project is worthy of your support.

The resort's public outreach program has at all times been respectful and considerate in addressing the views of the community. Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

The official review and comment period will last 45 calendar days from the date that the OEQC publishes the Notice of Availability in its *Environmental Notice*. You can find the *Environmental Notice* on-line at the OEQC website:

http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

turtle bay plan comments

1 message

meleana judd <meleanajudd@gmail.com> **Fri, Sep 23, 2011 at 10:54 AM**
To: ccComments@honolulu.gov, Comments@honolulu.gov, leesichter@gmail.com

Aloha,
I hope my comments aren't too late, i thought the 30 days ended today...
My simple comment is that the proposed plan/ unit numbers of over 300% increase is still WAY TOO MUCH! I also read an article about the 'lock out' units and would like to hear more specifics about the capacity of the proposed units. If my math is right the proposed development could house more than the entire North Shore population! What if these condos are occupied by new residents? Are there plans for schools etc?!
If there is any chance the development can be concentrated around existing condos/hotel vs the proposed sprawl over the whole property this would also be more favorable. I was also disappointed to see that the agricultural section while accurate in that it is currently not producing (on makai side of hwy) did not pay any attention to the value of the ag land for future use. I was also confused why no information about the ag taking place on the mauka side of hwy was included.
As a young farmer I would like to hear more about agriculture on the property. Please preserve some of our last remaining coastline for our future generations.
I can be reached at 59-414 Kamehamehay Hwy, 96712 or at this email.

Mahalo.

--
MeleanaJudd@gmail.com
808.551.8132

Solar Hot Water- sunearthinc.com
Inter-Island Solar Supply- solarsupply.com
MeleanasFarm.com- community supported agriculture
North Shore Rentals-
pipeline solar home on beach- www.airbnb.com/rooms/164963
green lodge on farm- www.airbnb.com/rooms/160906

LEE SICHTER LLC

45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Meleana Judd @ meleanajudd@gmail.com

I am writing in response to the email you sent on Friday, September 23, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

1. The existing resort presently contains 500 hotel units and 368 condominium units, for a total of 868 units. The proposed plan would increase that number by 150 percent. It proposes the addition of 625 new hotel units and 750 new residential units.
2. If some or all of the proposed hotel units are built as timeshare units, an additional 375 units could be created. For example, if a timeshare unit contains two rooms, they could each be rented out separately. Under this scenario, the total number of new units proposed is 1,000, rather than 625. At the higher number, the proposed expansion plan would increase the number of units at the resort by 200 percent.
3. We are advised that the total population of the North Shore was approximately 18,300 in 2006. The SEIS will update those population numbers as revised by the 2010 U.S. census. Assuming an average household size of 2 persons for every proposed new residential unit, the total population of the new residential units would 1,500, far less than one tenth of the North Shore's population. The SEIS will include a socio-economic impact analysis that will provide detailed information about the proposed project's population impacts. It will also discuss the project's social impacts on schools and public facilities.
4. The resort owners have also included a new alternative in the SEIS that would further reduce to the number of proposed hotel units. The Conservation Partner alternative proposes that the development be centralized around the existing hotel and that much of the remaining coastline be preserved as open space. To be implemented, it will require the participation of a third party or parties who would provide economic consideration in lieu of the foregone development rights.
5. The Turtle Bay property makai of Kamehameha Highway was reclassified from the State Agricultural District to the State Urban District in the mid-1980s and was rezoned for resort use. Therefore, it is no longer considered to be agricultural land by the State or the City and County of Honolulu.

6. The SEIS is required to update the 1985 Kuilima EIS. That document did not include the mauka agricultural lands. It focused on the proposal at that time to expand the resort on the makai lands. The current effort, therefore, is generally limited to discussing the same area covered in 1985. While the resort's revised master plan includes the mauka agricultural lands, they are not part of the SEIS discussion.
7. The resort owners have been working with the Trust for Public Lands to declare a conservation easement over all the resort's mauka agricultural lands to ensure that they are preserved for agricultural use. In addition, the proposed resort expansion plan focuses on the preservation of the coastline.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

The official review and comment period will last 45 calendar days from the date that the OEQC publishes the Notice of Availability in its *Environmental Notice*. You can find the *Environmental Notice* on-line at the OEQC website:

http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

NO Turtle Bay Expansion

1 message

Mociun <mociun@hotmail.com> Fri, Sep 23, 2011 at 1:58 PM
To: "leesichter@gmail.com" <leesichter@gmail.com>

We have been residents of the North Shore for 15 years. We strongly feel that the undeveloped areas on the North Shore aka The Country should continue to be UNdeveloped.
We are a group of islands in the middle of a huge ocean. On the mainland people can drive away from urban areas to unspoiled nature, for Oahu that is the The Country. If we develop every inch of these islands where do we go to relax? See nature? Hike? Fly to another island? It's expensive and time consuming. People of all incomes can come to The Country even by bus.
If you "Pave Paradise and put up a parking lot" everybody will be able to park, but for what? A hotel instead of a pristine beach where a monk seal comes back yearly to raise her pups? We think it's important to preserve the natural areas.
Sincerely,
Mike and Kathy Mociun

Sent from my iPad

LEE SICHTER LLC
45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Mike and Kathy Mociun @ mociun@hotmail.com

I am writing in response to the email you sent on Friday, September 23, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. I understand that you oppose the proposed resort expansion plan. However, I hope that once you have had an opportunity to review the project's Draft SEIS that discusses the project in detail, you might decide that the project is worthy of your support.

We agree that the unique setting of Turtle Bay is important asset of the resort and the proposed expansion plan is mindful of the need to preserve that asset. The proposed plan preserves the rural character of the resort beyond its centrally located hotels.

In 1977, an amendment to the Oahu General Plan, voted on by the residents of the City and County of Honolulu, designated the Kuilima Hotel property to be reclassified as a Visitor Destination Area. Several years later, the Ko`olauloa Development Plan was adopted by the City as a means of implementing the General Plan. It depicted the Kuilima property as a resort. In 1986, the City Council approved an expansion plan for the resort that allows the development of five new hotels. It was decided at that time, that the development was needed to create new jobs in the region and to support the continuing health of the visitor industry.

In 1999, the Ko`olualoa Development Plan was replaced with Ko`olau Loa Sustainable Communities Plan. The principal difference between the two plans is that the latter established an urban growth boundary that was intended to limit development and protect the rural character of the region. Because the Turtle Bay Resort property was reclassified to the Urban district about 14 earlier, it is fully contained within the Growth Boundary.

The resort owners also share your concerns about the project's potential impacts on Hawaiian monk seals. A marine resources study will be included in the SEIS and it will evaluate those impacts.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

From: A & B [mailto:leinaur001@hawaii.rr.com] **Sent:** Friday, September 23, 2011 9:23 AM **To:** Nishiura, Sharon N. **Subject:** TURTLE BAY SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

The scope needs to include sequencing, phasing and time lines.

The scope needs to make clear all of the water resources/wells and the availability of water for both ag land that is owned by the developer and other agricultural lands.

The document needs to expand on its regard for existing landscape and further developed the Conservation Plan.

The scope needs to consider other alternative to crate a smaller foot print.

The DEIS needs to remove ambiguity about number of rooms and how the room designations relate to jobs. The original permits were granted on a 1:1 full service hotel room to condo ratio with jobs being the major motivation. Current plans are diluting the rational and the commitment.

Mahalo, Bob Leinau

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October 26, 2012

To Bob Leinau @ leinaur001@hawaii.rr.com

I am writing in response to the email you sent on Friday, September 23, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

1. The Draft SEIS will discuss the sequencing, phasing and time lines (construction schedule) for the proposed expansion project.
2. An analysis of water demand and the availability of water resources will be included in the Draft SEIS.
3. The Draft SEIS will address the existing landscape.
4. The Draft SEIS will include an Alternatives Analysis that refines the Conservation Plan.
5. We do not agree with your conclusion that the current expansion plans are diluting the rationale and commitment for new employment opportunities. The Draft SEIS will include a socio-economic impact analysis that will disclose the number of jobs that will be created during construction and operation of the proposed expansion project.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

Fwd: SEIS Comment (Deadline September 23, 2011)

1 message

Lee Sichter <leesichter@me.com> **Mon, Sep 26, 2011 at 1:19 PM**
To: Lee Sichter <leesichter@gmail.com>

Sent from my iPad

Begin forwarded message:

From: Choon James <choonjameshawaii@gmail.com>
Date: September 23, 2011 3:33:13 PM HST
To: leesichter@me.com
Cc: choonJamesHawaii <choonJamesHawaii@gmail.com>
Subject: SEIS Comment (Deadline September 23, 2011)

Lee Sichter, LLC,
Consultant for Turtle Bay Resort, LLC
Turtle Bay Resort
Environmental Assessment & Supplemental Environmental Impact Statement Preparation Notice
Filed with the Office of Environmental Quality Control
(Published August 23, 2011)

Aloha Mr. Sichter:

As I mentioned at the Turtle Bay Resort, LLC Open House on September 15, 2011, we are disappointed that we have not been consulted on this project. You mentioned that you have met with approximately 150 groups and individuals. But we who are in close proximity to this proposed project site have not been contacted or consulted. We are just on the south side abutting Marconi Road, next to the Turtle Bay Resort Golf Course. I checked in with my immediate neighbors, Russell Jenks, Kupuna Lehulu Freitas and they confirmed they have not received information about this project either.

I also mentioned this to Turtle Bay Manager Drew Stottsberry that night and he said we would be put on the mailing list. I submit to you we must be more than just a mailing list item. We will be most affected parties by virtue of our property's location. We have a permanent stake in this proposed development.

You can contact us through this email and we can give you more information of the individuals living next to this proposed site.

We have lots of questions and many concerns.

Mahalo,

Choon James

Mailing Address:
55-052 Naupaka Street
Laie,Hawaii, USA 96762
(808) 293 9111
ChoonJamesHawaii@gmail.com

http://www.CJRealEstateHawaii.com

http://www.CountryTalkStory.com
Saturdays 5:00 pm Olelo TV 52

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October 26, 2012

To Choon James @ choonjameshawaii@gmail.com

I am writing in response to the email you sent on Friday, September 23, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

Thank you for your contact information. Your name and address have been added to the resort's mailing list and you will be contacted as necessary.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

SEIS comments

1 message

mikenancymcgovern@comcast.net <mikenancymcgovern@comcast.net> Sat, Sep 24, 2011 at 1:13 AM
To: ccComments@honolulu.gov, leesichter@gmail.com, drew@replayresorts.com

Aloha -

I want to mirror some of the comments submitted to ensure they are taken into consideration and to show that this really concerns us also.

A. ***TRAFFIC*** - Traffic analysis must consider impact on Kamehameha Hwy. from Haleiwa Town to Kahaluu.

Replace the "Kawela Conservation" with a "Focused Low Rise" Alternative defined as:

1. All resort expansion is to occur in, or adjacent, to the existing resort (called Ahupua'a O Hanaka'oe in the SEISPN); expansion will utilize the existing infrastructure wherever possible. Benefit: This leaves the Kawela and Kahuku Point lands in open space, conservation, golf course and recreational use.

2. The extent of the expansion as measured in rooms, units and living area is **not** to exceed **half** the existing resort. Benefit: this resort expansion alternative results in only a 50% increase in units and hence environmental, cultural and traffic impacts.

3. Limit resort road development to the existing intersection and road plus access roads to housing and hotels. Benefit: this minimizes the investment in road and utility infrastructure.

4. Limit building height to 60' for hotels and 30' for resort residential. Benefit: Building height is a significant factor in maintaining rural character and keeping the country, country.

5. The Community Housing requirement of the project will be met either as planned adjacent to the existing Marconi Road intersection or via land exchange in Kahuku Town or via other land exchange options. Benefit: TBR Community housing will be integrated with the existing and planned community housing of the City and County of Honolulu.

B. Iwi - Very critical that areas are well studied and despite the comment that the areas near the shore and in the Kawela area have been disturbed in the past so there are no iwi there - past development has shown that iwi are not necessarily near the surface and can be several feet down. Take into consideration what happened at the Keeaumoku Wal-Mart and the former Whole Foods site at the Ward Complex in town. Any development near the shoreline should be reconsidered and all shoreline put into conservation in perpetuity.

C. Monk Seal and Green Turtle Habitats - Another reason that the shoreline setback should be as deep as possible. Hawaiian Monk Seals are highly endangered and we must protect this special species. In fact the State wants to bring Monk Seal pups from the Northwestern Islands to the Main islands so they have a chance to thrive. Turtle Bay could become a world class "nursery" for Monk Seal pups.

D. Open Coastline - One alternative not studied was to place all development in the current footprint. Spreading it out along the shore does not preserve the precious coastline for future generations.

E. Number of Hotels - It is really 3 hotels with 2 connected by a walkway / outdoor area. Saying it is 2 hotels when it is not, is a bit of sophistry not worthy of maintaining. Let's call it as it really is.

F. Cultural Guidelines - This will only be meaningful if it is a requirement that all future parcel owners must follow as part of the deed of sale otherwise it is just window dressing. Since Replay is only the master planner, most likely not the developer, there is absolutely no guarantee that future developers will even listen to our concerns and honor the Hawaiian culture in appropriate ways. In addition, the use of certain Hawaiian words such as "piko" in an inappropriate way, is culturally insensitive and should not be done.

G. **Definition of a unit -**

1. The SEIS must use a 21

st century system of counting and measuring impacts both positive and negative

from this expansion. Clearly a hotel unit which is one room (studio) is different from one which is a two bedroom suite or an Ocean Villa resort unit or a lock out unit which can be converted into two rooms. A lower cost smaller unit might have higher occupancy than a higher cost larger unit but when occupied it will have fewer visitors and less demand on resources. A hotel unit, lock out, which consists of two rentable suites, will have more visitors than a unit which can't be booked separately; a lockable unit which

becomes two studio rooms of 140sf is quite different from a unit which becomes a 2 bedroom suite and a studio hotel room with a total of 1,500sf. A residential condo unit with 1 bedroom and 1 bath in 600sf has a different environmental impact than a 3 bedroom 2 bath unit of 1,400 sf.

2. A method used when evaluating real estate alternatives is to define a base unit and then add to it; for example, base units might be a standard hotel room in the Turtle Bay Hotel; a studio or A model unit (1/1) in the Kuilima Estates; and a Kuilima B model for the lock out base unit. When determining incremental impacts one could add square feet and bedrooms to these base units to arrive at an effective density. This method would enable us to understand the relative size of the expansion in familiar terms, e.g. the existing resort and Kuilima units which were in place when the expansion was approved. What is the effective density of the "preferred alternative" for expansion of the Turtle Bay Resort relative to the existing Turtle Bay Resort?

Mahalo for your time and consideration.

Nancy and Mike McGovern

LEE SICHTER LLC

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October 26, 2012

To Mike and Nancy McGovern @ mikenancymcgovern@comcast.net

I am writing in response to the email you sent on Saturday, September 24, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

1. The SEIS will include a traffic study that addresses the area from Kahalu`u to Hale`iwa.
2. The resort owners have included a new alternative in the SEIS that we believe will address your concerns concerning land preservation. The Conservation Partner alternative proposes that the development be centralized around the existing hotel and that much of the remaining coastline be preserved as open space. To be implemented, it will require the participation of a third party or parties who would provide economic consideration in lieu of the foregone development rights.
3. The proposed unit count of the two hotels included in the Conservation Partner alternative is 440 units, which is less than the current number of hotel units at Turtle Bay, but more than the half you request.
4. The Conservation Partner alternative generally limits new roadway development to the Hanakao`e area of the resort (the central portion).
5. The Conservation Partner alternative limits the height of the proposed hotels to 70 feet; 10 feet higher than you request. The trade-off here relates to building footprint; the higher the building, the smaller the footprint.
6. The Conservation Partner alternative proposes the community housing at the intersection of Marconi Road and Kamehameha Highway.
7. A new archaeological inventory survey to supplement the previous study has recently been completed to ensure that the proposed development does not disturb *iwi kupuna*.
8. A marine resources report has been prepared to identify the anticipated impacts upon endangered species. This and all of the above mentioned reports will be included in the Draft SEIS.
9. See response #2 above.
10. The owners' representative has stated publically that Covenants, Conditions and Restrictions (CC&Rs), or project documents will be formulated to make sure that the cultural guidelines are part of the recorded documents and will run with title for the property. This will

allow for proper management and enforcement of these commitments in perpetuity.

11. The term "piko" has been removed from the SEIS.
12. If some or all of the proposed hotel units are built as timeshare units, an additional 375 units could be created. For example, if a timeshare unit contains two rooms, they could each be rented out separately. Under this scenario, the total number of new units proposed is 1,000, rather than 625. The SEIS will evaluate the resort expansion plan's impacts based upon the maximum unit count including lock-off units.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

Turtle Bay

1 message

Kelly Viszolay <viszolaygallery@cox.net> Sat, Sep 24, 2011 at 4:15 AM
To: leesichter@gmail.com

As a long time visitor to Turtle Bay I can tell you that it needs to stay as undeveloped as it currently is
One of the reasons that I come to Hawaii is to go to Turtle Bay
I have stayed at the Hotel since it was the Hilton and have also stayed at Kuilima many times
Basically, my children have grown up here on vacations.
There is no other place like it on Oahu or in Hawaii

I have walked to Kawela Bay many times from the resort and I know how spiritual that area is.

Once you build something you cannot take it away.

Please consider donating this amazing piece of property to the State of Hawaii
and move on to other developments where people want it
If you won't do this please minimize your development

Kelly Viszolay
Laguna Beach, Ca

LEE SICHTER LLC

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October 26, 2012

To Kelly Viszolay @ viszolaygallery@cox.net

I am writing in response to the email you sent on Saturday, September 24, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

We acknowledge your concern about the proposed expansion of the Turtle Bay Resort. However, once you have viewed the Draft SEIS we would hope that view of the proposed expansion plans might change. The SEIS is intended to disclose the impacts resulting from the development of a project that was approved over 25 years ago but has been delayed due to changes in ownership and economic challenges. The owners' representatives have been meeting with the community for nearly two years to gain insight about how best to proceed with the long-stalled development.

The owners share your concerns about preserving the resort's coastal resources. In its Alternatives Analysis, the Draft SEIS includes a Conservation Partner Alternative that proposes to withdraw development from much of the coastline and centralize it around the existing hotel as you recommend. The implementation of the Conservation Partner Alternative is subject to the participation of a third party or parties who would provide economic consideration in lieu of the foregone development rights.

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Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

Turtle Bay Development

1 message

Brian Emmons <brimohi@msn.com> **Sat, Sep 24, 2011 at 1:47 PM**
To: cccomments@honolulu.gov, leesichter@gmail.com, drew@replayresorts.comcccomments

To whom it may concern-

I am still terribly concerned about the regional traffic impacts, effects on endangered species and potential harm to *iwi kupuna* if this project moves forward. I am even more concerned with the continued paving over of our island, to the detriment of Hawaii residents, only to benefit offshore investors!

One alternative apparently not considered in the SEIS was to place all development in the current footprint. Spreading it out along the shore DOES NOT preserve our precious coastline and open space!

Please! The rich have enough playgrounds--save the open space for the rest of us.

KEEP THE COUNTRY COUNTRY!

Aloha, Brian Emmons
1755 Waiola St
Honolulu HI 96826

LEE SICHTER LLC

45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Brian Emmons @ brimohi@msn.com

I am writing in response to the email you sent on Saturday, September 24, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

1. The owners of the Turtle Bay Resort share you concerns about existing and future traffic volumes on Kamehameha Highway. The resort is part of the North Shore and Ko'olau Loa communities and is committed to finding workable traffic solutions.
2. They also share your concerns about the impacts that the proposed resort expansion may have upon the threatened green sea turtle (*Chelonia mydas*) and the endangered Hawaiian monk seal. A marine resources impact study has been prepared for inclusion in the Draft SEIS that is now nearing publication. The report documents the coastal monitoring that has occurred at the resort continuously since the early 1990s and specifically addresses the increasing presence of green sea turtles and Hawaiian monk seals. The report also addresses specific impacts and presents measures to mitigate them.
3. A new archaeological inventory survey has been conducted at the resort to ensure that the proposed development will not disturb *iwi kupuna*. Its findings will be included in the Draft SEIS.
4. The resort owner's believe, and the Draft SEIS will demonstrate, that the proposed project will include many positive benefits for the surrounding communities, the region, and the island of O'ahu. The scale and design of the proposed project will be consistent with the rural character of the area.
5. The Draft SEIS will include an alternative that concentrates the proposed expansion in the immediate vicinity around the existing hotel and leaves the coastal areas at Kawela Bay and on both sides of Kahuku Point in open space.
6. The underlying philosophy for the proposed project is to strengthen the relationship between the resort and the surrounding community. In addition to the proposed creation of a Gathering Place and a Farmers' Market, the proposed expansion plan includes the provision of several new public parks and increases the number of required shoreline accesses.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

The official review and comment period will last 45 calendar days from the date that the OEQC publishes the Notice of Availability in its *Environmental Notice*. You can find the *Environmental Notice* on-line at the OEQC website:

http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

Fwd: turtle bay

2 messages

nick denzer <nick@3buildersinc.com> **Sat, Sep 24, 2011 at 11:43 AM**
To: amymdenzer@gmail.com, leesichter@gmail.com, drew@replayresorts.com

---------- Forwarded message ----------
From: **nick denzer** <nick@3buildersinc.com>
Date: Sat, Sep 24, 2011 at 11:37 AM
Subject: turtle bay
To: ccComments@honolulu.gov

thanks for fielding our comments.
i am a small business owner working out of waialua. i appreciate created commerce and jobs with turtle bay expansion however i agree with all of lucky cole and gil riviere's comments.

biggest issues for me are protection of coastline and traffic. traffic is already bad from haleiwa to turtle bay. this will certainly need to be studied and addressed. regarding coastline, any visitor that appreciates hawaii will value a coastline with minimal disturbance. this is permanent value for locals and visitors. the aloha of keeping natural coastline will be best for all of us. the payback will be infinite and eternal.
aloha
nick denzer
waialua, hawaii

ccComments <ccComments@honolulu.gov> **Mon, Sep 26, 2011 at 11:27 AM**
To: nick denzer <nick@3buildersinc.com>
Cc: "leesichter@gmail.com" <leesichter@gmail.com>, "drew@replayresorts.com" <drew@replayresorts.com>

Your comments for the Supplemental Environmental Impact Statement Preparation Notice for Turtle Bay resort have been received by the Department of Planning and Permitting. Your comments were also sent to the Consultant and Applicant. Their contact information is:

Consultant:

Lee Sichter LLC

45024 Malulani Street #1

Kaneohe, Hawaii 96744

Contact – Lee Sichter, (808) 382-3836

leesichter@gmail.com

Applicant:

Turtle Bay Resort, LLC

57-091 Kamehameha Highway

Kahuku, Hawaii 96731

Contact – Drew Stotesbury, (808) 447-6951

drew@replayresorts.com

Thank you.

From: nick denzer [mailto:nick@3buildersinc.com]
Sent: Saturday, September 24, 2011 11:38 AM
To: ccComments
Subject: turtle bay

thanks for fielding our comments.

i am a small business owner working out of waialua. i appreciate created commerce and jobs with turtle bay expansion however i agree with all of lucky cole and gil riviere's comments.

biggest issues for me are protection of coastline and traffic. traffic is already bad from haleiwa to turtle bay. this will certainly need to be studied and addressed. regarding coastline, any visitor that appreciates hawaii will value a coastline with minimal disturbance. this is permanent value for locals and visitors. the aloha of keeping natural coastline will be best for all of us. the payback will be infinite and eternal.

aloha

nick denzer

waialua, hawaii

LEE SICHTER LLC
45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3936; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Nick Denzer @ nick@3buildersinc.com

I am writing in response to the email you sent on Saturday, September 24, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

The current plan proposed the addition of two new hotels, one with 375 units and the other with 250 units. This is far fewer than the 2,500 hotel units allowable under the current zoning for the property. The resort owners have also included a new alternative in the SEIS, in response to concerns raised by others, including Mr. Cole and Mr. Riviere. The new alternative would further reduce to the number of proposed hotel units. The Conservation Partner alternative proposes that the development be centralized around the existing hotel and that much of the remaining coastline be preserved as open space. To be implemented, it will require the participation of a third party or parties who would provide economic consideration in lieu of the foregone development rights.

The resort's owners share your concerns about traffic. The SEIS will include a traffic study that evaluates the impacts of the proposed project on Kamehameha Highway.

A marine resources study is being prepared for inclusion in the SEIS. The resort owners share your concerns about protecting the area's coastal resources.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

RE: Turtle bay

1 message

ccComments <ccComments@honolulu.gov> **Mon, Sep 26, 2011 at 12:50 PM**
To: OnFitness Magazine <onfitnessmag@hawaii.rr.com>
Cc: "leesichter@gmail.com" <leesichter@gmail.com>, "drew@replayresorts.com" <drew@replayresorts.com>

Your comments for the Supplemental Environmental Impact Statement Preparation Notice for Turtle Bay resort have been received by the Department of Planning and Permitting. Your comments were also sent to the Consultant and Applicant. Their contact information is:

Consultant:

Lee Sichter LLC
45024 Maluiani Street #1
Kaneohe, Hawaii 96744
Contact - Lee Sichter, (808) 382-3636
leesichter@gmail.com

Applicant:

Turtle Bay Resort, LLC
57-091 Kamehameha Highway
Kahuku, Hawaii 96731
Contact - Drew Stotesbury, (808) 447-6951
drew@replayresorts.com

Thank you.

----Original Message----
From: OnFitness Magazine [mailto:onfitnessmag@hawaii.rr.com]
Sent: Saturday, September 24, 2011 1:30 PM
To: ccComments
Subject: Turtle bay

To whom it may concern,

I am not in favor of the current proposal turtle bay so far has brought forward. I accept some limited development but much more scaled back. There is just so much traffic and infrastructure our island can handle. Already traffic is unbearable and our island resources will be less available. I understand the pressure from special interest groups inside and outside our island that cares little for what is really best for Hawaii. For these outside money groups who only care about maximizing their profits, money and greed is their worship. Build baby build is their mantra and slogan. These lands here need to be preserved for future generations. Why do we need to bring more town to North Shore. The people of Oahu love the north shore the way it is.
Country. I implore you to keep the country country and keep town the town.

Thank you

Joseph Grassadonia

Sent from my iPad
E

LEE SICHTER LLC

45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Joseph Grassadonia @ onfitnessmag@hawaii.rr.com

I am writing in response to the emails you sent on Tuesday, August 23, 2011, and on Monday, September 24, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments.

1. We acknowledge your opposition to the proposed expansion of the Turtle Bay Resort. However, please note that the SEIS includes a new alternative called the Conservation Partner alternative that proposes that the development be centralized around the existing hotel and that much of the remaining coastline be preserved as open space. To be implemented, it will require the participation of a third party or parties who would provide economic consideration in lieu of the foregone development rights.
2. The resort owners share your concerns about the project's impacts on Kamehameha Highway. The project cannot prevent an increase in traffic. At issue is what the resort owners can do to mitigate the impacts of the traffic the resort generates.

   A traffic impact analysis report (TIAR) for the Turtle Bay Resort was approved by the State Department of Transportation in 2009. It is now being updated for the Draft SEIS and its findings and recommendations will be included in the document. The scope of the update extends from Kahalu'u to Hale'iwa. Measures to mitigate traffic impacts must focus on transportation demand management (TDM); how to better utilize existing resources. To that end, the resort owners have commissioned a TDM study. The TDM recommendations will be included in the Draft SEIS.
3. There are no special interest groups involved in the proposed expansion of the Turtle Bay Resort. The present owners purchased the property and after instituting a two-year long community outreach program to determine the wants and needs of the community and the region have decided to proceed with the expansion project, but at a significantly reduced scale. If maximizing their profits was there only goal, the Proposed Action would be the full build-out of the resort as allowed under existing zoning approvals.
4. The SEIS will include a detailed discussion on sustainability and how the project's resources, especially the coastal area, can be preserved for future generations.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

Deadline on Turtle Bay SEIS comments

1 message

Tinker Blomfield <tinker001@hawaii.rr.com> **Sun, Sep 25, 2011 at 12:19 PM**
To: leesichter@gmail.com

Aloha Lee Sichter,

Many of us who have made the North Shore our home for several generations, and have grown up surrounded by the resources of the ocean and our outstanding shoreline, feel strongly about protecting it from development. We owe this to future generations.

I am writing to you to endorse the 5 points made by Kathleen M. Pahinui, regarding:

1. IWI
2. MONK SEAL AND GREEN TURTLE HABITATS
3. OPEN COASTLINE
4. NUMBER OF HOTELS.
5. CULTURAL GUIDELINES

Please, keep all your expansion on the current footprint.

Mahalo,

Tinker Blomfield
Pupukea

LEE SICHTER LLC

45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Tinker Blomfield @ tinker001@hawaii.rr.com

I am writing in response to the email you sent on Sunday, September 25, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

1. Please be assured that the concern for the potential disturbance of cultural sites and burials is of the highest importance to the resort owners. To that end, an entirely new archaeological inventory survey has been conducted on the property and is presented in its entirety in the Draft SEIS. The study was conducted in direct response to the recommendations made by the SHPO and has been carefully coordinated with that office. A plan for the study's implementation was submitted to and approved by SHPO before any fieldwork commenced.
2. The marine resources analysis being conducted for the SEIS will include an evaluation of the proposed project's impacts upon Hawaiian monk seals and green sea turtles. The report and its findings will be included in the SEIS.
3. The resort owners shall your concerns over the preservation of the coastal resources.
4. In its Alternatives Analysis, the Draft SEIS includes a Conservation Partner Alternative that proposes to withdraw development from much of the coastline and centralize it around the existing hotel as you recommend. The implementation of the Conservation Partner Alternative is subject to the participation of a third party or parties who would provide economic consideration in lieu of the foregone development rights.
5. The owners' representative has stated publically that Covenants, Conditions and Restrictions (CC&Rs), or project documents will be formulated to make sure that the cultural guidelines are part of the recorded documents and will run with title for the property. This will allow for proper management and enforcement of these commitments in perpetuity.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we

will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

Turtle Bay Expansion

1 message

Aukai Ferguson <aukai5@yahoo.com> **Mon, Sep 26, 2011 at 11:17 AM**
To: snishiura@honolulu.gov, leesichter@gmail.com

To Whom It May Concern:

My name is Aukai Ferguson, I am a life long resident of the North Shore. I feel that I have a valuable perspective to share regarding the purposed expansion of the Turtle Bay Resort, because I grew up on the North Shore (1970-present), am an active member of the community, and have two young children currently enrolled at Sunset Beach Elementary.

First, I think it's important to frame the expansion in an appropriate context. In my opinion, the proposal by the previous owner, Oaktree Capital Management LLC., was merely an advertising point for potential buyers to suggest an inflated value for the now outdated 1985 unilateral agreement in relation to an outdated environmental impact statement and should not be used in anyway to suggest the current purposed expansion is a "reduction" in the scope of the development. In other words, too much is still too much, regardless of the starting point, hypothetical, or otherwise.

Second, from a historical stand point, a lot has changed since that unilateral agreement was agreed upon some 25 plus years ago. At the time, there were still many families in the Kahuku community looking for work after the Kahuku Sugar Mill closed (1971). Now, some 40 years after the sugar mill has closed, both communities (Kahuku and Sunset) have found an equilibrium in regard to balancing work and their desire to live in a rural/country environment. A change to the equilibrium by a huge expansion of hotels would dramatically alter this equilibrium, thus causing a complete change in the communities values.

Third, I realize that tourism is, and will continue to be, Hawaii's number one industry. What makes this our number one industry is our natural resources, primarily our beaches. The North Shore of Oahu has become one of the top locations for visitors on Oahu. It's primary draw is the surf/beaches and the fact that it is away from the mass of hotels in Waikiki.

Finally, in my opinion, living on an island, sustainability has a much more critical role in our state's survival. I see the government's role as critical in facilitating this survival. Growth may be unavoidable, but at the very least it should be managed responsibly.

Mahalo,

Aukai Ferguson
551-6830

LEE SICHTER LLC
45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Aukai Ferguson @ aukai5@yahoo.com

I am writing in response to the email you sent on Monday, September 26, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. Following are responses to your comments in the order they were presented in your letter.

1. The 1986 Unilateral Agreement was required by the Honolulu City Council at the time the ordinance to rezone the property to allow for the expansion of the resort was being considered. Essentially, it represents the Conditions of Approval that were subsequently attached to the approved zoning ordinance. As such, it was filed with the Bureau of Conveyances and now runs with the title of land, meaning that whoever owns the Turtle Bay Resort property and applies for a building permit to construct anything new, must comply with the content of the Unilateral Agreement. For this reason, it is not outdated, but is, rather, still both relevant and contemporary. The approved zoning ordinance allows an additional 3,500 resort units to be built on the property. This "entitlement" defines the value of the property. You may not agree with the City Council's decision to rezone the property to allow for expansion, but it was done in conformance with the 1977 Oahu General Plan that designated the then-called Kuilima property to be developed as a destination resort.
2. We cannot agree with your conclusion that a lot has changed in the region since the Unilateral Agreement was approved. From a planning perspective, development in the North Shore and Ko`olau Loa districts is controlled by the North Shore Sustainable Communities Plan and the Ko`olau Loa Sustainable Communities Plan, respectively. These two plans represent a consistent long-term land use policy that was initiated by the City and County of Honolulu in the early 1980s with the adoption of the plans' predecessors, the North Shore Development Plan and the Ko`olau Loa Development Plan. Those plans were originally adopted to implement the vision of the 1977 O`ahu General Plan that designated the North Shore and Ko`olau Loa districts as rural areas and established specific population growth limits for each. The population size of the two districts today reflects the population limits established over 30 years ago.

   The decision to approve the expansion of Kuilima in 1986 was in direct response to the closure of the Kahuku Mill, as you point out. But the existing "equilibrium" you ascribe to the region today requires many residents to commute to Honolulu for employment, just as their parents before them had to do after the mill closed. Rather than change an existing equilibrium, the now proposed resort expansion will fulfill the approved Unilateral Agreement, albeit at a reduced scale, and provide working families with a greatly improved quality of life; one where they can reduce their round-trip commute by several hours a day and spend more time with their loved ones. We do not believe that this would result in a "...complete change in the communities values." Rather, the long-overdue fulfillment of the original vision as articulated in the O`ahu General Plan and the Sustainable Communities Plans is entirely consistent with the rural values of the region.
3. We cannot agree that the attraction of the North Shore's beaches is somehow limited to their location away from Waikiki. If that were the case, we would see Waikiki visitors descending upon the beaches at Kailua Bay and Kalaeloa that are arguably far more attractive than Waikiki. But the visitors do not come to Kailua or Kalaeloa in nearly the numbers as they do to the North Shore. Why? Because the North Shore is the famed surfing capitol of the world and we believe most visitors want to see the majestic power of the surf. And they even come in the summer when the surf is flat, because it is, afterall, the famed "North Shore." To that end, the resort expansion now proposed will not undermine or detract from the North Shore's fame, or for that matter, the quality of the beaches.
4. We believe that you will be pleased to learn that the Draft SEIS now nearing completion contains an entire appendix on sustainable practices. In fact, the resort's expansion plans are grounded in a philosophy of sustainability. We sincerely hope that once you have had an opportunity to review the project's Draft SEIS that discusses the project in detail, you might decide that the project is worthy of your support.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

Turtle Bay Resort SEIS Preparation Notice

1 message

James O'Shea <jcposhea@gmail.com> **Mon, Sep 26, 2011 at 2:05 PM**
To: ccComments@honolulu.gov, leesichter@gmail.com, drew@replayresorts.com

Please consider the traffic impacts from Kaneohe to Wahiawa, including ingress and egress of emergency vehicles during peak traffic times. Please do not consider widening the highway or creating an alternate route upcountry.

What are the plans to mitigate the additional truck and worker traffic during construction? The wind generation project scheduled truck work to take place off-hours.

What will be the water source for the project? Is there sufficient supply? Is there a regional or island short and long term water plan that can be taken into consideration?

Please identify the electricity plan for the development.
What will the increased power demand be for the development?
What changes to existing infrastructure will be needed to service the property?
Will power lines to the property need to be upgraded? If so, what changes will be required? Which powerlines will be changed and how? What will be the visual impacts? What magnetic field changes will be created?
It is now becoming clear that magnetic field exposure can impact health. See this article: "Maternal Exposure to Magnetic Fields During Pregnancy in Relation to the Risk of Asthma in Offspring" found here:
http://archpedi.ama-assn.org/cgi/content/full/archpediatrics.2011.135

What will be the projected impact on the area's schools? Sunset Beach enrollment is at its highest level; there were four kindergarten classes last year.

Will the project be helping to create/fund additional evacuation centers to accommodate to the additional population/visitors?

One of the great things about the North Shore is that you can see stars at night. Currently, Turtle Bay is the biggest producer of light pollution on the North Shore. The glow from the resort can be seen many miles away. What is being done in the development to limit light pollution? There are new lights specifically designed to control light casting.
http://en.wikipedia.org/wiki/Light_pollution

Mahalo for your time and attention.

James O'Shea

LEE SICHTER LLC

45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To James O'Shea @ jcposhea@gmail.com

I am writing in response to the email you sent on Monday, September 26, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

1. The resort owners share your concerns about the project's impacts on Kamehameha Highway. A traffic impact analysis report (TIAR) for the Turtle Bay Resort was approved by the State Department of Transportation in 2009. It is now being updated for the Draft SEIS and its findings and recommendations will be included in the document. The study will address ingress and egress issues. The scope of the update extends from Kahalu'u to Hale`iwa. We understand that the future widening of Kamehameha Highway for the purpose of adding lanes is not under consideration by either DOT or the City. Therefore, measures to mitigate traffic impacts must focus on transportation demand management (TDM); how to better utilize existing resources. To that end, the resort owners have commissioned a TDM study. The TDM recommendations will be included in the Draft SEIS.
2. Measures to mitigate the impacts of construction-related traffic will be considered in the SEIS.
3. The resort has its own fresh water wells. These wells have sufficient capacity to supply the proposed project and contribute additional water to the Board of Water Supply's regional system for the benefit of the larger community.
4. The SEIS will discuss the project's electrical demands and how they will be addressed. No new transmission lines will be required. It is our understanding that issues pertaining to magnetic field exposure relate in part to the capacity of the transmission line; a 12kv line has a much smaller field than a 138kv line.
5. A socio-economic impact analysis has been prepared for the project and will disclose the projects impacts on area schools. The study will be included in the SEIS.
6. The SEIS will include a discussion of natural hazard emergency responses.
7. Marine resource and fauna studies already completed for the project both recommend that lighting at the resort be shielded to minimize impacts on seabirds and turtles. The shielding of lights will help to reduce light pollution.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

September 26, 2011

Turtle Bay Resort, LLC
Attention: Mr. Drew Stotesbury
57-091 Kamehameha Highway
Kahuku, Hawaii 96731
email: drew@replayresorts.com

Department of Planning and Permitting
Attention: Ms. Sharon Nishiura
650 South King Street, 7th Floor
Honolulu, Hawaii 96813
email: snishiura@honolulu.gov

Lee Sichter LLC
Attention: Lee Sichter
45024 Malulani Street, #1
Kaneohe, Hawaii 96744
email: leesichter@gmail.com

Ladies and Gentlemen:

SUBJECT: Turtle Bay Resort Expansion - Ko'olauloa District, Island of Oahu; TMK: (1) 5-6-003, etc.

Thank you for the opportunity to review and comment on the subject matter. The Department of Land and Natural Resources' (DLNR) Land Division distributed or made available a copy of your report pertaining to the subject matter to DLNR Divisions for their review and comments.

At this time, enclosed are comments from (a) Engineering Division; (b) Division of State Parks; and (c) Land Division – Oahu District on the subject matter. Should you have any questions, please feel free to call Darlene Nakamura at 587-0417. Thank you.

Sincerely,

Russell Y. Tsuji
Land Administrator

Enclosures

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

August 24, 2011

MEMORANDUM

TO: **DLNR Agencies:**
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
X Div. of State Parks
X Commission on Water Resource Management
X Office of Conservation & Coastal Lands
X Land Division – Oahu District
__Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Turtle Bay Resort Expansion
LOCATION: Ko'olauloa District, Island of Oahu; TMK: (1) 5-6-003, etc.
APPLICANT: Lee Sichter LLC on behalf of Turtle Bay Resort, LLC

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by September 19, 2011.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Darlene Nakamura at 587-0417. Thank you.

Attachments

( ) We have no objections.
( ) We have no comments.
(✓) Comments are attached.

Signed:
Date: 9/6/11

cc: Central Files

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LD/RussellTsuji
Ref: TurtleBayEpansion
Oahu.855

COMMENTS

( ) We confirm that the project site, according to the Flood Insurance Rate Map (FIRM), is located in Flood Zone .

(X) **Please take note that according to the Flood Insurance Rate Map (FIRM), the project site is located in Zones X, AE, VE and AE Floodway (AEF). The National Flood Insurance Program does not have any regulations for developments within Zone X, however, it does regulate developments within Zones AE, VE and AEF as indicated in bold letters below.**

( ) Please note that the correct Flood Zone Designation for the project site according to the Flood Insurance Rate Map (FIRM) is .

(X) **Please note that the project must comply with the rules and regulations of the National Flood Insurance Program (NFIP) presented in Title 44 of the Code of Federal Regulations (44CFR), whenever development within a Special Flood Hazard Area is undertaken. If there are any questions, please contact the State NFIP Coordinator, Ms. Carol Tyau-Beam, of the Department of Land and Natural Resources, Engineering Division at (808) 587-0267.**

Please be advised that 44CFR indicates the minimum standards set forth by the NFIP. Your Community's local flood ordinance may prove to be more restrictive and thus take precedence over the minimum NFIP standards. If there are questions regarding the local flood ordinances, please contact the applicable County NFIP Coordinators below:

(X) **Mr. Robert Sumitomo at (808) 768-8097 or Mr. Mario Siu Li at (808) 768-8098 of the City and County of Honolulu, Department of Planning and Permitting.**

( ) Mr. Frank DeMarco (808) 961-8943 of the County of Hawaii, Department of Public Works.

( ) Mr. Francis Cerizo at (808) 270-7771 of the County of Maui, Department of Planning.

( ) Ms. Wynne Ushigome at (808) 241-4890 of the County of Kauai, Department of Public Works.

( ) The applicant should include project water demands and infrastructure required to meet water demands. Please note that the implementation of any State-sponsored projects requiring water service from the Honolulu Board of Water Supply system must first obtain water allocation credits from the Engineering Division before it can receive a building permit and/or water meter.

( ) The applicant should provide the water demands and calculations to the Engineering Division so it can be included in the State Water Projects Plan Update.

(X) **Additional Comments: Because portions of this project are being conducted in a flood zone designated as AEF, strict adherence to the NFIP regulations, specifically 44CFR §60.3(d)(3), must be followed.**

( ) Other:

Should you have any questions, please call Ms. Suzie S. Agraan of the Planning Branch at 587-0258.

Signed: _____
CARTY S. CHANG, CHIEF ENGINEER

Date: 9/6/11

54908

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

August 24, 2011

MEMORANDUM

TO: **DLNR Agencies:**
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
X Div. of State Parks COPY OF EIS AT LAND DIVISION, ROOM 220
X Commission on Water Resource Management
X Office of Conservation & Coastal Lands
X Land Division – Oahu District
__Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Turtle Bay Resort Expansion
LOCATION: Ko'olauloa District, Island of Oahu; TMK: (1) 5-6-003, etc.
APPLICANT: Lee Sichter LLC on behalf of Turtle Bay Resort, LLC

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by September 19, 2011.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Darlene Nakamura at 587-0417. Thank you.

Attachments

( ) We have no objections.
(✓) We have no comments.
( ) Comments are attached.

Signed: _____
Date: 9-8-11

cc: Central Files

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

August 24, 2011

MEMORANDUM

TO: **DLNR Agencies:**
__Div. of Aquatic Resources
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X Engineering Division
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__Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Turtle Bay Resort Expansion
LOCATION: Ko'olauloa District, Island of Oahu; TMK: (1) 5-6-003, etc.
APPLICANT: Lee Sichter LLC on behalf of Turtle Bay Resort, LLC

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by September 19, 2011.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Darlene Nakamura at 587-0417. Thank you.

Attachments

( ) We have no objections.
(✓) We have no comments.
( ) Comments are attached.

Signed: _____
Date: 8/26/11

cc: Central Files

LEE SICHTER LLC
45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

Russell Y. Tsuji
Land Administrator
Department of Land and Natural Resources
State of Hawai'i
P.O. Box 621
Honolulu, Hawai'i 96809

Dear Mr. Tsuji:

I am writing in response to the letter you sent on September 26, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. We acknowledge that the Division of State Parks and the Land Division have no comments at this time.

With regard to the comments from the Engineering Division, we acknowledge the information provided regarding the project area's Flood Insurance Rate Map designations and the requirement to comply with the rules and regulations of the National Flood Insurance Program, inclusive of section 60.3(d)(3) of 44CFR.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. The official review and comment period will last 45 calendar days from the date that the OEQC publishes the Notice of Availability in its *Environmental Notice*. You can find the *Environmental Notice* on-line at the OEQC website:

http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

Comments on Turtle Bay SEIS Preparation Notice

1 message

Timothy Vandeveer <tvandeveer76@hotmail.com> **Mon, Sep 26, 2011 at 4:27 PM**
To: cccoments@honolulu.gov, Lee Sichter <leesichter@gmail.com>

Aloha-
Please see attached comments and questions on the Turtle Bay SEIS Preparation Notice.
Thanks-
Tim Vandeveer
388-0660

SEIS Questions and Comments.pdf
155K

September 26, 2011

Re: Turtle Bay Resort Environmental Assessment and Supplemental Environmental Impact Statement Preparation Notice

Aloha Lee, et al.-
Thank you for extending the comment period and for maintaining such a transparent and civil discussion throughout the past year. While we definitely don't see eye to eye on much involving the current plans that developers have for our island home, please accept my sincere appreciation for the difficulty in your task. In hopes that we can find a workable solution to our problems, now begin my comments…

My name is Tim Vandeveer, I am a resident of Sunset Beach, a former employee of Turtle Bay Resort and co-chair of the Defend Oahu Coalition.

Defend Oahu Coalition was formed in 2005 with the express purpose of protecting communities in Ko'olauloa and the North Shore from the threat of massive development. With exception of the "No Action" (No Further Development) alternative in your SEIS Preparation Notice (pg. 23), each of the actions proposed in this document pose an existential threat to the quality of life of residents in communities all across the island. Those living in communities neighboring the planned development will naturally shoulder the heaviest burdens that these untimely and unsustainable proposals would bring, but the adverse impacts will ultimately affect everyone who visits or resides in O'ahu. As such, the scope of your document is inadequate. Proposed studies regarding impacts are not expansive enough and fail to address the impending disaster unfolding in Ko'olauloa and the North Shore.

In the document, you propose ways to mitigate problems stemming from such a disaster. This does not change the fact that it is still a disaster. Comments about how the applicant plans on dealing with the desecration of Hawaiian burials, the forced loss of habitat for native species of plants and animals, the worsening traffic problem on Kamehameha highway and the impending "ownership structure" fail to address how such proposed developments would significantly contribute to the urbanization of this rural area. The preliminary discussion of impacts and mitigation measures in the document signal that the applicant is unwilling or incapable of addressing this underlying problem. Based upon this oversight, it can be anticipated that the draft SEIS will raise more questions than it will answer. In this letter, I ask questions about both what the Preparation Notice does deem important enough to mention and what it fails to.

First, I am curious as to what individuals comprise some of the agencies and community groups in your plan, particularly the "Kuilima North Shore Strategy Committee", the "Turtle Bay Advisory Group" and the "Cultural Advisory Group". You mention that you are not actively seeking endorsements from the groups and individuals you are meeting with, but list these groups on your website and in the SEIS Preparation Notice as having given their mana'o in your planning process. Many of the individuals that are listed as having already done so stand to financially benefit directly or indirectly from any

development moving forward at Turtle Bay. Are you prepared to name the individuals who comprise some of the "community groups" who have advised this document and also list their potential conflicts of interest in helping sell a development that would benefit them personally but potentially hurt the community at large?

It is misleading to the public to list your goals and objectives as "developing and managing the Turtle Bay Lands in a holistic manner drawing inspiration from the ahupua'a model of sustainability and respect for the environmental, cultural, social and economic elements." Please make a clear distinction between goals and objectives and techniques. As representatives of multinational banks and investment firms, your goals and objectives are to make money. Your technique is to wrap this scheme in an offensive bastardization of the ahupua'a concept and sell it to an unwilling and divided public. Would you please include a financial timeline in your history of the property, showing how repeated speculation and *not* holistic inspiration has affected this community in the last 25 years? Please share with the community what percentage of profit the owners of the resort wish to reap from developing the property and how their bottom line informs decisions about how much "proposed action" we need in this rural area?

In the description of the proposed action for the "Preferred Plan", please provide not only the percentage difference in this plan vs. the "Full Build Out Alternative" (65% less according to you) but also the percentage increase in proposed development vs. what exists today. (200-300%).

According to the State Historic Preservation Division, based on your own archaeological study (2006), the probability of disturbing iwi within the Jaucus sands on property were "high". Why did you ignore SHPD's request of 150-200 meter minimal setbacks on the shoreline and instead opt to build in areas that are sure to disturb these sacred burials? Was it money? (Mitigation measures are not an answer, please provide the reasoning behind the decision.)

Regarding a Marine Life Conservation District at Kawela Bay, will the developer be willing to contribute financial support for this cause (perhaps utilizing new legislation passed by the State that would enable them to do so)? If so, how much?

How will you prohibit fertilizers, herbicides and pesticides from continuing to runoff the golf course into Punaho'olapa marsh and the moat that you plan to complete?

There is a development program for the Opana-Kawela ahupua'a and a "Kawela Conservation Plan" for the same area, but both involve similar developments. Would options be considered involving something that actually preserved these areas for recreational use as they are currently used by residents and visitors alike?

In your "Preferred (Reduced Density) Plan", in the Hanaka'oe ahupua'a you state that you will be constructing two hotels and base this logic on a different management structure in each hotel. From a non-developer's point of view, it appears that three buildings will actually be constructed in this area, with two of them simply separated by a commercial "gathering place". Would you please include somewhere in your notation, that these two hotels are indeed three separate structures?

The "gathering place" is noted for featuring Hawaiian culture, but previous public statements made by owner's representatives regarding the makeup of this place suggest that it will more truly reflect the commercial culture that is evident in the existing hotel at Turtle Bay, or perhaps a commercialization of Hawaiian culture evident at places such as the Polynesian "Cultural" Center. If either scenario is planned, will retail shops and restaurants located within the "gathering place" be run as non-profits or donate proceeds to Native Hawaiian organizations?

Park land on either side of the Hanaka'oe ahupua'a is located within areas that include drainage swales. Will efforts be made to improve these areas to prevent them from flooding? Would the developer be willing to dedicate these parks before any construction were set to begin?

Regarding farmer's markets and the importance of keeping merchandise agriculturally and locally based... will you regulate the percentage of agricultural products vs. souvenier items at the farmer's market and require foods sold be grown locally?

Proposed development in the Kahuku ahupua'a and "shoreline setback" still involve Jaucus dunes and areas where the probability for discovering individual burials and numerous burial sites is still considered "high" (by State Historic Preservation Division). According to SHPD (and your own 2006 archaeological index), the proposed widening of the Alpha Road for "circulation" will likely involve the discovery of iwi as well. Similar questions (see above) pertaining to the destruction of iwi and proposed alternative uses for these sites arise from this fact. Hawaiian monk seals (oddly not mentioned by name in the document) have chosen to give birth in increasing numbers over the past few years in an area known as the "queen's bath", most recently in July 2011. In your "Preferred Plan", this area is slated for "Resort Residential" construction. NOAA has attributed a loss of birthing beaches to the dwindling numbers of these magnificent creatures in the main Hawaiian Islands. Will measure be taken to provide an increased buffer (greater than the 150 ft. setbacks you propose) to ensure that this does not occur at this property? How do new federal proposals for greater shoreline protection for monk seals impact development plans? How will you take a *proactive* approach in regard to protecting endangered and threatened species on property?

When the developer has sold off all of the assets that it can, who/what entity will be financially responsible for the remainder of the land (if any) and maintain continuity with the agreements (e.g. water testing). How will this be structured financially? From a financial feasibility perspective, what is the time line and probability of finding over a billion dollars in funding? Is this just another "blue sky" dream for speculators playing the greater fool gambit?

Dedicated park lands have been part of the plans for a long time, but were sequenced far enough into the project that they never came to pass. When will the park lands be

dedicated and what is the sequencing? Beach rights of way need to be frequent and accommodate parking. Too often our beach accesses are "controlled" by inadequate parking constraints and lack of appropriate amenities. What is the spacing between the public rights of way and what are the parking provisions at all of them? It is also important to honor Hawaiian rights to access the beach. A larger beach set back offers greater advantage.

Please explain how the current plans will reconcile the unfulfilled representations made to the State Land Use Commission at the time of the land reclassification. Is there a new time line that will be in affect that requires a new completion date if proposed development plans move forward? Will this new time line be enforced by State or City government?

What affect will a new development plan have on the terms and conditions of the Unilateral Agreement with the City? Will the owner of the land still have the option to proceed with "full build out" development at some future time? Since some of the conditions have changed what parts of the Unilateral Agreement become invalid?

What creative options have been explored for the owners to get their money back out of a bad investment that do not include exploiting the land with unacceptable high density and negative impacts for those who live here after the bankers have gone? Has serious consideration been given to a no-build option that would reflect more closely the preservation recommendations that came out of former Governor Linda Lingle's Turtle Bay Advisory Working Group (TBAWG)? Some members of Defend Oahu Coalition and others in the community have floated a "6th Alternative" for possible consideration; one based on the TBAWG plan, limiting development to the Hanaka'oe ahupua'a and preserving the rest of the property as open space. Will you include this option in your draft?

It is commendable that the developer seeks to preserve the farmland in the mauka lands. It is the sincere hope within the community that the partnership involving the Trust for Public Lands and North Shore Community Land Trust will be strengthened and expanded to include preserving the makai side of the property.

Will farmers on the mauka lands have any special considerations given to them for affordable housing units?

Much of the existing use of SEIS lands center around the reason people come to Turtle Bay, which is to experience the natural beauty of the pristine coastline surrounding the hotel. Will studies be done to reflect the potential loss of business from those who come to the Resort for its rural atmosphere which sets it distinctly apart from Waikiki? Will new owners move away from the current marketing strategy ("true Hawai'i")? Will the TBR sales department cease courting the movie industry, which has also come to the Resort in recent years to utilize the open space and natural environment on property? Will data involving the loss of revenue from the film industry and its ripple-effect for the island economy be included in the draft?

In regard to impacts on climate and air quality, will proposed hotels and "resort residential" complexes be LEED certified?

Please define "transportation management". Past suggestions that visitors to the resort will carpool or take buses from the airport are unrealistic. Will traffic studies include how guests most frequently travel to the existing hotel and base future projections on that information?

It is stated that the water is currently supplied from Waialee by the Board of Water Supply. The SEIS then goes on to discuss the conversion to the Turtle Bay/Opana Wells. With a greater demand on the water resources within the hydrological unit, what affect will the increased draw have on the availability of the water pumped that supplies the farmers on the mauka side of the highway? In other words, what is the current MPD water use and rated capacity for the wells now and what will it be in the future for the SEIS lands as proposed and what are the projected water demands for the farm lands. By farm lands, it is important to not only discuss the water needs for the Turtle Bay agricultural lands but also other adjacent agricultural that currently have access to this water. Note one of the key metrics that needs to be assessed in addition the increased MGD draw rate, is the increase in salinity. What is the maximum draw that can sustain a fixed salinity count?

How can the proposed action not exacerbate the evacuation on the highway during natural disasters when tens of thousands of residents fleeing for their lives would be competing in Kamehameha highway traffic with thousands of additional hotel guests doing the same? Will studies include Civil Defense data on projected estimates of road usage during tsunamis and hurricanes? If the owners plan on encouraging guests to stay in the upper floors during tsunami alerts, what efforts will be made to strengthen the infrastructure of the buildings? Will data reflect the projected climate change data in regards to rising sea levels over the next fifty years?

In regards to flora, the document states that it is "not anticipated" that any endangered flora will be impacted. What if they are? With all of the effort in this SEIS spent on cultural and environmental sensitivity it is hoped that an effort will be made to replace the trees removed on at least a 1:1 ratio and that there will be a generous mix of Hawaiian *endemics*, particularly the Pritchardia (Loulu) palms that used to live in the area as supported by pollen found in soil samples on the property. It was disheartening to hear Doug Ogilvie refer to beautiful stands of mature Ironwood and Milo trees surrounding Kawela Bay as "overgrown" and therefore expendable.

An increase in waste streams due to more people and activities on the property is likely. What quality control and testing provisions have been made to assure that the increases will not adversely affect the wet lands, the near shore waters and the adjacent James Campbell National Wildlife Refuge?

As mentioned above, anticipated impacts on archaeological sites and iwi kupuna are of great concern to our host culture and your explanation for areas as being "previously disturbed" is inadequate at best. If the intrusive sampling methods and mitigation measures you propose are universally acceptable, please include (as an addendum to the document), the locations of family burial plots of all investors, speculators, representatives and consultants involved in the development plans so that equal consideration can be given to the bones of their ancestors.

Please give special consideration to the host culture when exploring the "cultural resources" that will inform your document and how this culture lived and thrived before the area was used by the military, ranching and agricultural plantations. It would also be helpful to further study and explain the "plantation mentality" that gave rise to the Unilateral Agreement, how this once pervasive thinking has changed in recent history (with increased development saturation and environmental pressures), and its continued impact on host culture. This community has been promised jobs and affordable housing by scores of offshore developers and speculators for decades.

Representations were made in the Unilateral Agreement regarding what types of hotels would be built on the property (e.g. full service, as was the hotel at Turtle Bay in 1986). The original Unilateral Agreement and approvals were granted on the premise that hotel rooms would create jobs. To try to keep this basic concept intact, a 1:1 ratio of hotel rooms (not condo/time shares) to condo units was established. Please explain how that is being preserved with some detail as to how single hotel units will NOT be split into two units or duplexes. This seemingly small detail needs to be clearly understood as it relates proportionately to all of the negative impacts ... more is not better. Traditional hotel rooms generate the most jobs. If the Unilateral agreement was predicated on the need for jobs, how can this project be allowed to move forward without the guarantee that those jobs will be delivered? Will the socio-economic impacts involving employment figures for condo-tels and timeshares vs. full service hotels be addressed in the SEIS draft? Will this study include scenarios which involve projections of how the quality of life would be affected for workers in the existing hotel if non-union hotels were allowed to be constructed on property? In the "provision of new housing opportunities" – how much will these units cost, what will the profile entail (one and two story housing is the norm on the North shore) and how do your numbers stack up against today's requirements and standards?

Serious concerns have been raised by maintenance and engineering workers at the hotel regarding the deteriorating condition of the infrastructure within and surrounding the hotel at Turtle Bay, especially as it pertains to utilities and wastewater. Utilities and wastewater infrastructure should be updated and plans moving forward should be done by design and not piecemeal. Are renovations being planned for the wastewater treatment facility situated mauka of the Kamehameha highway, which is over 25 years old? How will force mains and subterranean collection lines be constructed, to link different phases of development on SEIS lands to the treatment plant? Will a sewer lift station be constructed, which will then transferred waste across the highway or will individual pipes be dug each time a developer begins a different phase? One of the concerns in the area where development is being proposed is the type of geology encountered when digging in the ground. Pipes have repeatedly collapsed when areas of soft coral have given way around them, causing environmental hazards and jeopardizing the ability to pump waste from the makai side of the property to the treatment plant. With chances of disconnection so high, please assure the community that plans exist to handle all of this anticipated waste in a responsible, collaborative way.

The traffic on the North Shore is unacceptable already and the addition of many more cars seriously affects safety, quality of life issues along with the overall desirably of the North Shore as a destination and place to live. As you admit in the document (pg. 39), the two-lane Kamehameha highway is the only arterial highway serving the North Shore and Ko'olauloa regions and the proposed action will make traffic even worse. This proposed project along with the very ambitious plans in Laie and Malaekahana could have profound negative synergies. The socioeconomic down sides of this negative scenario need to be more fully explored. How much is too much? What percentage of the time will cars traveling in each direction during daylight hours be in the respective A,B,C,D,E,& F traffic categories? To say that it is a State problem is not a solution. The resort has committed to dedicating 50 feet of additional road space for widening, but perhaps a poll should be conducted among residents who own homes along the highway as to whether or not they would like to dedicate their property to condemnation in the event the rest of the highway from Haleiwa to Kahalu'u is deemed "eminent domain" and therefore necessary for widening to accommodate all the traffic from all proposed **developments in the North Shore and Ko'olauloa.**

Does the applicant admit that they will be forced to "bus-in" employees, since the development is too large to accommodate local employment capabilities?

Bicycle trails are great, but most guests come from the airport, not Sunset Beach or Kahuku. For many years there has been talk of having a bike way that will connect Kaena Point with Ko'olauloa. It is the type of project that gets addressed one stretch at a time. It would be valuable if an adequate space were planned for this long term goal by leaving significant off-sets adjacent to the property on ***both sides*** of the Kamehameha highway.

If the applicant fails to adequately address these concerns, may other (community based) entities prepare a formal determination of impact since the applicant has rendered DPP moot? Would DPP consider not accepting the applicant's SEIS until a plan that weighs all options and impacts is prepared?

In conclusion, perhaps the most important issue that must again be addressed is the elephant in the room: how would the different developments being proposed in this document contribute to the urbanization of this rural area? More importantly, what would the cumulative effects of these developments be when placed in the context of the legion of other schemes being proposed throughout Ko'olauloa and the North Shore? To try and mitigate our way into the future while ignoring these crucial questions will only

supplement an attitude that is as antiquated as it is unsustainable. Community acceptance of any action at Turtle Bay Resort hinges on the answer.

Thanks again for your time.
Sincerely,
Tim Vandeveer

LEE SICHTER LLC

45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Tim Vandeveer @ tvandeveer76@hotmail.com

I am writing in response to the email you sent on Monday, September 26, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your email.

1. The resort's owners acknowledge your opposition to the proposed expansion plan.
2. Although the SEIS may reference certain advisory groups that have participated in the community outreach program over the past two years, the resort owners are not willing to provide the names of all the participants without their prior written permission. If you have a specific reason for knowing these names please explain the purpose and we will consider approaching these private citizens.
3. It stands to reason that any property owner, from a person who owns a residential lot to the owners of a large resort property, uses the basic test of economic feasibility to make investment decisions. But economic feasibility does not drive quality of life or design decisions. We regret that you are unwilling to accept the possibility that other motivations exist. For proprietary reasons, detailed financial information will not be disclosed in the SEIS.
4. The Turtle Bay Resort property presently contains 500 resort units and 366 privately owned residential condominium units plus two (2) manager's units, for a total of 868 resort and dwelling units. The total number of units included in the Proposed Action would represent a 158 percent increase in the number of units.
5. The SHPD's recommendation was based on an assumption that *iwi kupuna* are potentially present in the shoreline areas. The resort owners elected to authorize a new archaeological inventory survey in order to provide the SHPD with the information it needs to make a final determination about appropriate setbacks. A plan for the new survey was reviewed and approved by the SHPD. The survey was then implemented during January and February 2012. Subsurface excavation was systematically conducted in every proposed development site on the property. The results of the supplemental archaeological inventory survey will be presented in the SEIS.
6. The Unilateral Agreement states that the property owner shall use its best efforts to have a Marine Life Conservation District established at Kawela Bay.

The resort owners believe that the ultimate decision is best left to the people who most use the shoreline and the bay, the community. The SEIS will recommend that a community advisory committee be formed to decide whether the MLCD should be pursued. The resort owners are willing to consider providing community and financial assistance to support committee recommendations.

7. The resort owners know of no rules or regulations that prohibit the use of fertilizers, herbicides and pesticides on private property. Therefore, what is at issue is the management of their use. As the Punaho`olapa Marsh is viewed as a valuable asset and amenity to the resort property, it is not in the owners' interest to contaminate it. The golf courses at Turtle Bay Resort are carefully managed by trained professionals to ensure that the application of fertilizers, pesticides and herbicides is limited to the uptake capacity of the vegetation and the potential for runoff is minimized.
8. A new alternative will be presented in the SEIS called the Conservation Partner alternative that contemplates preserving the entire Kawela Bay property in open space.
9. The information you request will be provided in the SEIS.
10. The management and building structures of commercial activities that may be associated with the Gathering Place has not yet been decided. However, it is likely that they would be Hawaiian inspired and regionally relevant architecture including planning with for-profit activities created by local businesses.
11. The SEIS will discuss the improvement plans for the East Main Drain and the West Main Drain. The resort owners are obligated to implement the park dedication requirements as presented in the Unilateral Agreement.
12. Decisions about the regulation of products to be sold in the Farmer's Market have not yet been made. However, it is intended to feature primarily local produce.
13. The aforementioned supplemental archaeological inventory survey recently completed on the property included the proposed alignment of the Alpha Road.
14. A marine resources study is being prepared for inclusion in the SEIS. The resort owners share your concerns about protecting the area's coastal resources including monk seals and green sea turtles. The proposed 150-foot setback and contemplated education programs are believed to be adequate for the protection of these species. Given that the setback will begin at the as-yet-to-be determined certified shoreline, the actual location of structures will likely be much greater than 150 feet from the water's edge. The proposed development will not encroach into beach areas.
15. Because the public comment period for various proposals government for greater Hawaiian monk seal protection by the federal have been extended indefinitely by NOAA, we are unable to determine what effect final rule making might eventually have if the proposals actually result in new federal action.
16. The resort owners believe that the creation of Covenants and Restrictive Conditions (CC&Rs) represent the most practical management tool for ensuring that commitments and agreements are fulfilled. The long-term financial structure of implementing these commitments has not yet been resolved.
17. The Unilateral Agreement dictates the timing for park dedication. The SEIS will discuss the provision of public parking at each of the 12 public access ways included in the Proposed Action. Maps included in the SEIS will depict the spacing of these access ways. All public access ways will honor traditional and customary Hawaiian practices to the extent required by law.
18. A general development schedule for the Proposed Action will be included in the SEIS. While representations concerning the project schedule based upon the best available information at the time were made to the State Land Use Commission, those representations were rendered moot by the changes in property ownership over time. The Commission's Decision and Order contained no performance timing requirements.
19. The Unilateral Agreement runs with the land and is, therefore, unaffected by the Proposed Action. As discussed above, the resort owners are willing to establish CC&Rs to memorialize and enforce their development commitments.
20. The resort owners' version of the 6th Alternative will be included in the SEIS.
21. The resort owners are working with the Trust for Public Land to establish a conservation easement over the mauka agricultural land so they will be preserved as ag lands forever.
22. The marketing of community housing units will be limited to that which is allowable by law.
23. The Proposed Action embraces the preservation of the rural character of the resort property. The resort owners do not anticipate a loss of revenue as the result of the proposed development.
24. Decisions regarding LEED certification are still pending. However, the resort owners are committed to responsible sustainability practices including energy efficiency in the design of the resort units. Decisions regarding LEED certification for individual resort residences will likely be made by individual development parcel owners, the master developer will establish minimum standards.
25. A transportation demand management analysis will be included in the SEIS. The Unilateral Agreement includes provisions for the implementation of buses and/or vans for visitors and employees. The operation of these transportation systems is commonly referred to as transportation management.
26. The SEIS will include a discussion of the Proposed Action's water demand. An estimate of the capacity of the resort's wells will also be provided. While the agricultural lots are part of the overall resort property, they are not included in the SEIS because they are not part of the Proposed Action; and they have a separate water source for irrigation purposes.

27. The SEIS will discuss impacts related to tropical cyclones. The coordination of evacuations during times of natural disasters falls under the jurisdiction of the Oahu Civil Defense Agency and the Honolulu Police Department. Given the fact that the entire region is served by a single two-lane highway, the agencies strategy is to encourage residents to relocate to designated emergency shelters. The existing Turtle Bay hotel is designated by the Oahu Civil Defense Agency as a private shelter, meaning that resort guests and visitors can take shelter in the upper stories, but the structure has not been identified for use by the general public. Thus, during times of natural disaster, the majority of the resort's population would likely remain on the property.
28. The SEIS will address climate change issues to the extent possible.
29. The SEIS Preparation Notice was written before the botanical survey of the property was completed, hence the use of the word "anticipated". Now that the report has been completed, the SEIS will be able to affirm that no endangered plant species have been identified on the resort property. The report identifies ironwood as an invasive species and recommends selective thinning of the ironwood groves to facilitate the restoration of the coastal strand.
30. A discussion of the resort's wastewater treatment system will be included in the SEIS. The facility is operated in compliance with Department of Health standards and regulations. The discussion of specific quality control and testing provisions is typically beyond the scope of an environmental impact statement.
31. See discussion in item #5 above. As the resort does not include a public cemetery, the location of other family's burial plots is not relevant to the SEIS.
32. The Proposed Action is predicated upon a sustainable development concept called Tomorrow's Ahupua`a. Tomorrow's Ahupua`a is inspired from the traditions, values, and aspirations of the Hawaiian culture to develop a sustainable community that celebrates the balance of its environmental, socio-political, economic, and cultural resources. It will look to the wisdom of the past to build a bright and balanced future. The SEIS will also contain a cultural impact assessment that will discuss in detail the project area's cultural history. It is our understanding that the Unilateral Agreement was an instrument of conditional zoning that is often employed by the Honolulu City Council.
33. The Unilateral Agreement is recorded at the Bureau of Conveyances and, therefore, runs with the title of the land. The resort owners are obligated to fulfill its requirements. The SEIS will include a discussion of how the Unilateral Agreement will be implemented.
34. An engineering analysis of the Proposed Action's relationship to infrastructure will be presented in the SEIS and will include a discussion of how new improvements will be phased. The geological character of the area will be taken into consideration.
35. The resort's owners share your concerns about traffic. The SEIS will include a traffic study that evaluates the impacts of the proposed project on Kamehameha Highway. The Level of Service (LOS) categories to which you refer represent the technical means by which the capacities of roadway intersections are evaluated. As required by the State Department of Transportation, the calculation of LOS focuses on the peak AM and peak PM period. Thus, a determination of trip durations throughout the day is beyond the scope of the Traffic Analysis Impact Report that will be presented in the SEIS. The resort owners have been advised by the State Department of Transportation and the City and County of Honolulu that there are no plans to widen the entire length of Kamehameha Highway.
36. A socio-economic impact analysis will be included in the SEIS. It will estimate the number of employees that will be needed for the Proposed Action. The Unilateral Agreement includes a requirement that the resort owners provide bus service for its employees.
37. The implementation of a region serving bikeway is under consideration as part of a multi-modal transportation planning effort by the resorts owners.
38. We are unable to respond to this question because we cannot speak on behalf of the City's Department of Planning and Permitting.
39. In 1977, an amendment to the Oahu General Plan, voted on by the residents of the City and County of Honolulu, designated the Kuilima Hotel property to be reclassified as a Visitor Destination Area. Several years later, the Ko`olauloa Development Plan was adopted by the City as a means of implementing the General Plan. It depicted the Kuilima property as a resort. In 1986, the City Council approved an expansion plan for the resort that allows the development of five new hotels. It was decided at that time, that the development was needed to create new jobs in the region and to support the continuing health of the visitor industry.

    In 1999, the Ko`olualoa Development Plan was replaced with Ko`olau Loa Sustainable Communities Plan. The principal difference between the two plans is that the latter established an urban growth boundary that was intended to limit development and protect the rural character of the region. Because the Turtle Bay Resort property was reclassified to the Urban district about 14 earlier, it is fully contained within the Urban Growth Boundary.

    Together, these plans and policies are intended to ensure that the rural character of the North Shore is preserved for future generations. The Proposed Action is consistent with these policies.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive

a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

The official review and comment period will last 45 calendar days from the date that the OEQC publishes the Notice of Availability in its *Environmental Notice*. You can find the *Environmental Notice* on-line at the OEQC website:

http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

RE: Turtle Bay Development

1 message

Henry Matson <hmatson@charter.net> **Tue, Sep 27, 2011 at 1:11 PM**
To: snishiura@honolulu.gov, leesichter@gmail.com

I strongly oppose the future development of Turtle Bay because:

1. Kam Highway is not capable to safely handling anymore traffic. The **Existing Traffic** backs up and causes long slow delays every weekend day and 50% of weekdays.
2. There are several burial sites which should remain untouched as their ancestors intended.
3. The Sea Turtles and Seal habitat will be adversely impacted with possible irreparable harm being caused to these species.
4. Additional waste treatment will adversely impact the coral reefs that are one the most important natural resources that Hawaii has. These reefs support the sea life, man and animals on the island. They are one of the most important resources in the eco system.
5. The island needs balance. Keep the North Shore for the Hawaiian people and the country life style and keep Waikiki for the Tourist and the Hotel life style.
6. We should not allow any amount of money to consume something that can not be replaced once it is gone. Hawaii does not need another Hotel or condo project. We already have enough of them.

Henry Matson

57-432 Honokawela Dr. Kahuku Hawaii

P 808 2322328

LEE SICHTER LLC

45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Henry Matson @ hmatson@charter.net

I am writing in response to the email you sent on Tuesday, September 27, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

1. The resort owners share your concerns about the project's impacts on Kamehameha Highway. A traffic impact analysis report (TIAR) for the Turtle Bay Resort was approved by the State Department of Transportation in 2009. It is now being updated for the Draft SEIS and its findings and recommendations will be included in the document. The scope of the update extends from Kahalu'u to Hale`iwa. We understand that the future widening of Kamehameha Highway for the purpose of adding lanes is not under consideration by either DOT or the City. Therefore, measures to mitigate traffic impacts must focus on transportation demand management (TDM); how to better utilize existing resources. To that end, the resort owners have commissioned a TDM study. The TDM recommendations will be included in the Draft SEIS.
2. Please be assured that concern for and respect of the *iwi kupuna* are among the greatest concerns of the resort's owners. A Supplemental Archaeological Inventory Survey has now been completed for the entire resort area and its findings will be included in the Draft SEIS. The study affirms that the proposed development will not disturb *iwi kupuna.*
3. A marine resources report has been prepared to identify the anticipated impacts upon endangered species. This and all of the above mentioned reports will be included in the Draft SEIS.
4. While the resort owners agree that balance is always best, it is not possible to restrict population and travel in the manner you suggest. The Turtle Bay Resort property was reclassified to the Urban District and rezoned in the mid-1980s in compliance with the Ko`olauloa Development Plan and the O`ahu General Plan that both called for the expansion of the Kuilima property to a visitor destination area to ensure the continued vitality of the island's visitor industry. Limiting development on the North Shore is neither a practical nor realistic answer. Even if there was no further development between Kahalu`u and Hale`iwa, there would still be traffic congestion on the highway. So long as the famed beaches of the North Shore remain an attraction for O`ahu's residents and visitors, people from Honolulu, Hawaii Kai, Kailua, Kane`ohe, Aiea, Pearl City, Waipahu, Ewa, Kapolei, Waianae and Wahiawa will come.
5. The SEIS will contain a detailed discussion of what the resort will do to implement the principles of sustainability.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

The official review and comment period will last 45 calendar days from the date that the OEQC publishes the Notice of Availability in its *Environmental Notice.* You can find the *Environmental Notice* on-line at the OEQC website:

http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

From: Nick Marck [mailto:joenapkin2@mac.com] **Sent:** Thursday, September 29, 2011 6:34 AM **To:** ccComments **Subject:** Turtle Bay Development

Dear Sirs,

I oppose the current over development plans. Once the pristine character of Kawela Bay is violated, it can never be retrieved. Future generations will ask "How could they sacrifice the beautiful bay for private profit?"

In addition, I strongly oppose the future development of Turtle Bay because:

Kam Highway is not capable to safely handling anymore traffic. The **Existing Traffic** backs up and causes long slow delays every weekend day and 50% of weekdays.

There are several burial sites which should remain untouched as their ancestors intended.

The Sea Turtles and Seal habitat will be adversely impacted with possible irreparable harm being caused to these species.

Additional waste treatment will adversely impact the coral reefs that are one the most important natural resources that Hawaii has. These reefs support the sea life, man and animals on the island. They are one of the most important resources in the eco system.

The island needs balance. Keep the North Shore for the Hawaiian people and the country life style and keep Waikiki for the Tourist and the Hotel life style.

We should not allow any amount of money to consume something that can not be replaced once it is gone. Hawaii does not need another Hotel or condo project. We already have enough of them.

Nick marck

57-323 pahipahialua Street

Kahuku, HI 96731

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PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Nick Marck @ joenapkin2@mac.com

I am writing in response to the email you sent on Thursday, September 29, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

1. The resort's owners acknowledge your opposition to the proposed expansion plan.
2. The proposed plan includes specific recommendations to improve the water quality of Kawela Bay.
3. The resort's owners share your concerns about traffic. The SEIS will include a traffic study that evaluates the impacts of the proposed project on Kamehameha Highway.
4. A new archaeological inventory survey has been conducted on the property and its results will be presented in the SEIS. The survey will help to ensure that no *iwi kupuna* are disturbed.
5. A marine resources study is being prepared for inclusion in the SEIS. The resort owners share your concerns about protecting the area's coastal resources.
6. The SEIS will include an evaluation of the resort's wastewater treatment and will determine what measures need to be taken to ensure that the water quality of the coastal area is not adversely affected.
7. So long as the famed beaches of the North Shore remain an attraction for O`ahu's residents and visitors, people from Honolulu, Hawaii Kai, Kailua, Kane`ohe, Aiea, Pearl City, Waipahu, Ewa, Kapolei, Waianae and Wahiawa will come. No area can be restricted from access by others.
8. The SEIS will include a discussion of how the resort can improve its sustainability practices for the benefit of future generations.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

October 3, 2011

My name is Bob Comeau, Executive Director of the North Shore Career Training Corporation in Kahuku. This testimony is offered in response to Turtle Bay Resort LLC's Environmental Assessment and SEIS Preparation Notice, and specifically on the impacts of the proposed resort expansion on labor force requirements on the local community.

The Corporation is a private, non-profit, community-based organization formed to provide training and employment opportunities for residents of the Koolauloa and North Shore districts of Oahu. It was created in 1978 as an outgrowth of the community's concern for its long-term economic welfare and as a means of coordinating efforts toward resolving those needs. Our funding has come from a variety of sources, including Campbell Estate, Kuilima Resort Company, the State Department of Labor, and other public and private entities.

Many of us have been involved for over 30 years searching for ways to solve the chronic employment problems of the area. Since the traumatic closing of the Kahuku Sugar Plantation in 1971, we have struggled for solutions which would allow us to continue living in our community to raise our children, earn an honest living, and maintain our own lifestyle.

We knew that the only way these things could happen would be by encouraging economic growth within our area. We supported Del Webb, Prudential Insurance, and Asahi Jyuken then, and we continue to support Turtle Bay Resort LLC now, for there simply are no other viable options available to us. We love the country as our home, but we reject the notion that it should remain untouched or in its natural state for others to enjoy. The true beauty of an area is measured in many ways, not only by its physical, scenic attributes, but equally in its ability to provide sustenance and hope for those who call it home. For better or worse, our State has come to terms with the fact that tourism will provide the base for our economy. We accept this reality and have committed ourselves to supporting its growth, via this development, in our community.

We need the jobs this project will provide and have played an active role, together with the developer, in assuring that the jobs to be created will accrue to our people. Specifically, the Corporation has established a comprehensive training, education, and employment center in Kahuku, with operational funding provided by the developer and other entities noted above. The main objective of the center is to enhance employability prospects of area residents and maximize the number to be employed at the resort.

The Corporation has established a long, close working relationship with the resort's owners. We firmly believe that this is a realistic, mutually beneficial situation and we have come to accept them as honest, honorable businessmen. We understand the tradeoffs: we must give something - our land - in order to get something - jobs.

In the long-term economic interests of our people, we continue to support this project.

LEE SICHTER LLC

45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Bob Comeau @ noshore@juno.com

I am writing in response to the letter you sent on Tuesday, October 3, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Thank you for your expression of support for the proposed expansion project.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

DEPARTMENT OF PARKS & RECREATION

CITY AND COUNTY OF HONOLULU

1000 Uluohia Street, Suite 309, Kapolei, Hawaii 96707
Phone: (808) 768-3003 • Fax: (808) 768-3053
Website: www.honolulu.gov

PETER B. CARLISLE
MAYOR

GARY B. CABATO
DIRECTOR

ALBERT TUFONO
DEPUTY DIRECTOR

October 14, 2011

Mr. Drew Stotesbury
Turtle Bay Resort, LLC
57-091 Kamehameha Highway
Kahuku, Hawaii 96731

Dear Mr. Stotesbury:

Subject: Supplemental Environmental Impact Statement Preparation Notice Turtle Bay Resort Expansion

Thank you for the opportunity to review and comment on the Supplemental Environmental Impact Statement Preparation Notice for Turtle Bay Resort Expansion.

The Department of Parks and Recreation has no comment at this time as the supplemental EIS does not propose any changes to previous commitments regarding dedication of parks and improvements and we look forward to continued participation in the EIS process.

Should you have any questions, please contact Mr. John Reid, Planner, at 768-3017.

Sincerely,

GARY B. CABATO
Director

GBC:jr
(430550)

cc: Ms. Sharon Nishiura, Department of Planning and Permitting
Mr. Lee Sichter, Lee Sichter LLC

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October 26, 2012

Gary Cabato
Director
Department of Parks & Recreation
City and County of Honolulu
1000 Uluohia Street, Suite 309
Kapolei, Hawai'i 96707

Dear Mr. Cabato:

I am writing in response to the letter you sent on September 21, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. We acknowledge that your department has no comments at this time.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party.

In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you would prefer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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Very truly yours

Lee Sichter

September 16, 2011

TO: Department of Planning and Permitting
Mr Lee Sichter

FR: Dee Dee Letts

RE: Turtle Bay Supplemental Environmental Impact Statement (SEIS) Preparation Notice

Mahalo for the opportunity to comment on the SEIS Preparation Notice. Prior to beginning my comments I would like to recognize Replay Resorts for their willingness to meet and talk with a range of members of the Ko`olau Loa/North Shore community regardless of their prior views on the proposed resort. This approach is truly unique for a developer in our area and a very welcome change from the others we are currently dealing with.

While I recognize that this is only a preparation notice there are several concerns that it raises that I hope are more thoroughly addressed in the Draft Supplemental Environmental Impact Statement (DSEIS). I have taken time to note the key ones below.

- The ahupua`a concept of sustainability and collaboration through mutual dependency for the survival and benefit of all living within the ahupua`a does not translate well to a for profit model. The intent of this master plan and SEIS is to achieve a level of entitlements for the land that will then be sold to the highest bidder for a profit. If the applicant were going to ultimately develop 100% of the project there might be some faith that the Hawaiian concepts so easily used in this document might be implemented but as it is the intent to sell to other entities once the entitlements are achieved makes these concepts more a window dressing for decision makers then a real commitment on the part of the landowner. If the DSEIS wants to continue to use these concepts as a selling point for their plan then it needs to address how they will assure that the concepts are implemented. This would include limits on number of keys, making sure that new buyers can't apply for variances, that design features are not guidelines and that any oversight person or agency has authority to make decisions that are mandated to be followed by all subsequent owners at a minimum. If compliance can not be guaranteed then the lovely concepts are not worth the paper they are written on.
- Resort development is by its nature not a sustainable use of land. If we consider job creation part of modern sustainability then this document falls far short in even that area. There are no promises made as to the types of resort uses that will ultimately be developed by the purchasers of the entitlements. They might be hotels or condominiums or timeshares. The employment differences between the three are immense as is the range of pay scales provided by each. Most do not provide a livable wage to support a family in Hawai`i without supplemental income.
- The applicant's various intents for management and uses by regions as outlined in Section 5, appears to be a statement of their intent for purposes of the DSEIS it may not be the intent of the ultimate developer as previously stated therefore the document should focus on facts rather then concepts that may are or may be implemented. These facts should include area footprint increase, number of keys, traffic etc.
- The reference to partnering with the military for a sustainable ahupua`a model is really troubling. Does the applicant know that the military's EIS for the stryker training grounds admitted? It admitted that the vehicles would so compact the soil that in all likelihood nothing would ever grow on the land again.
- As far as being ahupua`a friendly the friendliest this development could be would be to focus on no development outside of the existing footprint of the resort and leave the Kahuku point and other undeveloped lands alone. More hotel rooms within the existing footprint to concentrate development and allow visitors the access to wild undeveloped coastline would be a better design for the resort. The old argument that a stand alone hotel can't make it (which is also alluded to in this document) has been disproved by the success of the existing hotel.
- If you concentrated the development in the existing footprint you would not need the interior road and all the costs and potential cultural issues that go with the development of the road.
- Please drop the use of the word piko to describe a bar and shopping area. I am not native Hawaiian but having lived in this community for over 40 years I find that term offensive from a cultural standpoint.
- Please consider locating the farmers market on Kamehameha Highway. The document references the Haliewa Farmers Market which is successful because it is on the main road – in fact it is located so it gets traffic from both the bypass and the Haleiwa town road. A farmers market is not a tourist draw and if it is inside and not accessible from the highway it will not be a local draw either.
- Need to discuss how the golf course serves to protect the marsh as golf course runoff is often laden with pesticides and nitrates.
- The cultural associations are high across this entire property not higher in one place or the other as the document implies.
- The setbacks are deeper in some areas then the law requires however in the Kawela Bay area in particular a prior communication from SHPO suggest that in order to protect `iwi kupuna the setback should be 200 to 300 **meters** not feet.
- `Iwi Kupuna are not mentioned in the Prep Notice and need to be fully dealt with in the DSEIS. I believe there have been 19 sets found on site some of which have gone missing and can not be found. The suggestion in the document that since the land was disturbed for agriculture etc. this will not be a problem is false. Disturbing the land to plant a crop is very different from disturbing the land to plant a building both in depth of disturbance and in magnitude of disturbance. Please do not treat this important issue lightly. This is an important consideration when it comes to calculating the potential costs of concentrating the development in the most disturbed footprint as opposed to stringing it out across the entire property.

- The document states that no more then 1000 keys will be provided for lock out units at Kawela Bay – how will this be accomplished? Will the condos or timeshare or whatever units on the Kahuku side or around the existing hotel also have the potential to be developed as lock outs and if so how many keys will be allowed here?
- All traffic studies should be predicated on number of keys not number of units for sale.
- Many of the concepts in the document such as architectural guidelines, a compliance entity (konohiki) are nice concepts but unless as previously stated they are enforceable they come back to window dressing. I look forward to a discussion in the DSEIS as to how the applicant intends to operationalize these.
- Any claim of reduction in size must be calculated based on keys not number of units so it is not clear whether the preferred alternative is 60% less or not. Also please discuss how large an increase it is over what already exists.
- All setbacks should be predicated on a new certification of the shoreline.
- The Amphitheater proposal must address maximum size of events to take place and deal with the traffic and parking issues raised by the event size. How will the maximum event size set be enforced as a private owner will want to maximize return and therefore exceed any set maximum number of patrons set. The 4th of July celebration took longer to get to, park and get out of then the event itself lasted. Also as this area is identified to be a "private park" it should not be counted in the park space acreage claimed for the project as it will not necessarily be open to the public and will be a profit center.
- Looking forward to a discussion on the affordable housing concept – affordable to residents in our area or will it be set by the 80 to 120% of median income for the island. If intended to be affordable to local residents how do you enforce something that is more restrictive than state law? Are you looking at rentals which are a bigger need and tend to be affordable for lower incomes etc.?
- All future plantings should be with native plants and invasive species should be removed in any areas developed.

In closing for now I look forward to the DSEIS and especially to its discuss on how the soft "window dressing" issues will be operationalized to assure that they are implemented. In the event they can not be developed in a way that guarantees implementation and adherence then I would prefer they be dropped for the DSEIS as they seize to be relevant to any decision making or disclosure requirements of the document.

LEE SICHTER LLC

45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Dee Dee Letts @ ddletts@lava.net

I am writing in response to the email you sent on Tuesday, September 20, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

1. We believe that upon reviewing the Draft SEIS, you will find that the ahupua`a concept of sustainability as expressed in Tomorrow's Ahupua`a represents an innovative holistic approach for the development, operation and management of a visitor destination community. While decisions remain to be made about whether Replay Resorts will develop the Turtle Bay Resort property, or portions or all will be sold to others, the resort owner's representative has stated publicly on numerous occasions that documenting commitments in the form of Covenants, Conditions and Restrictions (CC&Rs) would represent an appropriate mechanism for tying enforceable commitments to the title of the land, just as the Unilateral Agreement is tied forever to the property.

   With regard to your comment concerning entitlements, the Turtle Bay Resort property has already been reclassified to the Urban District and rezoned to allow for the development of 3,500 new units. No additional discretionary permits are required. The SEIS is being prepared at the requirement of the Hawai`i Supreme Court to disclose the impacts of the proposed development. The intent of the SEIS is to fulfill that obligation, not "...to achieve a level of entitlements for the land that will then be sold to the highest bidder for a profit."

2. The socio-economic impact analysis to be included in the Draft SEIS will address the employment opportunities associated with the varying types of hotel and other potential operating business(s).

3. The SEIS will include the factual information you request, with the exception of specific building footprints that cannot be known until final designs and building permit applications for a particular parcel are finalized.

4. While you may find the mention of partnering with the military as "troubling", the resort owners believe that communicating with regional and adjacent neighbors is essential to proper resource management. We expect that Konohiki (land stewards) from neighboring Ahupua'a communicated on land issues during the pre-contact era. Despite the past practices at the Kahuku Training Area, there is always an opportunity to work together to improve environmental conditions. Kaho`olawe Island would not be accessible today if concerns about what the military did in the past prevented a dialogue from being initiated.

5. The resort owners have included a new alternative to evaluate in the SEIS that we believe will address your concerns. The Conservation Partner alternative proposes that the majority of development be centralized around the existing hotel and that much of the remaining coastline be preserved as open space. To be implemented, it will require the participation of a third party or parties who would provide significant economic consideration in lieu of the foregone development rights.

6. As demonstrated in the SEIS's Conservation Partner alternative, the length of the resort's spine road can be reduced.

7. The use of the word "piko" has been recommended by native Hawaiians who have consulted with the project. We will leave it to them to decide whether it is appropriate to use.

8. The ability to locate the Farmers' Market is constrained by land ownership. The Market cannot be located within Kamehameha Highway's state-owned right-of-way as you are likely aware of the Haleiwa Roadside Market struggles with the Department of Transportation rules and regulations. The intent of the resort owners is to situate it in a commercially logical and viable location without conflicting with State or County land use policies.

9. The SEIS will discuss the relationship of the golf course to the marsh. However, we do not agree with your conclusion that all golf course runoff "is often laden with pesticides and nitrates." Golf courses can and are operated on an efficiency basis and at fairly low profit margins. Pesticides and nitrates are expensive and our golf course agronomists attempt to carefully evaluate their chemical and fertilization use to minimize environmental impacts and costs of materials.

10. A Cultural Impact Assessment has been prepared for the property and will be included in the SEIS. The CIA discusses the fact that habitation with in the area now occupied by the resort was concentrated at Kawela Bay, and it is that recognition upon which the statement in the SEISPN was made.

11. The previous archaeological inventory survey has been supplemented with a new survey that included extensive trenching and testing in all proposed development areas. The State Historic Preservation Office approved the methodology for the new survey prior to its implementation. The results of the survey will be included in the SEIS. The presence of burials will be evaluated through the local burial committee, Oahu Burial Council and related government agencies to determine the most appropriate mitigation measures for honoring and protection.

12. As discussed above, honoring and protection of *iwi kupuna* will be discussed in the SEIS in the context of the Supplemental Archaeological Inventory Survey and the Cultural Impact Assessment. Your statement regarding missing remains is not accurate.

13. The reference to lock-out units pertains to all 625 proposed resort units.

14. The update of the traffic impact analysis report approved in 2009 by the State DOT is based upon the total unit count, including lock-outs. The TIAR update will be included in the SEIS.

15. Please see discussion in #1 above.

16. Because the Unilateral Agreement made no mention of lock-out units, it is difficult to assume how many of the 3,500 units then proposed might fit that category. Thus, when comparing the current expansion plan to the previously granted entitlements, it is more appropriate to compare a simple unit count to a simple unit count. The existing resort has 500 hotel units and 366 condominium units with two manager's units contained within the Kuilima Estates. The Proposed Action includes 625 hotel units and 750 residential units, including 160 community housing units (intended to be affordable to the community). These numbers suggest that the Proposed Action constitutes a 158% increase over the current number of units at the resort.

17. All setbacks must be based upon the certified shoreline.

18. The public park requirements for Turtle Bay Resort are documented in the Unilateral Agreement. If the resort owners elect to provide additional private parks beyond what is required, they may do so. The resort owners share you concerns about traffic impacts. Operation of the Gathering Place will take traffic considerations into account.

19. The SEIS presents a discussion of the project's resident community/ affordable housing strategy.

20. Future landscaping at the resort will likely be a combination of exotic and native plants. Invasive species will be removed in areas to be grubbed and graded.

21. We look forward to your review of the SEIS and believe you will be pleasantly surprised.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

The official review and comment period will last 45 calendar days from the date that the OEQC publishes the Notice of Availability in its *Environmental Notice*. You can find the *Environmental Notice* on-line at the OEQC website:

http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

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Subject: [Turtle Bay Resort SEIS] Please moderate: "SEIS Preparation Notice"
From: Turtle Bay Resort Development <info@turtlebayseis.com>
Date: Sun, Sep 18, 2011 3:05 pm
To: info@turtlebayseis.com

A new comment on the post "SEIS Preparation Notice" is waiting for your approval
http://turtlebayseis.com/seis/prep-notice/

Submitted : Sep 18, 2011 @ 15:05
Author : Nancy McGovern (IP: 71.224.6.118 , c-71-224-6-118.hsd1.pa.comcast.net)
E-mail : nancydmcgovern@comcast.net
URL :
Address :
City :
State :
Zip :
Phone :
Comment:
Any further development would be detrimental to the North Shore and Oahu.

The roads could not possibly handle all the traffic, the hotel now cannot fill all their rooms - how will they be able to fill all these proposed hotels, the Villas have had such difficulty selling their condos - how do these developers think they can sell all the proposed condos? EVen rentals at The Villas and Kuilima are never filled. Adding more of the same will not change that.

One of Turtle Bay's primary attractions is their beautiful golf courses - why destroy them - no one would come to play a 9-hole course or a golf course that wraps around condos - the beauty of the Fazio and Palmer is why people come to the North Shore. The proposed golf course will be just like all the rest in town.

They can talk about setbacks and how they are environmentally focused, but adding people, buildings, cars, etc. into the equation will destroy the shoreline, the wildlife, plant life - and the beauty of the North Shore.

The developers keep speaking of how much they have reduced their plan that would have been ok with the 1985 EIS. That is mute as The Court determined that changed circumstances (changes in traffic patterns, use of beaches and near shore waters would impact endnagered species (esp. monk seals and green turtles), hotel demand, etc., etc.) could have a substantial effect upon the environment that was not contemplated in the 1985 EIS. That study only went through 2000, it is so different now.

There is already another hotel that is going to be built about 5 miles up the road. There was one there that went out of business.

Too much development = no visitors to the beautiful unspoiled North Shore. They'll just stay in town.

Bottom line, no growth is still the best plan.

Approve it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=approve&c=98
Trash it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=trash&c=98
Spam it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=spam&c=98
Currently 37 comments are waiting for approval. Please visit the moderation panel:
http://turtlebayseis.com/tbr/wp-admin/edit-comments.php?comment_status=moderated

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October 26, 2012

To Nancy McGovern @ nancydmcgovern@comcast.net

I am writing in response to the email you sent on Sunday, September 18, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

1. The resort owners share your concerns about traffic impacts upon Kamehameha Highway. The SEIS will contain a detailed evaluation of the proposed expansion plan's traffic impacts and recommend measures to mitigate those impacts.
2. The existing hotel frequently operates very near full capacity. A market study conducted for the proposed project confirms that there is sufficient demand to justify the proposed development. The SEIS will discuss the conclusions of the market study.
3. Under the Proposed Action, the Fazio Course will be refurbished, not destroyed. It would be reduced to nine holes.
4. The resort owners are committed to the preservation of the Turtle Bay Resort shoreline. The SEIS will evaluate the impacts of the proposed development upon coastal resources.
5. The court required that a supplemental EIS be prepared to address the impacts of the original expansion plan to account for changes over time; namely the presence of Hawaiian monk seals and changes in traffic conditions. The resort owners have gone a step further and have revised the master plan. The SEIS will evaluate the impacts of the revised master plan.
6. The recently approved Marriott Hotel in Laie is intended to serve a very different market than the Turtle Bay Resort.
7. See response #2 above.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

The official review and comment period will last 45 calendar days from the date that the OEQC publishes the Notice of Availability in its *Environmental Notice*. You can find the *Environmental Notice* on-line at the OEQC website:

http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

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Subject: [Turtle Bay Resort SEIS] Please moderate: "Objectives"
From: Turtle Bay Resort Development <info@turtlebayseis.com>
Date: Mon, Sep 19, 2011 9:43 pm
To: info@turtlebayseis.com

A new comment on the post "Objectives" is waiting for your approval
http://turtlebayseis.com/the-plan/objectives/

Submitted : Sep 19, 2011 @ 21:43
Author : Justin Parker (IP: 98.150.229.240 , cpe-98-150-229-240.hawaii.res.rr.com)
E-mail : justinthe12@yahoo.com
URL :
Address :
City :
State :
Zip :
Phone :
Comment:
No, your supposed "protection" of the proposed MPA, is suspicious to me. I do not believe that your organization wants to protect Oahu's wildlife, but merely wants to discourage fishermen from infesting your shores and scaring away the tourists, who pay your bills. I am a proponent of
currently existing MPAs but to try to make a perfect marine habitat to serve your own needs, namely money, to me is wrong. If you are serious about protecting the ocean environment stop serving unsustainable seafood in your restaurants. Fish such as sea bass, opakapaka, hapu'u, (Hawaiian sea-bass) and to a lesser extent ahi, are unsustainable. If the planned MPA goes through, I want to see on your menus only sustainable types of fish: aku, 'opelu, and akule as well as three invasives: ta'ape, to'au, and sardines.

Approve it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=approve&c=100
Trash it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=trash&c=100
Spam it: http://turtlebayseis.com/tbr/wp-admin/comment.php?action=spam&c=100
Currently 38 comments are waiting for approval. Please visit the moderation panel:
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October 26, 2012

To Justin Parker @ justinthe12@yahoo.com

I am writing in response to your email of Monday, September 15, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

The Unilateral Agreement that was approved as part of the resort's conditional zoning approval in the mid-1980s requires the resort owner to use their best efforts in establishing a Marine Life Conservation District at Kawela Bay. Thus, the owners are obligated to pursue this concept. However, the owners believe that ultimately, it is in the best interest of all that the community participates in decision-making concerning Kawela Bay and the Turtle Bay Resort coastline. To that end, the resort owners will propose in the SEIS that a Marine Advisory Council be established, made up of representatives of the community, including fishermen and cultural practitioners, to determine what is best for Kawela Bay and the shoreline.

The SEIS will also include a detailed discussion about how to improve sustainability at the resort. Your recommendations about the resort's restaurants limiting seafood to sustainable fish is commendable and will be passed on to our food and beverage management staff for consideration.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

Lee Sichter <leesichter@gmail.com>

I oppose the current Turtle Bay redevelopment plan

1 message

Rob Barreca <rob@surfbeyond.com> **Mon, Sep 19, 2011 at 5:34 PM**
To: snishiura@honolulu.gov, leesichter@gmail.com, ccComments@honolulu.gov

I respectfully oppose the proposed plan for expanded development on the North Shore. I am an Oahu resident and longtime surfer of the surrounding areas to Turtle Bay. Beyond traffic and infrastructure considerations is the potential to forever destroy the scenic beauty of the North Shore. There are reasons people come to Oahu beyond the sprawling development of Waikiki and that is to experience the country. There is a reason so many residents leave town to go up north for the weekend. Opening the North Shore to massive development is a bad idea for our current residents, local economy and our value as a tourism destination. We already have one Waikiki, let's keep it that way and focus on keeping country COUNTRY.

Sincerely,

Rob Barreca
Surfrider Foundation Co-Chair
Resident Paloto Valley
3535 Maluhia St
Honolulu, Hi 96816

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October 26, 2012

To Rob Barreca @ rob@surfbeyond.com

I am writing in response to the email you sent on Monday, September 19, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

1. The resort's owners acknowledge your opposition to the proposed expansion plan.
2. The resort's owners share your concerns about traffic. The SEIS will include a traffic study that evaluates the impacts of the proposed project on Kamehameha Highway.
3. A marine resources study is being prepared for inclusion in the SEIS. The resort owners share your concerns about protecting the area's coastal resources. The SEIS will include an evaluation of the resort's wastewater treatment and will determine what measures need to be taken to ensure that the water quality of the coastal area is not adversely affected.
4. In 1977, an amendment to the Oahu General Plan, voted on by the residents of the City and County of Honolulu, designated the Kuilima Hotel property to be reclassified as a Visitor Destination Area. Several years later, the Ko`olauloa Development Plan was adopted by the City as a means of implementing the General Plan. It depicted the Kuilima property as a resort. In 1986, the City Council approved an expansion plan for the resort that allows the development of five new hotels. It was decided at that time, that the development was needed to create new jobs in the region and to support the continuing health of the visitor industry.

   In 1999, the Ko`olualoa Development Plan was replaced with Ko`olau Loa Sustainable Communities Plan. The principal difference between the two plans is that the latter established an urban growth boundary that was intended to limit development and protect the rural character of the region. Because the Turtle Bay Resort property was reclassified to the Urban district about 14 earlier, it is fully contained within the Urban Growth Boundary.

   Together, these plans and policies are intended to ensure that the rural character of the North Shore is preserved for future generations.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Thank you.

-----Original Message-----
From: sightpacific@hawaii.rr.com [mailto:sightpacific@hawaii.rr.com]
Sent: Monday, September 19, 2011 8:48 PM
To: Nishiura, Sharon N.
Cc: alan@aloha.com; ghdoeberry@gmail.com
Subject: Turtle Bay

Aloha,

Hotel development provides experience in the island, short term, for visitors. For golf. It provides return on investment for others who do not live here. It provides low wage jobs, none able to sustain rentals or mortgages or families. In exchange, development like this will diminish local culture (way of life), clog existing roads, put the burden of any infrastructure to suit increased tourism on the public and basically turn the North Shore into another Waikiki, Ko'olina.

Why wreck what needs protection for developers' dreams and deals?

Mr. Tanoue has not real island values.

Paul Nelson

ccComments <ccComments@honolulu.gov> **Thu, Sep 22, 2011 at 3:41 PM**
To: Raymond Beatty <sailing@hawaii.rr.com>
Cc: "leesichter@gmail.com" <leesichter@gmail.com>, "drew@replayresorts.com" <drew@replayresorts.com>

Your comments for the Supplemental Environmental Impact Statement Preparation Notice for Turtle Bay resort have been received by the Department of Planning and Permitting. Your comments were also sent to the Consultant and Applicant. Their contact information is:

Consultant:

Lee Sichter LLC
45024 Maiulani Street #1
Kaneohe, Hawaii 96744
Contact - Lee Sichter, (808) 382-3836
leesichter@gmail.com

Applicant:

Turtle Bay Resort, LLC
57-091 Kamehameha Highway
Kahuku, Hawaii 96731
Contact - Drew Stotesbury, (808) 447-6951
drew@replayresorts.com

Thank you.

-----Original Message-----
From: Raymond Beatty [mailto:sailing@hawaii.rr.com]
Sent: Thursday, September 22, 2011 1:14 PM
To: ccComments
Subject: Turtle Bay

I am definitely opposed to any more development in the Turtle Bay area,
There is no way that the roads can handle any more traffic.
Thank you,
Ray Beatty
Retired, Honolulu Fire Dept.

LEE SICHTER LLC
45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

To Paul Nelson @ sightpacific@hawaii.rr.com

I am writing in response to the email you sent on Monday, September 19, 2011 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

1. We agree that hotel development tends to provide short-term experience for visitors and golfers. However, through the implementation of its Tomorrow's Ahupua`a Plan, the proposed expansion plan hopes to impress upon short-term visitors the core values of the Hawaiian culture.
2. We agree that successful development provides a return on investment for those who invested regardless of their place of residency.
3. We do not agree that resort development provides only low wage jobs that cannot sustain families.
4. As discussed above, rather than diminish culture, the proposed plan intends to exemplify it as the preferred model for sustainability.
5. The resort's owners share your concerns about traffic. The SEIS will include a traffic study that evaluates the impacts of the proposed project on Kamehameha Highway.
6. The SEIS will also evaluate the project's impacts on infrastructure.
7. In 1977, an amendment to the Oahu General Plan, voted on by the residents of the City and County of Honolulu, designated the Kuilima Hotel property to be reclassified as a Visitor Destination Area. Several years later, the Ko`olauloa Development Plan was adopted by the City as a means of implementing the General Plan. It depicted the Kuilima property as a resort. In 1986, the City Council approved an expansion plan for the resort that allows the development of five new hotels. It was decided at that time, that the development was needed to create new jobs in the region and to support the continuing health of the visitor industry.

   In 1999, the Ko`olualoa Development Plan was replaced with Ko`olau Loa Sustainable Communities Plan. The principal difference between the two plans is that the latter established an urban growth boundary that was intended to limit development and protect the rural character of the region. Because the Turtle Bay Resort property was reclassified to the Urban district about 14 earlier, it is fully contained within the Urban Growth Boundary.

   Together, these plans and policies are intended to ensure that the rural character of the North Shore is preserved for future generations.

8. It is not our place to judge the values of Mr. Tanoue. However, as the Planning Director for the City and County of Honolulu, he has served with honor and distinction.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

DEPARTMENT OF TRANSPORTATION SERVICES

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET, 3RD FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 768-8305 • Fax: (808) 768-4730 • Internet: www.honolulu.gov

PETER B. CARLISLE
MAYOR

WAYNE Y. YOSHIOKA
DIRECTOR

KAI NANI KRAUT, P.E.
DEPUTY DIRECTOR

TP8/11-430466R

September 19, 2011

Mr. Lee Sichter
Lee Sichter, LLC
45024 Malulani Street, No. 1
Kaneohe, Hawaii 96744

Dear Mr. Sichter:

Subject: Supplemental Environmental Impact Statement Preparation Notice (SEISPN) Turtle Bay Resort; Ko'olau Loa, Oahu, Hawaii; Tax Map Key (TMK): 5-6-003: por. 1, por. 3, por. 10, por. 26, 33, por. 35, por. 37, 38, 40-44; 5-7-001: 1, por. 13, 16, 17, 20, 22, 30, 31, 33; 5-7-003: 72; 5-7-006: 1, 2, 22, 23

This responds to your letter of August 19, 2011, requesting our comments concerning this proposed project.

Our Public Transit Division (PTD) has the following comments:

- Your Supplemental Environmental Impact Statement (SEIS) should include a description of current Public Transit services and operations, the impact of your project on Public Transit during construction and as a result of completion. Basic information is available on our websites: www.thebus.org and www.honolulu.gov/dts. For more details, you may contact our staff at 768-8370.

- Construction notes should include the following note regarding transit:

  "This project may affect bus routes, bus stops, and paratransit operations, therefore, the Contractor shall notify the Department of Transportation Services, Public Transit Division at 768-8396 and Oahu Transit Services, Inc. (bus operations: 848-4578 or 852-6016 and paratransit operations: 454-5041 or 454-5020) of the scope of work, location, proposed closure of

any street, traffic lane, sidewalk, or bus stop and duration of project at least two weeks prior to construction."

Your SEISPN notes the SEIS will address the project's impact on traffic for the surrounding local street networks. We reserve further comments pending submission of the SEIS traffic impact study.

Thank you for the opportunity to review this matter. Should you have any further questions, please contact Michael Murphy of my staff at 768-8359.

Very truly yours,

WAYNE Y. YOSHIOKA
Director

LEE SICHTER LLC
45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

Wayne Yoshioka, Director
Department of Transportation Services
City and County of Honolulu
650 South King Street, 3rd Floor
Honolulu, Hawai'i 96813

Dear Mr. Yoshioka:

I am writing in response to the letter you sent on September 19, 2011 concerning on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write. Following are our responses to your comments in the order they were presented in your letter.

1. The SEIS will include a description of public transit services and operations available to the resort and discussion of the project's impacts upon them.
2. The resort owners acknowledge that the project's construction notes should include the language you recommend.
3. We look forward to your comments on the SEIS.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012.

The official review and comment period will last 45 calendar days from the date that the OEQC publishes the Notice of Availability in its *Environmental Notice*. You can find the *Environmental Notice* on-line at the OEQC website:

http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Pacific Islands Regional Office
1601 Kapiolani Blvd., Suite 1110
Honolulu, Hawaii 96814-4700
(808) 944-2200 • Fax (808) 973-2941

Turtle Bay Resort, LLC
Atten: Mr. Drew Stotesbury
57-091 Kamehameha Hwy.
Kahuku, HI 96731

Dear Mr. Stotesbury,

This letter provides comments on the Supplemental Environmental Impact Statement Preparation Notice (SEISPN) for the proposed Turtle Bay Resort Expansion project on the island of O'ahu. The National Marine Fisheries Service (NMFS) Pacific Islands Region's Protected Resources Division is concerned about how the resort expansion may affect two marine species protected under the Endangered Species Act (ESA) that frequent the area in question: the threatened green sea turtle (*Chelonia mydas*), and the endangered Hawaiian monk seal (*Monachus schauinslandi*). In particular, we want to make you aware of recent significant events that have occurred in the area of the resort that were not addressed in the original Kuilima Resort Expansion EIS since it was prepared in 1985.

Hawaiian monk seals are known to frequent the area around the Turtle Bay Resort. There have also been several pupping events on Turtle Bay Resort's lands at the beach adjacent to Kahuku Point in recent years. These critically endangered animals are very sensitive to human disturbance and could be negatively affected by increased human presence in this relatively remote location. Mitigation measures to minimize human disturbance and interactions with monk seals should be discussed in detail in the SEIS.

Green sea turtles occur off shore of the action area and may occasionally bask on the beaches on the resort's property. It should also be noted that green sea turtle nesting has been documented in Kahuku and other areas near the Turtle Bay Resort's lands in recent years. Our agency recommends the developers contact the Pacific Islands Fisheries Science Center's Protected Species Division (808-983-5300) for information on exact nesting locations and incorporate appropriate mitigation measures in the SEIS.

One mitigation measure that may be necessary to reduce impacts to nesting sea turtles and hatchlings is to install wildlife-friendly lighting. There are many resources available to help developers install wildlife-friendly lighting that is also more effective in terms of safety and security, and in many cases more energy efficient. General rules to keep in mind for wildlife-friendly lighting are:

1. Mount lights as low as is practicable to minimize light trespass (trespass = light shining where you do not want or need it). Directing light using shields usually increases the amount of light in the area you are targeting, increasing its utility for safety and security purposes;

2. Use only the lumens output necessary for the particular application (most of the time, this can be minimal);

3. Keep lights shielded to direct light exactly where you want or need it to eliminate point source light (full cut-off shields whenever possible; bulbs should not be directly visible); and

4. Use long wavelength lights; many manufacturers offer "turtle friendly bulbs", "yellow bug bulbs", or amber LEDs for outdoor light fixtures that appear yellow, amber, or red to the human eye. This light is not only better for wildlife but it does less damage to humans' natural night adaptive vision, allowing for better eyesight at night for residents and visitors. Low pressure sodium lights are also a good option, especially for areas like parking lots (again, with full cut off shields). Many of these lights are also the most energy efficient options, reducing utility costs.

Please contact Kim Maison of my staff (kimberly.maison@noaa.gov, 808-944-2278) or Joy Browning of the US Fish and Wildlife Service (Joy_Browning@fws.gov, 808-792-9429) for more information or recommendations on potential mitigation methods for lighting.

Should you have any questions regarding the rest of these comments, please contact Jayne LeFors on my staff at (858) 546-5653 or at the e-mail address jayne.lefors@noaa.gov.

Sincerely,

Alecia Van Atta
Assistant Regional Administrator
for Protected Resources

cc: Lee Sichter LLC

LEE SICHTER LLC
45024 MALULANI STREET #1, KANEOHE, HAWAII 96744
PH. (808) 382-3836; FAX. (808) 234-0872; WEB. WWW.LEESICHTER.COM

October 26, 2012

Ms. Alecia Van Atta
Assistant Regional Administrator for Protected Resources
U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Pacific Islands Regional Office
1601 Kapiolani Blvd., Suite 1110
Honolulu, Hawai'i 96814-4700

Dear Ms. Van Atta:

I am writing in response to your letter commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. We sincerely appreciate your taking the time to write.

The owners of the Turtle Bay Resort share your concerns about the impacts that the proposed resort expansion may have upon the threatened green sea turtle (*Chelonia mydas*) and the endangered Hawaiian monk seal. A marine resources impact study has been prepared for inclusion in the Draft SEIS that is now nearing publication. The report documents the coastal monitoring that has occurred at the resort continuously since the early 1990s and specifically addresses the increasing presence of green sea turtles and Hawaiian monk seals. Resort management is fully aware of the pupping events that have occurred along the Turtle Bay Resort coastline and of the turtle nesting sites. However, for security purposes, maps of those locations will not be included in the Draft SEIS. The report also addresses specific impacts and presents measures to mitigate them, including your recommendations for wildlife-friendly lighting.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

The official review and comment period will last 45 calendar days from the date that the OEQC publishes the Notice of Availability in its *Environmental Notice*. You can find the *Environmental Notice* on-line at the OEQC website:

http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Gmail

(no subject)

andrea anixt <andreapeatmoss@yahoo.com>
Reply-To: andrea anixt <andreapeatmoss@yahoo.com>
To: "leesichter@gmail.com" <leesichter@gmail.com>

Wed, Oct 31, 2012 at 2:56 PM

SEIS comment redux

The Koolauloa Sustainable Communities Plan of June 2009 (27 members of the community worked on for many months) reflects my view that NO future expansion of visitor accomodations at Turtle Bay be built and that the area be designated a Special Planning Area. It is an urban development in an area designated rural in the State's Sustainability 2050 Plan, The Oahu General Plan, and the Koolauloa Sustainable Communities Plan.

Urban development belongs as planned in Leeward Oahu and the Ewa Plain. The existing hotel and Ola's Restaurant and LeiLei's are something I do patronize and have enjoyed, but enough is enough. In the context of the current era and looking to the future of Koolauloa many, many residents just do not want more large developments and feel that the infrastructure does not and will never exist off Kamehameha Highway for more even if we did want it.

1. Traffic. Of the nearly 500,000 visitors to Oahu annually, over half travel to the North Shore and around Koolauloa. Plus all local residents traffic and the frequent holo-holo of everyone else on Oahu. City planners don't seem to comprehend what ONE road in and out means for safety, emergency vehicles, when there are accidents and flooding closing THE one road, Kamehameha Highway.

2. Water supply for current and future needs. The Kahuku Hospital was denied h aving a kidney dialysis center due to lack of water not long ago. The Board of Water Supply has plans to use expensive desalinization processed water in Koolauloa and Waianae within @ 10 years, too expensive for the already high cost of living for seniors and fixed income people, and more than we should even consider having to pay for special interest developments.

3. The population was supposed to be @ 15500 by the year 2035 out here when Governor Ariyoshi's General Plan was promising people like me a rural area to live in in the 1970's. There are already 21,406 + according to the 2010 Census and BYU-Hawaii has added to that considerably already, and wants to build a town the size of Waimanalo (@5000) at Gunstock Ranch on AG land.

This is not a stand-alone development consideration for Turtle Bay or HRI, or BYU and add to that the Stryker Brigade and their 18 to 22 ton training vehicles above Turtle Bay polluting the whole area's land and water with things like asbestos and Depleted Uranium while using live-fire ammunition.

Why do you WANT to develop here? That info WILL get to you tourists and business will likely suffer.

4. The scenic beauty of Koolauloa will be irrevocably compromised by urban developments like these and that is for residents and tourists.

I was on an international airline' staff for 38 years in Hawaii and testified at the original hearings in the 70's that people want to see some semblance of "old Hawaii" on Oahu when then come here, not just Waikiki type development. The existing hotel is probably less than 80 percent full on average and you have @ 500 VRBO's in the area around Turtle Bay, Kahuku, Sunset, etc.plus Laie may get their new hotel... Marketing a destination like TB in a 'suburb' like surrounding??? Beauty is what you're selling. Don't lose it.

5. Iwi Kupuna, monk seals, real respect for the beautiful aina already controlled by Turtle Bay, and many other considerations are present. AG land is a big consideration. We need all that we can get on Oahu and not more visitor accomodations where Ag is viable. The plan to have access for fishing TB has seems inadequate and what about worker housing for a larger development? A lot of collateral damage comes with developers in Hawaii. Koolauloa is just the wrong place and that cannot be changed.

Andrea Anixt

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October 31, 2012

To Andrea Anixt @ andreapeatmoss@yahoo.com

I am writing in response to your email of Wednesday, October 31, 2012 commenting on the Turtle Bay Resort's Supplemental Environmental Impact Statement (SEIS) Preparation Notice. You have advised me that you previously sent your comments to Turtle Bay Resort, but neither they nor I have any record of receiving them. Mahalo for resending them now. Following are responses to your comments in the order they were presented in your email.

The Draft SEIS will address the relationship of the Proposed Action to the Ko`olau Loa Sustainable Communities Plan, the O`ahu General Plan, and the State's Sustainability 2050 Plan.

The Draft SEIS will address traffic congestion on Kamehameha Highway.

The Draft SEIS will address the availability of potable (drinkable) water for the existing resort and the proposed resort expansion.

The Draft SEIS will address the issue of population in the Ko`olau Loa district discuss how the Proposed Action will impact population growth in the future.

The Draft SEIS will address the visual impact of the Proposed Action. However, please be assured that the resort owners are committed to preserving the rural character of the resort.

The presence of *iwi kupuna*, Hawaiian monk seals, and green sea turtles will be discussed in the Draft SEIS and the Proposed Action's impact upon these valued cultural and natural resources will be addressed. The Proposed Action's relationship to agricultural productivity will also be addressed.

The Draft SEIS will address fishing impacts along the coastline.

The Draft SEIS will also address the provision of housing that is affordable to the community including the resort's workers.

Because you took the time to comment on the SEIS Preparation Notice, you are considered to be a Consulted Party. In accordance with the State Office of Environmental Quality Control's (OEQC) efforts to reduce paper consumption, we

will be publishing the Draft SEIS on-line. We now anticipate that the document will be available for public and agency review on November 23, 2012. On that day, you can view it at our website: www.turtlebayseis.com. However, if you wish to receive a copy, please call the Turtle Bay Resort office at 447-6953 and provide a name and an address where we can mail it to you on a compact disc. If you do not have access to a computer, we would be happy to mail you a hard copy of the four-volume document, but we respectfully encourage you to consider the paper-saving alternatives.

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http://hawaii.gov/health/environmental/oeqc/index.html

Mahalo for your participation in the environmental review process. We sincerely look forward to hearing your thoughts on the proposed project and our efforts to achieve a sustainable future.

Very truly yours

Lee Sichter

Draft Supplemental Environmental Impact Statement for

TURTLE BAY RESORT EXPANSION

Portions of Ahupuaʻa O ʻŌpana-Kawela, Ahupuaʻa O Hanakaʻoe, and Ahupuaʻa O Kahuku, Koʻolau Loa District, Island of Oʻahu

Volume Three of Four

PREPARED FOR TURTLE BAY RESORT, LLC by LEE SICHTER LLC • NOVEMBER 2012

APPENDIX A:

A CULTURAL APPROACH TO SUSTAINABILITY

A Cultural Approach to Sustainability

Prepared as a collaborative effort by
Turtle Bay Resort LLC, WCIT Architects, and Kuiwalu
October 2012

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A Cultural Approach to Sustainability

1. Introduction

I kekahi wā, he kaiaulu ʻeleu a paepae nā ahupuaʻa o Turtle Bay Resort. Ma ka ʻāina a i ke kai, ua lawaiʻa nā poʻe, e hāhāpaʻakai, e aulau i nā hala, e kanu paʻa i ko lākou ʻohana, a me e hoʻākoakoa me ko lākou ʻohana. ʻOiai loli ka ʻāina, ke noho loa nei ka ʻuhane aloha o kēia mau ʻāina. Makemake ʻo Turtle Bay Resort e hōʻihi i ka ʻuhane e hanohano ʻana i ka waiwai Hawaiʻi mai nā kūpuna mai. Aia kēia mau waiwai i ka ahupuaʻa paepae ʻo Tomorrow's Ahupuaʻa. Nānā i hope, nānā i mua.

At one time, the ahupua'a of Turtle Bay Resort were a vibrant and sustainable community. On the land and in the ocean, the people fished, gathered salt, harvested hala, buried their families, and gathered with their families. Although the land has changed, the aloha spirit of these lands remains. Turtle Bay Resort desires to respect that spirit by honoring the Hawaiian traditional values. These values are in the sustainable ahupuaʻa called Tomorrow's Ahupuaʻa. Looking forward, looking back.

Today, a growing interest in sustainability has heightened public awareness of the applicability of traditional Hawaiian land use and cultural practices to modern economic activities. This has led to the project team's exploration of the *ahupua`a* natural resources management system to provide a basis for the master planning process.

> *"In traditional Hawaiian life, an ahupua`a, or land division, was a complete ecological and economic production system that provided all the resources to sustain the community living within its boundaries. Ahupua`a boundaries were the natural geographic formations such as mountain ridges, gulches, and streams, and ahupua`a were typically wedge-shaped, extending from the top of the mountain into the outer edge of the ocean reef. Fish and marine resources were harvested from the ocean, kalo (taro) and `uala (sweet potato) were raised in the lowlands, and upland areas provided trees and other forest products.*
>
> *The ahupua`a concept is a holistic approach to land management that recognizes the connections between land-based and marine-based natural resources and the dependent relationships between ecological functions. Resources were managed for the collective good of all living within the ahupua`a, based on the principal that activities in one part of the ahupua`a affected all other parts. The ahupua`a concept is used as the organizing basis for land use planning and natural resource management in Ko`olau Loa."* (Ko`olau Loa Sustainable Communities Plan, Public Review Draft, October 2010)

The following sections outline the inspiration, foundations and practical approaches to implementing these guidelines past, present and into the future. This framework is a work in progress and will evolve overtime as the team consistently engages key stakeholders, obtains feedback and makes adjustments to create best practices around the evolving Tomorrow's Ahupua'a principles for the Turtle Bay Resort Community:

Nana I Mua, Nana I Hope
Looking Forward, Looking Back

The TBR properties include portions of seven ahupua`a (in order from west to east): `Opana, Kawela, Hanaka'oe, `O`io, `Ulupehupehu, Punala`u, and Kahuku. Exploring the history of these ahupua`a has renewed an understanding that the qualities inherent to them are still relevant today and can be translated to guide the decisions affecting the long-term responsible use and management of the land into the future. This new understanding has led to the formulation of a concept called *Tomorrow's Ahupua`a* that has become the guide for this planning process. *Tomorrow's Ahupua`a* strives to learn from the traditions, values, and aspirations of the host culture to develop a sustainable community platform that celebrates the balance of its environmental, socio-political, economic, and cultural resources. The project team looks to the wisdom of the past to provide sound guidelines to build a common sense approach to a new more balanced future.

The efforts that have been undertaken to produce the SEIS embrace the concept of *Tomorrow's Ahupua`a*. To begin with, the project team has discarded the assumption that everything to be known about the land has already been learned. The SEIS presents new studies of the property, including marine resource, flora, and fauna inventories; new social, economic, and cultural impact studies; and a Supplemental Archaeological Inventory Survey (SAIS).

Between 1977 and 2006, no less than 21 separate reports have been prepared documenting the archaeological resources at Turtle Bay. Nearly 30 years of work has culminated in an approval by the State Historic Preservation Division of the Department of Land and Natural Resources of an Archaeological Mitigation Plan in 2007. However, the Owner/Applicant voluntarily elected to prepare the SAIS, in part due to community concerns over potential *iwi kupuna* (human remains) in areas designated for new development but more importantly because it was the right thing to do. To that end, the SAIS was conducted to supplement the previous archaeological work. The land use plan presented in the SEIS is based upon a comprehensive subsurface investigation of the property to determine the presence of any cultural resources.

*Tomorrow's Ahupua`a* honors the important aspects of the traditional ahupua`a; understanding and maintaining lands from mauka to makai; recognizing and stewarding the unique elements and resources of each ahupua`a in order to strive for a path towards higher sustainability; and creating a management framework inspired by the traditional ahupua`a to care for the natural and cultural resources.

As a conceptual framework, *Tomorrow's Ahupua`a*, has led to the formulation of a revised master plan for the Turtle Bay Lands, called the Comprehensive Plan. The Comprehensive Plan is intended to guide design of the proposed expansion of the resort, its approach to sustainability and environmental stewardship, and the resort's future day-to-day operations.

In 2010 Hawai`i's Governor signed into law Act 181 amending Chapter 226, HRS (The Hawaii State Plan) to add a new definition for 'Sustainability' and provide new priority guidelines and principles to promote sustainability. Under state law,

> *"Sustainability means achieving the following:*
>
> - *Respect of the culture, character, beauty, and history of the State's island communities;*
> - *Striking a balance between economic, social, community, and environmental priorities; and*
> - *Meeting the needs of the present without compromising the ability of future generations to meet their own needs."*

The Comprehensive Plan incorporates this definition into its core principals.

2. Cultural Orientation

Full of resources and beautiful landscapes, Kahuku, O'ahu was the focus of many Hawaiian legends, poems, chants, and songs. The people of Kahuku proudly represented their homeland by wearing plated lau hala (Pandanus leaves) or lei made of hala fruit or seeds. People all over Hawaii immediately identified Kahuku natives by their hala garments. (Thrum 1976:100).

Nani i ka hala ka 'oiwi o Kahuku
The body of Kahuku is beautified by *hala* trees. (Pukui 1983:248).

According to Hawaiian legend, Hi`iaka, the beautiful younger sister of Pele, the temperamental volcano goddess, passed along the north coast of O'ahu on her journey around the Hawaiian Islands. Throughout her odyssey, Hi'iaka encountered many mythical creatures, some of which greeted her with good tidings while others greeted her with great malice. But when she encountered two such creatures Punaho'olapa (marsh) and Pahipahi'alua (ahupua'a west of the area project area) -

in Kahuku they "stole away into shelter of the hala groves without deigning to give [her] any salutation." (Emerson 1978:97) Upset over their disrespectful evasion, Hi'iaka proceeded to reprimand them in a poetic speech that employs the double-meaning of the word *hala*, which can also be defined as a sin or fault. (Emerson 1915:97-8 cited in Silva 1984: C-5).

Punaho'olapa Marsh is also mentioned in a story of a pet shark that killed the brother of his caretakers while defending the breadfruit trees surrounding his pond. Upon killing the man, the shark fled to Punaho'olapa and was never seen again. Man-eating sharks are also said to traverse the underground canals that run from Kahuku all the way to Waipahu in central O'ahu.

Another Hawaiian legend describes the land of Kahuku as an island independent from O'ahu. From the shore to the middle of Waiale'e it floated off the coast of O'ahu, being blown by the trade winds. Many different accounts are told about how the two islands were joined. One tells of the people securing it with fish hooks (McAllister 1933:155), while another tells a tale of two sibling chiefs who pulled the islands together by grasping hands. (Kamakau 1991:38-9).

And, within the portions of the seven ahupua`a that comprise the SEIS lands, 101 Land Commission Awards (LCA) were applied by native Hawaiian kuleana tenants of which 88 were awarded. Kahuku alone had 63 LCAs for small parcels of land to native tenants and in Kawela there were seven awards. The LCA records indicate that the predominant lands uses within these LCAs were for habitation and cultivation of wetland taro.

Kahuku's lands, waterways, and people were significant and important to be well represented in the Hawaiian culture. Clearly, the area's prominence and rich history are a great source of pride for the community.

3. Culturally Sensitive Community Engagement Process

3.1 Basis for Consultation

TBR recognized the necessity to re-engage the community and re-evaluate the project's existing Master Plan. More importantly, TBR saw an opportunity to engage the community in a genuine discussion on the development process.

It quickly became evident to the TBR project team that the legal challenge to the adequacy of the 1985 EIS was just a small part of the community's interest. The community felt disengaged from Turtle Bay's stretch of land. For many, the land contained valuable assets worthy of their consideration and input: Kawela Bay's pristine ocean resources that were once full of vibrant marine life; Kahuku Point, where native Hawaiian burials were known to be present; and Kuilima Hotel, where many families enjoy quick family get-aways. With such important community assets within the project area, the community was anxious to have their input heard.

The TBR project team acknowledged these interests and emotions, and recognized that a process of meaningful engagement and dialogue was necessary to re-establish trust and confidence that TBR would honor and respect this land. In 2010, TBR and its project team began a proactive community outreach, meeting with over 200 individuals and groups before the DSEIS Preparation Notice was released. A list of the individuals and groups consulted during the SEIS process is attached in Part Eight of this document.

A concerted community outreach program continues to engage the Hawaiian community, yielding valuable information regarding traditional and customary practices and potential sites of *iwi kūpuna* (human burial remains). The TBR project team appreciates that the protection and preservation of cultural resources is not only based upon past practices but present-day practices as well. The team understands that the efforts of contemporary practitioners represent a living culture.

In recognition of the rich *moʻolelo* and traditional land uses in the project area, great lengths were taken to contact and invite as many local *kūpuna* (elders) and cultural informants as possible. The individuals and groups consulted represented a wide range of backgrounds and interests on both traditional and customary practices as well as contemporary uses of the TBR SEIS lands. Concerted attempts were made to identify and locate all persons and groups that could make contributions to these discussions through their knowledge of the project area.

3.2 Hawaiian Cultural Consultation Principles

In order to build community involvement throughout the consultation process, the TBR project team (led by Turtle Bay Resort LLC Principals, long-tenured TBR staff, including Ralph Makaiau and Buddy Ako, WCIT Architecture, and Kuʻiwalu Consulting) attempted to establish meaningful relationships with community members, especially those that may be directly impacted by the proposed project. As with any relationship, shared commitments and values are central to its health and longevity. These principles, common in most cultures, are especially important in a Hawaiian context, and allowed for a solid foundation on which to build sustaining relationships with the community.

3.2.1 Purposeful or Mākia

There was an acknowledgement that the time and attention of the community is valuable and should be respected with thorough preparation. Accordingly, each consultation was mindful, with a specific purpose and objective, in order for it to be meaningful. The overarching purpose of each consultation was to listen, discuss, understand, and identify appropriate concerns regarding the Proposed Action and to develop shared strategies to address them.

3.2.2 Respectful or Hōʻihi

The project team understood the importance of a genuine dialogue with the community. To open this type of communication, it was important to ask for permission before acting and to be grateful for the opportunity to discuss important issues with community members and representatives. The act of requesting permission displayed an understanding of core Hawaiian values. It conveyed the respect with which the consultation process was performed and was in accordance with the spirit of the community engagement process. This approach was respected in turn by the community and made for a more open and genuine dialogue.

3.2.3 Humility or Haʻahaʻa

The project team recognized that the community consultation process must be performed with the intention of fostering long-term relationships with the community. It was, therefore, imperative to listen to each stakeholder with attention, respect, and compassion. By humbly seeking the contributions of the community, the project team was able to foster future consultations.

3.2.4 Trustful or Hilinaʻi

Trust is a fundamental component of any relationship. The project team committed to being truthful, open, and honest in the development of the SEIS. When this consultation principle breaks down, relationships with the community can be difficult to rebuild. The project team recognized the frustration by many in the community with the previous developers who the community felt was less than engaging. The project team understands that honesty is required to foster long-term relationships, even when the information may not be received favorably.

3.2.5 Thoughtful or Noʻonoʻo

The SEIS was developed and prepared in a thoughtful manner that reflects the spirit and interests of the most directly impacted community. However the project team is also very cognizant that there are others in the community who may feel that the Project is not in the best interest of the community. The consultation process played a meaningful role in the preparation of the SEIS, and community members understood that their input mattered. Notwithstanding that members of the community may have had differing opinions, it was critical and essential that the general interests of the community were taken into account.

3.2.6 Consistency or Pono

The project team understood that it was important to include the information gathered during the consultation process in the SEIS document. The project team provided consistent and accurate information to ensure transparency in the community engagement process.

3.2.7 Continuity or Ho'omau

The project team acknowledged that the community consultation process was part of the development of a long-term relationship between the community and the landowners. The continuation of this relationship will continue to be important to maintaining and sustaining the cultural and natural resources

3.2.8 Responsibility or Kuleana

The project team was committed. Once it took on the responsibility of engaging the community, it accepted the responsibility of continuing to engage them in the process, including the convening of a public meeting prior to publication of the DSEIS Preparation Notice. The project team will continue to keep the community informed of the SEIS process and the development of the Revised Master Plan.

3.2.9 Appreciation or Mahalo

The project team recognized that for many in the community, especially the Hawaiian community, participating in a very public process was uncomfortable. This was the case especially for many cultural practitioners and *kūpuna* (elders) that may prefer smaller, more intimate settings. Thus, the project team was very appreciative of those who took the time to talk story or attend the public meetings or smaller group forums. In both settings, the project team provided food and drinks to thank the public for their valuable time. The project team thought it important to demonstrate how grateful it was that community members take the time to speak candidly and share their *mana'o* (thoughts).

3.3 Consulted Parties and Stakeholders

There are a number of families and organizations who have an active cultural and, in some cases, genealogical relationship to the lands of the proposed project area. There are certain stakeholders whose views and perspectives were given careful consideration because of their cultural, legal, or community affiliation with the area. They include the following:

Kahuku Burial Committee, who represents families and individuals who have a cultural or lineal connection to these lands and have accepted the *kuleana* (responsibility) to *malama i na iwi kūpuna* (care for the ancestral remains);

Turtle Bay Employee Advisory Group, who represents the over 600 employees at Turtle Bay (e.g., housekeeping, grounds and maintenance, golf course staff, etc.);

**Ku`ilima North Shore Strategic Planning Committee,** who was established when Ku`ilima Hotel was initially built and was active in the development of the Unilateral Agreement;

Ko'olauloa North Shore Alliance; who is composed of various environmental and public interest organizations whose mission is to preserve the Country as it is;

Native Hawaiian Organizations and Community Organizations, including Office of Hawaiian Affairs; Oahu Island Burial Council; Hawaiian Civic Clubs from Ko'olau Loa, Ko'olau Poko, and Waialua; Mālama Ohana;, Kahuku Community Association; Ko'olau Loa Neighborhood Board; Queen Lili`uokalani's Children Center; Kahuku Farms; La'ie Kupuna Council; Hawai'i Reserves, Inc.; and Hi'ipaka LLC with Waimea Valley;

Environmental Organizations, including the Hawai`i Chapter of the Sierra Club;

Elected Officials, who serve the Kahuku community at the county and state levels;

Government agencies that have regulatory oversight of the resources on the lands to be developed at TBR, including the State Historic Preservation Division of the Department of Land and Natural Resources, the U. S. Army Corps of Engineers, the U.S. Fish & Wildlife Services, the State of Hawai`i Department of Transportation, and the City's Department of Planning and Permitting.

3.4 Consultation Process and Methods

The project team sought to re-establish a meaningful community relationship with the general public and particularly with the range of stakeholders involved with the lands at TBR. To achieve this, a culturally sensitive consultation process was undertaken, including small "talk story" sessions, informal one-on-one meetings, and presentations at larger public forums. A deliberate attempt was made by the project team to initiate a request with various stakeholders to listen to them in settings or forums in which they were most comfortable. The following is a brief description of the approaches used to reach out to the community and a discussion of some of the results of that engagement.

Individual and small talk story sessions. For many Hawaiians who previously dissociated themselves from community dialogues, requests were made to meet them in informal, one-on-one small talk story sessions. Similarly, elected officials and government agencies were given individualized briefings. For various Hawaiian families, cultural practitioners and resource gatherers, requests were made for small talk story sessions where the discussions could be confidential and respectful.

Public meetings. Members of the project team attended regular public meetings of the Ko'olauloa Neighborhood Board and Kahuku Community Association. Presentations were made to various organizations including the Ko'olauloa and Ko'olaupoko Hawaiian Civic Clubs to provide them a briefing of the Revised Master Plan and to get their *mana'o* (thoughts or wisdom) on cultural practices and issues or concerns they may have about the proposed project. The Association of Hawaiian Civic Clubs also held their annual convention at Turtle Bay on October 26, 2011 and

hosted a panel discussion regarding the proposed expansion that included Pi'ilani Smith, Creighton Mattoon, Dawn Chang, and Senator Clayton Hee that was moderated by Na'u Kamalii.

Public Meetings specifically in regards to Turtle Bay Resort Development. On May 11, 2011, representatives of TBR participated in a community forum called Talk Story 3 sponsored by the Defend O`ahu Coalition that was attended by over 100 people, including the Governor and other elected officials. Participants were told by TBR representatives that anyone who signed in and provided an email address would be notified when the SEISPN was available for review. An email list of attendees was subsequently sent to TBR by the Coalition and all of the parties on the list were sent an email in mid August 2011 notifying them of the opportunity to review the SEISPN at the TBR website.

On September 15, 2011, TBR hosted a public forum at the resort to discuss the SEIS Preparation Notice. Although this public meeting was not required by law, it was consistent with TBR's commitment to an open community engagement process. Over 100 people attended the event. Copies of the SEISPN were provided to anyone upon request. Comment forms were distributed and any that were filled out with a name and an email address have been included as a Consulted Party for the purpose of the SEIS.

Cultural Advisory Council (CAC). The TBR project team convened a CAC composed of Hawaiian cultural practitioners, educators, cultural experts, and individuals who could provide independent cultural guidance to TBR as it began to revise its Master Plan and prepare the SEIS.

Kahuku Burial Committee (KBC). Several years ago, a group of individuals who have lineal and cultural connections to these lands gathered to express their willingness to accept *kuleana* to *malama i na iwi kūpuna (responsibility to take care of ancestral bones)* that may be discovered on the project site. The KBC has met regularly and several members may seek formal recognition as lineal or cultural descendants by the O'ahu Island Burial Council for any *iwi kupuna* discovered on the project site. The KBC's *Kahu* (spiritual guide) have been Richard and Lynette Paglinawan, well-respected cultural practitioners.

Dedicated website to the SEIS. The TBR project team established the website www.turtlebayseis.com to keep the public informed of the progress of the Revised Master Plan and the SEIS. The website also provides an opportunity for the community to provide specific input on cultural practices and resources in the area.

Publication. The TBR project team voluntarily published a notice in the Honolulu Star-Advertiser on May 18, 2011 and July 1, 2 and 4, 2012, and in the Office of Hawaiian Affairs' *Ka Wai Ola* in the June 2011 and July 2012 editions informing the public of its intent to develop specific lands identified by tax map keys, also listing the names of the land commission awardees on the property, requesting any

information about cultural resources including potential burials. Several responses were received and the TBR project team followed up with the respondents.

Ethnographic Interviews. The archaeological consulting firm, Pacific Legacy, conducted 16 ethnographic interviews of individuals who had a personal association with the area that TBR proposes to develop. Their methodology and results are presented in the CIA prepared for the SEIS.

Commitment to Ongoing Consultation. The purpose of an effective community engagement process is to provide a fair and transparent process that provides accurate and current information to ensure informed decision-making. As referenced earlier, the term *kuleana* implies mutual responsibility. As part of TBR's commitment to ongoing consultation throughout the SEIS process, the project team kept stakeholders informed of various milestones related to the SEIS:

- January 2011 letters were mailed out to Native Hawaiian Organizations and community stakeholders informing them that TBR was preparing an SEIS and requesting an opportunity to meet with them individually or as an organization;
- August 2011 letters were mailed to the community stakeholders sending them copies of the SEISPN and inviting them to a public informational meeting on the SEISPN;
- February 2012 letters were mailed to community stakeholders on the results of the Supplemental Archaeological Inventory Survey (SAIS), including a question and answer fact sheet; and
- June 2012 letters were mailed to community stakeholders providing an update on the status of the SEIS and improvements to the hotel.

4. Hawaiian Traditions and the Natural Environment

The proposed expansion of the Turtle Bay Resort draws its inspiration from the host Hawaiian culture.

Hawaiian traditions include a spiritual and familial relationship with the natural environment and the resources that sustained life in these islands. Every aspect of nature was believed to be alive, and every form of nature was a *Kinolau* (body-form) of one of the numerous Hawaiian gods, deities, or other creative forces. The land, ocean, rain, and winds all were manifestations of the gods and they were revered for both their spiritual qualities as well as their physical ability to provide life-sustaining resources.

In a reciprocal relationship that is central to most aspects of traditional Hawaiian culture, man cared for nature (and its associated gods), and nature and the gods provided for man. Land (ʻĀina), in particular, was revered as if a nurturing elder sibling because of its ability to sustain life. Land's supremacy over man is affirmed in the traditional Hawaiian saying:

He ali'i ka 'aina, He kauwa ke kanaka
The land is a chief, Man is a servant

'Āina encompasses the proper management of the 'āina, kai (ocean), and wai (fresh water) resources. In Hawaiian tradition and story the 'Āina is the elder sibling – and its kuleana (responsibility/obligation) is the feed and nurture its younger sibling, kānaka. Kānaka, focuses on sustainability in economics, social-political, as well as overall health and wellness. The primary kuleana of kānaka is to protect and take care of the elder sibling, the 'āina. In maintaining this relationship *Tomorrow's Ahupua'a* will be a viable anchor in the Ko'olau Loa community for generations to come.

4.1 Traditional Land Tenure in Hawai`i

Hawaii is the most isolated landmass on Earth. Over 2,200 miles from the nearest populated area, Hawai'i is a remote outpost in the middle of the world's largest ocean. Approximately 2000 years ago, voyagers from central Pacific islands arrived on these shores. Archaeological evidence suggests that the descendants of these original settlers navigated back and forth between Hawai'i and their home islands until about 500 years ago. At about the same time, the great chief Umi-a-Liloa divided the largest of the Hawaiian Islands into the four political regions that remain today as the four counties of the State of Hawai'i: Kaua'i, O'ahu, Maui, and Hawai'i. These four *mokupuni* (islands) were further divided into *moku* (districts) and subdivided into *ahupua'a*.

Each land division was governed by an *ali'i* (chief) of a particular rank. Islands were governed by *ali'i nui* (high chief); *moku* were governed by *ali'i 'ai moku* (lower chief); and *ahupua'a* were governed by *ali'i 'ai ahupua'a*. Land in ancient Hawai'i was controlled by these chiefs who held them in trust for all of the people, a central principle of early (pre-1846) land tenure in Hawai'i was the *kuleana* (privilege and responsibility) of these chiefs to care for and employ the resources of the land in a *pono* (balanced) manner.

4.2 Elements of the Ahupua`a

Of the three major land divisions, the *ahupua'a* was particularly important because it represented the scale at which land and its natural resources were most efficiently employed in order to sustain a pre-Western contact population of up to a million people.

The term, *ahupua'a*, was derived from the words *ahu* (alter) and *pua'a* (pig). A stone alter was erected and topped by a carved image of a pig's head. These *ahu* served as a gathering area for the collection of tribute as well as a boundary marker between neighboring ahupua'a. They were often placed at the intersection of the *ahupua'a* boundary and the walking path that ran around most islands.

Ahupua'a contained nearly all the resources Hawaiians needed to survive. Through a system of *kapu* (prohibitions) and *kanawai* (laws), the *ahupua'a* was managed by the *konohiki* (agent of the *ali'i 'aiahupua`a*) who was responsible for the day-to-day operations of the district and combining its natural and human resources in a manner that best served the land, the people it fed, and the chief who governed it.

Although *ahupua'a* varied in size between hundreds and thousands of acres, in most instances they were complete lands sections defined by valleys with boundaries extending from the mountains out into the ocean. Their regions included *mauka* (upland), *kula* (plains), and *makai* (ocean) areas. Fresh water, animal and fish protein, wild and cultivated food and fiber crops, as well as building and tool materials were available in most *ahupua'a* making them largely self-sustaining. Use of these resources was the exclusive privilege of those residing within the *ahupua'a*, although trade between *ahupua'a* was common enough that regular markets were established in some areas.

4.3 Orientations of the Ahupua`a

The elements discussed above focus on the natural features and political structure that together created the basis for the efficient allocation and redistribution of resources within and across the land division. By contrast, the orientations inherent in an *ahupua`a* are the characteristic ways in which the *ahupua`a* reached this efficiency. The *ahupua`a* included environmental, social, political, economic, and cultural orientations; all of which had to function with internal efficiency and be in balance with one another. Weaving through each of these orientations, and across them as well, is the reciprocal relationship that should be maintained among people and between people and the *`aina*.

4.3.1 Environmental

Ancient Hawaiians lived close to the land and were intimately familiar with its rhythm and cycles. Great care was given to ensure that actions undertaken in one section of the *ahupua'*a did not adversely affect the resources in another. The connection between mountain and ocean resources was well-known and the *ahupua'a* was managed as an entire ecosystem. The environmental orientation to the *ahupua'a* provided for the balanced stewardship of its natural resources, and ensured that those resources were managed at a sustainable level consistent with social, political, economic, and cultural norms.

4.3.2 Social

The social orientation of the *ahupua'a* established the human framework necessary to support the community. As was previously noted, reciprocal relationships were fundamental to the organization of the *ahupua'a*. Some relationships were governed by prohibitions and laws, while others through social orientations between people, nature, and the gods. Reciprocal responsible behavior of chiefs and commoners

with respect for the resources of the *ahupua'a* provided for a social balance with the natural environment.

4.3.3 Economic

The *ahupua'a* served as the basis for the ancient Hawaiian economy in the same way that business enterprises function today in the global economy. The resources of the *ahupua'a* were expected to provide for the basic needs of the people it fed, and provide a surplus sufficient to pay a tribute or tax to its governing chief. As was previously noted, goods produced in one *ahupua'a* were exchanged for goods from a neighboring region to their mutual benefit and improved overall welfare. This economic orientation provided for the efficient production, distribution, consumption, and exchange of *ahupua'a* resources and services at a sustainable level, and in a manner preserving the necessary reciprocal relationships.

4.3.4 Cultural

Ahupua'a varied in size and their relative endowment of natural resources. This varied geography resulted in cultural orientations of the *ahupua'a* that were place-based and characterized by unique traditions, practices, and *mo`olelo* (stories). The cultural attributes informed the way in which the natural and human resources of an ahupua'a were employed.

5. Tomorrow's Ahupua`a

The owners and stewards of the Turtle Bay Resort believe the elements and orientations of the traditional *ahupua'a* can be employed as a guide to contemporary land use and development. *Tomorrow's Ahupua'a* is a concept developed by the project team that incorporates many of these attributes along with modern best practices to serve as a framework for the implementation of the Turtle Bay Resort Comprehensive Master Planning process and operating principles.

Tomorrow's Ahupua'a honors the important aspects of the traditional *ahupua'a* in order to create a design and management strategy that cares for the land, natural resources, people, and culture of the traditional *ahupua'a* that comprise the project area.

The Turtle Bay Resort Comprehensive Master Plan encompasses eight *ahupua'a* that, over time, have been consolidated into three larger ahupua'a. The SEIS Lands include the *makai* and *kula* lands of the 'Ōpana-Kawela and Hanaka'oe *ahupua'a*, and a portion of the *makai* lands of the Kahuku *ahupua'a*.

5.1 Ahupua`a O ` Ōpana-Kawela

The portion of the SEIS Lands contained within Ahupua`a O ` Ōpana-Kawela consists of approximately 63 acres situated *makai* of Kamehameha Highway, extending from the eastern end of Honokawela Drive east to the resort's West Main Drain, a

distance of approximately 4,700 feet or roughly nine tenths of a mile as measured along the coastline. At the resort's western boundary, the property extends inland from the shoreline approximately 200 feet to Kamehameha Highway. At the eastern boundary of the *ahupua`*a, the property extends approximately 1,125 feet from the shoreline to Kamehameha Highway.

The property generally fronts the eastern half of Kawela Bay and the western third of Turtle Bay. The headlands known as Kawela Point constitute the extreme eastern point of Kawela Bay and are situated about midway along the lateral extent of the `Opana-Kawela shoreline.

Kawela Bay is a roughly symmetrical horseshoe-shaped bay with a wide sandy beach. The eastern half of the *ahupua`a* shoreline consists of calcareous sediments chemically bound together into shelves of what is commonly referred to as beach rock. Portions of the beach rock are covered with sand while other areas are exposed. Kawela Bay is somewhat unique among the three bays that front the SEIS Lands in that the embayment is formed through a break in the beach rock shoreline. Both headlands that jut out into the ocean on the west and east sides of the bay are faced with beach rock shorelines. But the sand beach between the headlands is deep and not perched upon a hard substructure as are the other beaches along the property shoreline.

5.1.1 Historic Setting

According to Pukui, *Opana*, which is perhaps related to *`opa* translates as "the squeeze". *Kawela* is translated as "the heat" which is also the name used to describe the coastal portions of the land bordering Kawela to the west. The shoreline at Kawela was referred to as *Wakiu* meaning "northwest wind sound" (Clark 1977: 132). A fishpond of the same name was reportedly once located inland from this beach.

Kahuku and Kawela were designated as Crown Lands of King Kamehameha III during the Great *Mahele* of 1846 that reorganized land tenure throughout the Hawaiian Islands. Of the thirty five land commission awards (LCA) resulting from the *Mahele* that are located within the boundaries of the SEIS Lands, eleven are located in Kawela. House lots are mentioned in twenty-four of the thirty-five claims. There are thirty-six *lo`i* (pond-fields) described in the claims with three claims specifically mentioning *kalo* (taro). Testimonies refer to cultivated bananas, sweet potatoes, *wauke*, sugar cane, bitter melon, *noni*, and orange tree. Other named plants are *Pandanus* trees or *hala* groves and *koa* trees cultivated for canoes. One claim mentions a *puna pa`akai* or brackish spring and on mentions a fishery.

Specific pre-historic settlement patterns at ` Ōpana-Kawela are unknown, but *`olelo* cited in the Cultural Impact Assessment suggest the Kewela Bay supported a resident population. Land Court Awards granted in the mid-1800s provide greater insight. As presented in the CIA, eight Land Court Awards (LCA) were awarded

within the SEIS Lands contained within ` Ōpana-Kawela and another seven were granted in the same region, but on properties outside of the SEIS Lands. (Pacific Legacy 2012: Table 1)

In the early 1850s, 8,000 acres at Kahuku, including Kawela and the remainder of the SEIS Lands, were purchased from Kamehameha III and converted to a sheep and cattle ranch that was named Kahuku Ranch. The ranching venture had immediate adverse impacts on the landscape.

As discussed earlier, in 1889 Benjamin Franklin Dillingham chartered the O`ahu Railroad and Land Company (OR&L) and leased the Kahuku lands for the cultivation of sugarcane. By 1899, the railroad line extended from Honolulu around the west side of O`ahu to Kahuku. A 1906 train schedule indicates the train ran from the Waimea Station to Kahuku in 24 minutes with no stops. A 1930 USGS map depicts the railroad extending through the TBR property with stations at Kawela and Kahuku Ranch. A 1932 USGS map shows sugarcane fields extending to the coast and a line of houses fronting Kawela Bay. A 1954 map depicts a series of houses or beach cottages present along the side of Kawela Bay.

Subsequent to the rezoning of the property in 1986 for the then proposed resort expansion, the cottages along the eastern half of Kawela Bay were demolished to make way for the construction of a hotel. Much of the property was grubbed and graded, structural fill material was imported to the site, and several dozen concrete pilings were driven into the earth for the proposed hotel's foundation. Underground utilities were also installed. By the early 1990's, the Japanese economic crisis left the resort's, then Japanese owner to abandon hotel construction at Kawela Bay.

5.1.2 Existing Conditions

The SEIS Lands within the *ahupua`a* of ` Ōpana-Kawela are vacant and generally overgrown with scrub vegetation. The remnant concrete pilings remain in place; some erect and some toppled by erosion.

There is no resident population within the SEIS Lands of the ` Ōpana-Kawela *ahupua`a*.

5.2 Ahupua`a O Hanaka`oe

Approximately 271 acres of the SEIS Lands are contained with Ahupua`a O Hanaka`oe. Within the SEIS Lands, the boundary of Hanaka`oe extends east from the West Main Drain to the East Main Drain which enters the ocean at the approximate mid-point of Kuilima Bay.

Within the SEIS Lands, Hanaka`oe includes the approximate eastern two thirds of Turtle Bay, all of Kuilima Point, and the western half of Kahuku Bay. The length of

the coastline fronting the *ahupua`a* is approximately 1.36 miles or just over 7,000 feet.

At its eastern boundary along the East Main Drain, the property extends inland approximately 0.46 miles from the shoreline to Kamehameha Highway, or about 2,453 feet.

5.2.1 Historic Setting

No *`olelo* pertaining specifically to this *ahupua`a* have been identified. However, given its location between Kawela and Kahuku, it is likely that it supported a resident population. As discussed in Section G1a above, the large scale changes to the land resulting from the establishment of a cattle ranch, and later a sugar plantation, transformed the land, and in so doing, erased any surface features that might have informed us of the area's history.

As presented in the Cultural Impact Assessment prepared for the SEIS, four Land Court Awards (LCA) were awarded within the SEIS Lands contained within the Hanaka`oe ahupua`a and another three were granted in the same region, but on properties outside of the SEIS Lands. (Pacific Legacy 2012: Table 1), suggesting an active community engaged in plant cultivation and fishing.

5.2.2 Existing Conditions

Ahupua`a O Hanaka`oe contains the activity center of the resort and includes 500 resort units and 368 residential condominium units (366 are privately owned and 2 are operated as manager's units). The resort units consist of three components: the existing seven-story Turtle Bay Hotel containing 401 resort units; 57 Ocean Villa resort condominium units abutting the hotel on its east side are; and 42 Beach Cottages abutting the hotel to the west. Average daily occupancy of the 500 resort units averages approximately 80%. The residential condominium units comprise two adjacent developments south of the hotel's parking lot; Kuilima Estates East and Kuilima Estates West. The average daily resident population of Kuilima Estates is estimated to be about 223 persons.

5.3 Ahupua`a O Kahuku

Approximately 506 acres of the SEIS Lands are contained within Ahupua`a O Kahuku. The *ahupua`a* extends east from the approximate alignment of the East Main Drain to the eastern boundary of the Turtle Bay Resort, as delineated by Marconi Road. The shoreline of Ahupua`a O Kahuku extends approximately 8,230 feet and includes the eastern half of Kuilima Bay, all of Kahuku Point and about 3,000 feet of shoreline east of the point.

The eastern boundary of the *ahupua`a* extends inland approximately 6,280 feet, or about 1.18 miles, from the shoreline to Kamehameha Highway

5.3.1 Historic Setting

Of the three *ahupua`a*, Kahuku is most frequently identified in *`olelo* and legend. The name Kahuku appears to be used not only as the name of an *ahupuaʻa* and village, but as a district or place name for the area roughly between ʻŌʻio and Keana Ahupuaʻa. Of the seven *ahupuaʻa* represented in the project area, Kahuku has the most extensive traditional and mythological background.

According to Pukui et al. (1974:67) Kahuku literally translates as "the projection" and is the name of a village, land division, northernmost point, golf course, ranch, schools, forest reserve, as well as surfing beach on Oʻahu. Several other landmarks within the *ahupuaʻa* have traditional names, such as Punamanō, the spring-fed wetland which translates as "shark spring" John Clark (2003:310). Hanakaʻīlio ("work [of] the dog") is a sandy beach located between Kalaeokaunaʻoa and Kalaeuila Points (2003:92). Kalakala ("rough" or "craggy") is the name of the two semi-submerged linear outcrops of limestone that roughly parallel Kahuku Point to the east (Ibid:149).

Traditional accounts of natural resources and environmental conditions are relatively abundant for the *ahupuaʻa* of Kahuku. Traditional land use in Kahuku is also made apparent through legend. The landscape of Kahuku appears to have had several configurations, from the pre-European contact era to the present. During Hawaiian settlement prior to the arrival of Europeans, many parts of the landscape were used for traditional agriculture, habitation, and ceremony, varying from intense to moderate. In the initial Contact period, a good portion of the land lay fallow due to severe population decline and was overgrown in some areas with exotic plant species.

As discussed earlier, the subsequent creation of Kahuku Ranch, followed by cultivation of the land in sugar cane as part of Kahuku Plantation permanently altered its physical characteristics and use.

5.3.2 Existing Conditions

There are no persons residing with the portion of the SEIS Lands contained within the Kahuku ahupua`a, however the MacKenzie kuleana land is situated within the ahupua`a.

6. Implementing Tomorrow's Ahupua`a

Hānau ka ʻāina, hānau ke aliʻi, hānau ke kānaka.
Born was the land, born were the chiefs, born was the people.

Tomorrow's Ahupuaʻa honors and strives to incorporate the fundamental aspects of the traditional Hawaiian ahupuaʻa in order to create a foundation for a comprehensive contemporary management strategy to develop a sustainable

community within the Turtle Bay Resort. *Tomorrow's Ahupuaʻa* celebrates and focuses, with a cultural lens, on the proper balance of environmental, social-political and economic resources and incorporates modern innovative best practices to ensure a more sustainable future. *Tomorrow's Ahupuaʻa* is a cultural methodology derived from the traditional ahupuaʻa land management system of Native Hawaiians. Its fundamental notion is that sustainability manifests itself through the balance and relationship of ʻāina (land), kai (ocean), and kānaka (man).

ʻĀina encompasses the proper management of the ʻāina, kai (ocean), and wai (fresh water) resources. Moʻolelo tell us that ʻĀina is the elder sibling – and its kuleana (responsibility/obligation) is to feed and nurture its younger sibling, kānaka. Kānaka, focuses on sustainability of economy, politics, culture, and health and wellness. The primary kuleana of kānaka is to protect and take care of the elder sibling, the ʻāina. In return for this care, ʻāina provides sustenance for the kānaka. In maintaining this relationship, *Tomorrow's Ahupuaʻa* will be a viable anchor in the Koʻolau Loa and North Shore community for generations to come.

Pursuant to Act 181 (2011), the Hawai`i State Plan (Chapter 226, Hawaii Revised Statutes, as amended) has been amended to include the following definition of sustainability:

> "Sustainability means achieving the following
>
> 1. Respect of the culture, character, beauty, and history of the State's island communities;
> 2. Striking a balance between economic, social, community, and environmental priorities; and
> 3. Meeting the needs of the present without compromising the ability of future generations to meet their own needs."

Tomorrow's Ahupua`a has been developed to comply with this definition. It is grounded in not only addressing the values of the Hawaiian culture but in implementing them through an extensive program of action. By proposing a significant reduction in density over that which is allowable under existing land use and zoning ordinances, the Proposed Action is intended to achieve the balance envisioned by the State's definition of sustainability. And of equal importance, *Tomorrow's Ahupua`a*, as envisioned in the Proposed Action, is intended to address the current economic needs of the KNS region in a manner that is attentive to the needs of future generations.

6.1 Environmental Objective

Tomorrow's Ahupua`a includes an environmental objective to "Manage design, development, construction, and operations sustainably in a manner that embodies the spirit of long-established traditional ahupuaʻa system of planning and proactive resource management". The guidelines of this system emphasize the overall moku

(land district) and how each individual ahupuaʻa within the project area has a symbiotic relationship between its natural resources and built environment. The proper balance of this relationship ensures economic and social/political sustainability and supports strong health and welfare of its residents, guest and visitors.

Moreover, the intent of this objective and its accompanying guidelines is to respond to Hawaiʻi's complex growth challenges by promoting sustainable practices, high performance energy efficient buildings, economically viable and environmentally mindful development, and by encouraging best practices in new development today.

With the intent of providing a measurable basis for assessment, many of these standards are modeled after and based on highly respected and established programs like the US Green Building Council's LEED (Leadership in Energy and Environmental Design) Green Building Rating System and other similar industry standard best practice rating and measurements systems.

Recognizing that any responsible and reasonable growth of the Koʻolau Loa and North Shore communities will come with some impact to the environment, these guidelines set forth standards designed to proactively minimize the potential environmental impacts of development and looks to establish the foundation of Turtle Bay Resort's approach to defining a reasonable, responsible and balanced path to a more sustainable future.

6.2 Social-Political Objectives

To encourage and sustain the well being of the community, the resort must offer a meaningful contribution to the quality of life of its people. For the purposes of the SEIS, quality of life is defined by the balance of kānaka economic obligations, social interactions, and recreational opportunities. The objective to "Provide enhanced access to the shoreline for residents, visitors and locals from nearby communities by the provision of additional parks, shoreline access points and a shoreline trail interconnecting them", establishes a practical means for achieving this goal. Within Koʻolau Loa and the North Shore, the coastline is critical to the community's recreational and social needs. Providing unencumbered and easy access to a well maintained, safe and clean coastline is integral to both ʻāina and kanaka.

The objective to "Assist with local housing needs by providing additional housing units affordable to members of the local community beyond what is presently required", contributes to all three aspects of the sustainable formula; economic, social and cultural. By providing new affordable housing opportunities, above and beyond statutory obligations, the Proposed Action is fulfilling its obligation to ensuring the social well-being of the greater community. The provision of this new community housing in close proximity to one of the region's employment centers, as well as to new recreational opportunities, is intended to promote social health and wellness.

6.3 Economic Objectives

While many of the Proposed Action's objectives are interrelated, three of them focus on the project's economic relationship to the moku and to the long-term sustainability of the ahupuaʻa. The economic objective to "Create a healthy balance of economic, social and cultural vitality while maintaining the rural character of the resort's coastal area by focusing critical development mass within the ahupuaʻa of Hanakaʻoe around the existing hotel", is grounded in the principals of sustainability. Preservation of the resort's rural character is critical to its economic vitality and to the health of the ʻāina. Its rural sense of place is what distinguishes Turtle Bay Resort from its competitors in the visitor industry. And yet, a visitor destination area must include a full range of services and amenities to address the needs of its guests and residents.

To achieve this balance, the Proposed Action concentrates the resort amenities in the central area around the existing hotel and distributes the much lower density land uses throughout the remainder of the property. In this way, the region's rural character is preserved and nurtured. The vital economic core of the resort can function as an activity center without compromising the unique rural character of the resort's setting.

The objective to "Ensure the long-term preservation of the Agricultural Lands through the implementation of a conservation easement on the Agricultural Lands", is intended to strengthen the relationship between the resort and its valued agricultural properties. In a sustainable model, agricultural productivity becomes a crucial component of economic vitality. By nurturing agricultural production on its property, the resort extends economic benefits to its farmers and to the larger local community within which they live, work and play.

The objective to "Integrate the resort into the fabric and daily activities of the local community" emphasizes the fundamental principle that economic activity is derived from the individual endeavors of kānaka. To function as a valuable component of the ahupuaʻa as well as the larger moku, the resort must become closely aligned with its surrounding host communities, from which it derives its unique character. To achieve this, the resort must strive to become not only an employment destination, but also a social and recreational destination for its employees, their families, and their friends.

The objective to "Operate the resort as a place that will be equally welcoming to locals from neighboring communities as to visitors from afar", not only articulates this philosophy, but actualizes it. To be economically sustainable, the resort must be engaged in the community.

7. ʻĀina and Kānaka Guidelines

Managing Hawaiʻi's contextual island ecosystem(s) and their valuable finite natural resources is one of the primary purposes of *Tomorrow's Ahupuaʻa*. This system emphasizes the overall moku (land district) and how each individual ahupuaʻa within the project area has a symbiotic relationship between its natural resources and built environment. The proper balance of this relationship ensures economic and social/political sustainability and supports strong health and welfare of its residents, guest and visitors..

The following guidelines are intended to allow the traditional relationship between ʻāina and kānaka to flourish. ***ʻĀina Guidelines*** focus on land stewardship, master planning & design, and environmental infrastructure and green buildings. ***Kānaka Guidelines*** focus on community engagement. Collectively these guidelines provide a comprehensive management plan for the conservation and preservation of the cultural and natural resource of *Tomorrow's Ahupuaʻa*.

It is intended that the guidelines be applied to each of the development sites that together constitute the Proposed Action, e.g. sites H-1, H-1, RR-1 etc. Because of the phasing of development over an eleven-year period and the differing types of projects proposed, individual sites may be constructed by different developers. For these reasons, to achieve the vision of *Tomorrow's Ahupua`a,* it is important that uniform guidelines are applied to all development sites.

7.1 ʻĀina Guidelines

7.1.1 Land Stewardship

Uwē ka lani, ola ka honua.
When the heavens weep, the earth lives.
When it rains, the earth revives.

In the traditional ahupuaʻa, land stewardship is a key component. A core component of this land stewardship was an appropriate balance of the relationship between kānaka and ʻāina. The traditional ahupua`a principles of a self-sustaining ecosystem was dramatically altered through the changing uses of the land in the Koʻolau Loa moku, i.e. ranching and plantation. The goal of *Tomorrow's Ahupuaʻa* is to embrace traditional land management principles, employing a model that engages stewardship protocols and promotes the application of environmental guidelines that help to restore the balance between ʻāina and kānaka.

Nānā i hope
Looking Back

Mohala i ka wai ka maka o ka pua.
Unfolded by the water are the faces of the flowers.
Flowers thrive where there is water, as thriving people are found where living conditions are good.

In Hawaiʻi's island-ecosystem, wai is the key element of the ahupuaʻa. The ʻōlelo noʻeau above captures the common understanding that where there was wai, there were thriving Hawaiian communities. Wai is utilized in several core terms in the Hawaiian language. For example, the word for wealth is waiwai. An ahupuaʻa rich in wai is a wealthy ahupuaʻa. Kānāwai (laws) were also framed around wai management. Wai flowed from the ridges of the ahupuaʻa to the ocean, and could not be owned by any individual. Instead, wai was managed as a valuable natural resource for the entire community.

One of the important functions of wai was to feed the loʻi. Loʻi are irrigated terraces used to cultivate crops, such as kalo, the staple of the Hawaiian diet. Loʻi kalo (taro terraces) were strategically placed near the kahawai (streams) within the ahupuaʻa. This provided the taro patch with easy access to stream water that could irrigate its terraces. ʻAuwai (irrigation systems for the loʻi) were engineered to direct the flow of water from the uppermost terrace to the lower terraces and eventually back into the stream. As the stream water flowed in and out of each and every terrace, it collected nutrients that fed back into the natural habitat of the stream, which produced abundant resources. Although kānaka diverted water, the water was returned to the stream in its full capacity and richer. This was extremely important as it ensured that every kānaka who used the water from the top of the ahupuaʻa to the bottom had access to the stream resources in its full capacity. Wai management in the traditional ahupuaʻa is an excellent example of traditional land stewardship.

Nānā i mua
Looking Forward

He huewai ola ke kanaka na Kāne.
Water is life and Kāne is the keeper of water.

Tomorrow's Ahupuaʻa seeks to reestablish sustainable land stewardship and to reconstruct a modern balance of ʻāina and kānaka. In order to engage land stewardship in the project area, an intimate understanding of the ʻāina is required. Comprehensive planning and analysis has been and will continue to be completed to understand how to maintain, manage, and conserve the ahupuaʻa ʻs natural resources. This includes protective measures for management of native habitats and water resources. Land stewardship guidelines further address stewardship concerns such as iwi kūpuna (burials), agricultural conservation, and erosion control. The goal of the land stewardship guidelines is to proactively enhance and preserve specific natural and cultural assets as well as existing threats. The guidelines strive to ensure that kānaka practices are designed to protect, preserve, and steward the ʻāina, therefore creating a modern day system of balance.

Meaning a healthy balance considering all of the environmental, social-political and economic realities of the project in today's world.

Conducting site research and analysis will help build upon a comprehensive understanding of the site and its surroundings, and ensure that the built environment is responsive and respectful of its past, current and future place within the project and in the greater Koʻolau Loa community.

7.1.1.1 Guidelines

Prepare a Site Analysis narrative describing the essence of the project and how the project responds to the unique history, culture, and characteristics of the project site. This analysis should include regarding the following:

- Cultural Environment - Describe archeological sites & significant events that occurred on or near the site.

- Natural Environment - Include a resource habitat and native vegetation inventory describing existing conditions of the development site, vegetative cover and habitat. At a minimum, this inventory must include the following:
    - Identification of endangered species habitat.
    - Identification of heritage and champion trees.
    - Describe all wildlife, topography, water, view corridors, and other landscape features.
    - Selected removal of invasive species

- Built Environment - Describe any existing structures, utilities, transportation services, and other infrastructures.
  Explain how site features in all three categories shaped the final development.

7.1.1.2 Strategies

The specified guidelines require the team to conduct a thorough inventory and analysis of the environmental assets and cultural/historic attributes of the site, which will ultimately define the parameters for its future development. Identifying opportunities to understand the land, sustainable uses, and conservation strategies will help the team write a statement that defines the "Site Inventory."

These inventories or analysis are typically accomplished through voluntary development planning exercises/studies by a Developer hiring an expert team of specialists, or government mandated analysis such as an Environmental Impact Statement (EIS) or Environmental Assessment (EA).

Typically with an existing development site, area information is available through the federal government, the State of Hawaiʻi, and other agencies or non-profit

organizations that may have already collected general information for their own planning purposes. Development may begin by contacting the local planning office, state historic preservation office, state geographic information department, and state wildlife management agency. Private groups may also be able to assist with data assembly. Data may exist in many formats; the use of geographic information systems may facilitate organization and utilization of information. Greater care must be given in the inventory for areas that may be impacted by development.

7.1.1.3 Implementation: Master Developer Progress-to-Date

TBR has completed or is working on the following:

- Completed a comprehensive Site Analysis and developed the Proposed Action for the project area working with a number of qualified, well respected team of consultants and experts.

- In the process of completing the Supplemental Environmental Impact Statement (SEIS) that updates all related site technical reports providing key information to complete and maintain a thorough Site Analysis evaluation and refined land plan. Key updated reports are provided in appendix of the SEIS.

7.1.2 Iwi Kupuna

The purpose is to preserve and protect *iwi kūpuna* (human remains) by avoiding adverse impacts to *nā iwi kūpuna* and, where avoidance is not possible, to mitigate impacts through respectful and culturally appropriate protocols and treatment.

7.1.2.1 Guidelines

For Hawaiians, *nā iwi* (bones) are the essential physical material of a person with *ʻuhane* (spirit) providing a person's psyche. The manifestation of immortality, however, was in *nā iwi* because only *nā iwi* survived and remained as the lasting embodiment of an individual. As a result, *nā iwi* symbolized the link between *kūpuna* (ancestors) and the eventual mortality of living Hawaiians. By placing *nā iwi* in the ground to eventually become part of *haumea* (earth), Hawaiians ensured a place for the bones forever. Furthermore, *nā iwi* were a source of *mana* (spiritual power) of the deceased to that ground, in that *ahupuaʻa*, and to the entire island. The entire area becomes sacred with *mana* because of the location of *iwi kūpuna*.

At the request of the TBR owners, the following documents have been completed:

- A Supplemental Archaeological Inventory Survey (SAIS) to ensure the protection of cultural resources, including *iwi kūpuna* by describing the current TBR facility and the environment of the area, presenting the results of historical documentary and archaeological background research for the

general Kahuku area and, specifically, the TBR property, and conducting subsurface fieldwork to identify the areas of greatest sensitivity to the potential for subsurface human remains;

- A Cultural Impact Assessment (CIA) to identify cultural resources including traditional and customary practices and information on possible *iwi kūpuna* that may exist within the TBR property through archival research and community consultation;

- A Cultural and Natural Resource Management Plan (CNRMP) that will provide a cultural framework to inform decision making and facilitate sound management practices regarding cultural resources, including *iwi kūpuna;*

- A Cultural Management Plan (CMP) to set guidelines and procedures that will be used for report and respond to any inadvertently discovery of historic properties, including *iwi kūpuna* on all activities related to TBR; and

In addition, ongoing coordination continues with the Kahuku Burial Committee (KBC) who represents families who have a lineal or cultural connection to the TBR lands and have accepted the *kuleana* (responsibility)to *mālama i nā iwi kūpuna* (care for the ancestral bones).

7.1.2.2 Strategies

Because the sand dunes along the coast are known to have *iwi kūpuna,* TBR has intentionally avoided planning development along these areas to avoid potential adverse impact to known and potential burials. Previously identified and inadvertently discovered human skeletal remains have been found within the SEIS lands. Some of these *iwi kūpuna* have been preserved in place and others have been relocated to permanent re-interment preservation sites within each *ahupuaʻa*. For specific details on the *iwi kūpuna* that have been previously identified, refer to the Supplemental Archaeological Inventory Survey (SAIS).

The KBC, in coordination with TBR and with approval by the State Historic Preservation Division (SHPD) in consultation with the Oʻahu Island Burial Council (OIBC), will identify permanent re-interment sites within each of the three *ahupuaʻa* as possible re-interment sites for either previously identified or inadvertently discovered *iwi kūpuna* that SHPD or OIBC have either been preserved in place or given permission to relocate the *iwi kūpuna.* However, OIBC/SHPD will make the final determination.

All subsurface excavation related to planning, construction, operation and maintenance are subject to either on-call or on-site archaeological monitoring depending on whether the area is highly sensitive to potential subsurface *iwi kūpuna.*

7.1.2.3 Implementation: Master Developer Progress-to-Date

TBR has completed or is working on the following:

- The fieldwork and final report for the SAIS has been completed and will be submitted to SHPD for approval;

- The CIA has been completed and is appended to the SAIS;

- The CNRMP has been completed and is appended to the SAIS;

- The CMP has been completed and approved by TBR for incorporation into TBR's operation and maintenance program; and

- The KBC meets regularly to address issues related to *iwi kūpuna.*

7.1.3 Native Habitat Enhancement & Restoration

The purpose is to enhance and restore the site's native plants, wildlife habitats, wetlands, and bodies of water while stopping the spread of established invasive species, preventing infestation of new invasive species, and making best efforts to eradicate those invasive species.

7.1.3.1 Guidelines

Use mostly native plants, to enhance and restore predevelopment native ecological communities, water bodies, or wetlands on the project site. Work with a qualified biologist and landscape architects to ensure that restored areas will have the mostly native species assemblages, hydrology, and other habitat characteristics that likely occurred in predevelopment conditions.

- Identify previously disturbed areas that, if restored, would enhance the overall value of the property in terms of habitat and wildlife values.

- Restore disturbed areas (excluding the building or road footprints and associated structures) as practical and economically viable.

- Enhance disturbed areas (excluding the building or road footprints and associated structures, walkways, decks, etc.) returning them to a natural state that conforms to surrounding habitat.

- Create and commit to implementing a 10-year Invasive Species Management Replacement & Monitoring Plan in conjunction with the Oʻahu Invasive Species Committee (OISC) to identify, map, control, and eventually replace as much of the invasive species identified by the general OISC membership as economically viable and biologically possible.

7.1.3.2 Strategies

- Consider restoration and enhancements that could include, but not be limited to:
  - Trees, shrubs, and plants that require structure and diversity, use less irrigation, fertilization, and prohibit invasive species;
  - Aquatic habitat; and
  - Natural water features.

- Use the National Invasive Species Management Plan http://www.invasivespeciesinfo.gov.

- Consider alternatives to toxic spraying as removal technique. Consider rangeland mitigation in context to adjacent riparian and water courses.

- Implement restrictions that permit the planting of only native or non-invasive species in any landscaping.

- Ensure proper management of invasive species throughout the build-out of a development. Implement policy of contact avoidance with invasive infested areas. These policies will be necessary to avoid unknowingly assisting the spread of invasive species (e.g., seeds becoming stuck in tire treads or mud on the vehicle and being carried to unaffected areas).

- Alternative site designs that include measures to be taken to avoid impact to critical vegetation and habitat.

- Summary of the critical findings related to protection of habitat and vegetation.

- Outline of a long-term management plan that identifies responsible resources and funding in order to protect the habitat and vegetation.

- The inventory and report must be prepared by a professional who possesses the proper experience, education, certifications, and a strong understanding of native ecology. Work with local experts to determine the appropriate strategy for preserving native species.

7.1.3.3 Implementation: Master Developer Progress-to-Date

TBR has completed or is working on the following:

- Updated Flora and Fauna Study on the entire property which inventories all the current species, locations and provides a solid foundation and

recommendations for developing a long-term plan to re-establish native species and enhance the native habitat;

- Selected highly respected Walters Kimura Motoda (WKM) as master planning landscape architect/designer/advisor to refine a master landscape enhancement plan consistent with *Tomorrow's Ahupua`a* principles;

7.1.4 Agricultural Enhancement & Conservation

The purpose is to preserve agricultural resources by protecting prime and unique soils on farmland from development and encouraging community-based food production, improving nutrition through increased access to fresh produce, supporting preservation of small farms that produce a wide variety of crops, and supporting local economic development that increases the economic value and production of farmlands and community gardens.

7.1.4.1 Guidelines

Strategize to locate as much of the project development footprint such that it does not disturb prime soils, unique soils, or soils of state significance as identified in a state Natural Resources Conservation Service soil survey.

Work with the local community to facilitate a planned farmers' market that is open or will operate at least once weekly for at least five months annually.

7.1.4.2 Strategies

- Locate new development on areas of the site not within a state or locally designated agricultural lands or agricultural preservation districts.

- Develop strategic master plan to maximize state-of-the-art agricultural production, community farming, agri-tourism where appropriate and educational programs on how to produce as much food as possible to serve the community.

7.1.4.3 Implementation: Master Developer Progress-to-Date

TBR is working to establish productive working ag lands that provide significant produce for the resort, community and greater Oahu has completed or is working on the following:

- Agreement with Trust for Public Lands to conclude a conservation easement for all of the 470 acres of agricultural land on the Mauka side of Kamehameha Hwy to provide for Agricultural Use forever.

- TBR is developing a comprehensive Ag Lands Master Plan to establish a more strategic approach to crop selection and production to supply as much locally grown food to the project, neighborhood, region and Oahu as possible.

- Repositioning onsite restaurant facilities and menu to be focused on farm to table food offerings that use the food from the Ag production in the Kula lands.

7.1.5 Erosion Control

The purpose is to minimize potential erosion of, slopes, changes in grade, cleared area, and cut and fill volume.

7.1.5.1 Guidelines

Restore slope areas with native plants or noninvasive adapted plants.

7.1.5.2 Strategies

- Instead of building on steep slopes, these areas can be used to enhance the natural environment surrounding the project. Potential strategies can include the following: aggregate the natural areas and link significant habitats with corridors of undisturbed land to promote ecological connectivity; utilize open spaces, parks, trails, critical habitats, wetlands, water bodies, riparian corridors, buffers, and private outdoor areas to create a wildlife habitat network.

7.1.5.3 Implementation: Master Developer Progress-to-Date

TBR has completed or is working on the following:

- Refining Proposed Action preliminary comprehensive drainage plan to minimize erosion, and improve the management of storm water runoff through the use of bio-swales and detention and retention basins to control the flow during major storm events.

7.1.6 Water Resource Management (Kai & Wai)

The purpose is to reduce pollution and hydrologic instability from stormwater, reduce flooding, promote aquifer recharge, and improve water quality by emulating natural hydrologic conditions.

7.1.6.1 Guidelines

Create a surface and ground water conservation plan with the assistance of hydrologists and water quality specialists that will protect water quality and quantity in streams and groundwater sources.

The plan should identify ways to conserve water quantity and quality through reduced irrigation, efficient systems, alternative sources of water for irrigation, water harvesting and storage, and storm water runoff.

The plan should address application of fertilizers and pesticides and show that all federal permit requirements and Best Management Practices (BMP) have been followed for managing storm water runoff.

7.1.6.2 Strategies

- Identify ways to conserve water quantity and quality through reduced irrigation, efficient systems, alternative sources of water for irrigation, water harvesting and storage, and storm water runoff.

- Aquatic projects require a scientific approach that should involve specialists. Geomorphologists and aquatic biologists should be involved to assist in development strategies. Gain technical assistance from local conservation districts for any projects that would modify stream beds or banks or beach areas.

7.1.6.3 Implementation: Master Developer Progress-to-Date

TBR has completed or is working on the following:

- Working with technical and cultural consultants to coordinate storm and wastewater management in a way to maximize use of bio-swale filtering and minimize the amount of silt and runoff into the nearshore marine and other sensitive areas.

- TBR is presently studying the use of herbicides and pesticides on the golf courses to determine best practices to minimize any impacts to water resources.

- Refining Proposed Action preliminary comprehensive drainage plan to minimize erosion, and improve the management of storm water runoff through the use of bio-swales and detention and retention basins to control the flow during major storm events to the ocean.

- A proposal to restore the alignment of Kawela stream to its original and more environmentally sensitive alignment corresponding to the West Main Drain in Turtle Bay.

- Continue to expand initiatives designed to promote awareness of the unique water resources and how to enhance and protect these resources.

- Continued improvement in the operation and management of the resort's two (2) golf courses has yielded invaluable information about the relationship between golf course operations and groundwater and near-shore water quality.

- Planned re-design of the Fazio golf course to incorporate the front 9 holes into open space and support for recreation and natural bio-swale to support drainage while blending the back 9 holes as part of the Palmer 18 holes.

- Continued systematic monitoring of near shore water quality that started in the mid-1980s in an effort to ensure that near shore water quality is not impacted by golf course operations.

- The responsible use of treated effluent from the resort's Wastewater Treatment Plant as an irrigation supplement on the Palmer Course that has resulted in a substantial reduction in the need for herbicides.

- As the resort expands and the volume of treated effluent available for use to supplement the irrigation requirements of the golf courses. The resort owners are planning to upgrade the Wastewater Treatment Plant (under separate ownership) filter system so that the effluent can be used in other areas closer to residential zones, thus allowing responsible management of this water resource.

7.1.7 Comprehensive Cultural & Natural Resource Management Plan

The purpose is to preserve, enhance and conserve native and indigenous plants, wildlife habitat, wetlands, and water bodies.

7.1.7.1 Guidelines

Create and commit to implementing at least a ten-year management plan for new or existing onsite native habitats, water bodies, and/or wetlands and their buffers, and create a guaranteed funding source for management. Involve a qualified biologist or a professional from a Hawaiian natural resources agency or natural resources consulting firm in writing the management plan and conducting or evaluating the ongoing management. The plan must include biological objectives consistent with habitat and/or water resource conservation, and it must identify:

- Procedures, including personnel to carry them out, for maintaining the conservation areas.

- Estimated implementation costs and funding sources.

7.1.7.2 Strategies

- Employ an Adaptive Management strategy to revisit management decisions to ensure they are providing the desired outcome.

- Establish a Konohiki Council to provide guidance for decision making in each of the three ahupua`a that constitute the SEIS Lands.

- Develop strict lighting practices for site, effectively eliminating light pollution into the habitat or corridor. Lights must be directed downward and inward toward the building.

- Develop strict noise pollution practices in accordance with wildlife needs. Many animals have peak activity during nocturnal hours.

- Remove vegetation that attracts animals away from designed habitat and corridors. For example, removing fruit trees and replacing them with native plants will reduce the tendency for wildlife to leave habitat or corridor.

- Locate refuse and other animal attractants effectively from habitat and corridor areas.

7.1.7.3 Implementation: Master Developer Progress-to-Date

TBR has completed or is working on the following:

- For over 2 years with over 150 individuals or groups, reaching out to the community for cultural and technical advisory on matters of Conservation and Resources Management.

- Sponsoring and hosting annual Ocean Fest Event open to the public to promote awareness of the ocean and beach resources and education of how to better protect these resources.

- Developing a Cultural and Natural Resources Management Plan as a means to coordinate the long-term preservation of natural and cultural resources at the resort.

7.2 Master Planning & Design

'O ke kahua ma mua, ma hope ke kūkulu.
First the foundation, and then, the building.

The purpose is to provide an overarching plan that addresses all the components of the development project in a manner that ensures their integration and successful implementation. A master plan establishes the philosophy and vision for the development that, in turn, creates the foundation for design guidelines to establish a consistent and uniform standard of quality.

Nānā i hope
Looking Back

E lauhoe mai nā wa`a; i ke ka, i ka hoe, i ka hoe, i ke ka; pae aku i ka ʻāina.
Paddle together, bail, paddle; paddle, bail; paddle towards the land.

The ahupuaʻa was the epitome of master planning and design in Hawaiʻi. Although each ahupuaʻa was managed and planned distinctly, there are salient principles that guided the design of ahupuaʻa in general. The ahupuaʻa was part of an organized island management system. The island or mokupuni was the largest division, and each was divided into districts or moku. Each moku was further divided into multiple ahupuaʻa. The ali'i (chief) ruling system, the Hawaiian political system, mirrored these land divisions. The ahupuaʻa provided a valuable supplement to the political system by increasing social and political relations between neighboring communities.

The ahupuaʻa allowed for the master planning and design of large land tracts. It is a system of organizing self-sustained land sections divided from the mountain ridges to the outer reefs of the ocean. Each ahupuaʻa includes the ʻāina, kai, and wai resources within its boundaries. This land division system was first established under Oʻahu aliʻi nui (high-ranking chief) Maʻilikukahi, between approximately 1450–1500. Several generations later, this management framework was also incorporated on Hawaiʻi Island by ruling chief ʻUmi. Soon after, it was implemented throughout the entire pae ʻāina (archipelago). Both aforementioned chiefs were renowned for their sustainable ruling practices with hallmark periods of peace and prosperity. This new system had greatly diminished disputes over resources. Both ali'i introduced the ahupuaʻa framework in order to increase social, political, and economic sustainability as well as overall island-wide stability.

Master planning was a highly specialized function that ensured resource management and equitable access. In the ahupuaʻa, placement of homes, temples, structures, agricultural plots and walkways were very deliberate. Many considerations were taken into account such as the orientation of natural resources, design of the built environment (agriculture plots, heiau, house sites), and the needs of the community. This served to increase the productivity of each region as well as the collective operation and efficiency of the moku and larger mokupuni.

Nānā i mua
Looking Forward

ʻAu i ke kai me he manu ala.
Cross the sea like a bird.

Tomorrow's Ahupuaʻa strives to ensure that the master planning and design guidelines include an engagement of the larger community. Through this

communication with the host community, *Tomorrow's Ahupua`a* can more accurately identify all of the cultural assets of the project area. This includes both the wahi pana (important sites) and recreational spaces. Wahi pana will be celebrated through an increased commitment to protection and maintenance. Further, the guidelines will address the individual character of each ahupuaʻa, including the wahi pana, to bolster connectivity between stakeholders within the project area. Master planning and design will increase the balance between the needs of kānaka while maintaining the capacity of the ʻāina.

Tomorrow's Ahupuaʻa also seeks to provide the community with improved access to the various places and resources they need. A major consideration in master planning is transportation, which, when planned effectively, enables all members of the community adequate access to housing, places of work, goods and services, and recreation. It also provides moku connectivity, and provides alternative transportation options to the automobile.

One of the main goals of the master planning and design guidelines is to increase connectivity and human mobility in the project area and beyond in order to improve economic and social sustainability and enjoyment. By working toward this goal, *Tomorrow's Ahupuaʻa* will also contribute to the overall health and wellness of the moku by including environmental indications such as reducing its greenhouse gas emissions in its guidelines. This will ensure that developers consider internal and regional connectivity in their design and help identify the greatest opportunities to achieve connectivity and mobility.

7.2.1 Resort Connectivity

The purpose is to provide direct and safe connections for pedestrians and vehicles (cars, trucks, bicyclists, skateboards, etc) to local destinations, neighborhood centers, existing trails systems, and parks and beaches.

7.2.1.1 Guidelines

Make continuous provisions for bicycling and walking along, or parallel to, all streets within the project. Pedestrian and bicycle facilities shall comply with the American Association of State Highway and Transportation Officials, Guide for the Planning, Design, and Operation of Pedestrian Facilities, The Institute of Transportation Engineers (ITE), or similar widely accepted standards.

Connect trails, sidewalks, bicycle lanes, and other facilities to adjacent existing or planned facilities to establish or expand larger networks.

7.2.1.2 Strategies

- Design and develop a multi-modal internal transportation system with many practical and highly efficient options for moving people and resources

within the resort community, as well as connecting to other outside transportation corridors.

- Include pedestrian or bicycle through-connections between the development and existing trail systems, local destinations, and publicly owned parks and beach.

7.2.1.3 Implementation: Master Developer Progress-to-Date

TBR has completed or is working on the following:

- Removed barriers to entry by permanently opening vehicular gates to the resort and publicly inviting residents, community members, visitors and guests to use the Turtle Bay Resort public beach areas, shoreline and property trail systems in a responsible manner at their own risk.

- Increased public beach access and associated parking to 40 stalls allowing residents in Kahuku closer more efficient access to quality fishing, surfing, walking, and general access to a wide variety of beach environments.

- Developed Heli Huli adventure center which provides a variety of efficient and transportation options (bicycles, mopeds, seaways…) and activities that keep residents, visitors and guest opportunities for recreation and entertainment on site vs. using vehicles to travel to other destinations on the North Shore.

- Invested in path improvements and consistent security patrols that allow public access to Kawela Bay from Kam Hwy at users own risk.

- The Proposed Action would increase the number of public beach accesses at the resort and provide new pedestrian paths to the oceanfront and throughout the property.

- Work towards obtain Grants to connect the bike/ pedestrian path from Kahuku to Sunset.

7.2.2 Community Connectivity

The purpose is to encourage transit use and reduce driving by providing safe, convenient, and comfortable transit waiting areas and safe and secure bicycle storage facilities for transit users.

7.2.2.1 Guidelines

Work with the transit agency or agencies serving the project to identify transit stop locations within and/or bordering the project boundary to identify where transit

agency-approved shelters and any other agency-required improvements, including bicycle racks, should be placed. At those locations, install approved shelters and any required improvements, or provide funding to the transit agency for their installation.

Work with the transit agency or agencies to review and update the internal transit plan from every few years to maximize efficiencies and effectiveness of the plan.

Work with the transit agency or agencies serving the project to provide kiosks, bulletin boards, and/or signs that display transit schedules and route information at each public transit stop within and bordering the project.

7.2.2.2 Strategies

- Provide transit stop shelters and bicycle racks adequate to meet projected demand with a guideline of one shelter and one bicycle rack at each transit stop.

- Shelters should be covered, be at least partially enclosed to buffer wind and rain, and have seating and illumination.

- Bicycle racks should have a two-point support system for locking the frame and wheels and must be securely affixed to the ground or a building.

- Provide transit incentives to promote use of public and/ or private intermodal transportation options.

7.2.2.3 Implementation: Master Developer Progress-to-Date

TBR has completed or is working on the following:

- Continued cooperation and support of The Bus stops on site and future turnouts along Kamehameha Highway to facilitate more convenient public transportation without negative impacts on highway traffic.

- Adding 5 parks totaling 73.3 acres, and 12 public access points.

- Invested in path improvements and consistent security patrols that allow public access to Kawela Bay from Kamehameha Highway at users' own risk.

- Plans to write and apply for grants to pay for the connection of the bike/ pedestrian path from Kahuku to Sunset.

- In process to complete Traffic Demand Management plan that seeks to define efficient and feasible programs to enhance connectivity including but not

limited an internal shuttle system with energy efficient vehicles, building bike/ pedestrian paths and more…

7.2.3 Recreation & Open Space

The purpose is to create and/or expand recreational opportunities while minimizing any potential user conflicts and resource impacts.

7.2.3.1 Guidelines

In cooperation with appropriate agencies, prepare an assessment of supply and demand for different types of recreational experiences in the project vicinity.

- Identify existing and potential recreation opportunities and possible users.
- Identify sources of potential user conflict.
- Outline strategies for fostering positive interactions among users, organizations and land managers as new recreation services and opportunities are proposed and developed.

Locate recreation services and facilities at a site that minimizes the impact on the existing ecosystem and environment both socially and biologically.

- Prepare a management plan that demonstrates how the site's resources and carrying capacity will be respected and how the facility design and operation will minimize user conflicts.

7.2.3.2 Strategies

- Prepare a management plan that demonstrates how the site's resources and carrying capacity will be respected and how the facility design and operation will minimizes user conflicts.

7.2.3.3 Implementation: Master Developer Progress-to-Date

TBR has completed or is working on the following:

- Removed barriers to entry by permanently opening vehicular gates to the resort and publicly inviting residents, community members, visitors and guests to use the Turtle Bay Resort public beach areas, shoreline and property trail systems in a responsible manner at their own risk.
- Increased public beach access by expanding associated parking to a total of 40 stalls allowing residents in Kahuku area closer more efficient access to

quality fishing, surfing, walking, and general access to a wide variety of beach environments.

- Develop Heli Huli adventure center which provides a variety of efficient and transportation options and activities that retain residents, visitors and guest opportunities for recreation and entertainment on site, and in so doing reduces the use of vehicles to travel to other destinations on the North Shore.
- Invested in path improvements and consistent security patrols that allow public access to Kawela Bay from Kamehameha Highway at users' own risk.
- The Proposed Action would increase the number of public beach accesses at the resort and provide new pedestrian paths throughout the property.
- Work towards obtaining grants to connect the bike/pedestrian path from Kahuku to Sunset.
- By providing new park areas with unrestricted parking, TBR is improving the community's access to recreational and open space areas.
- As the new parks will be privately owned and operated with security provided by the resort, users will be ensured a safe and secure recreational environment.

7.3 Environmental Infrastructure & Green Buildings

Ka manu ka`upu halo `alo o ka moana.
The albatross that observes the ocean.
A careful observer.

In the ahupuaʻa, mālama ʻāina is a cultural framework that captures kānaka obligation to the ʻāina. The goal of mālama ʻāina is to preserve the integrity of the natural environment and simultaneously provide for all of the needs of kānaka. Mālama has numerous meanings including take care of, preserve, protect, save or maintain. ʻĀina means land, however, a literal translation reveals its root meaning: that which feeds'. The mālama ʻāina principle is defined as to take care of that which feeds'. Mālama ʻāina maintains the balance between kānaka and ʻāina.

Nānā i hope
Looking back

Hahai no ka ua i ka ulula`au.
The rain follows after the forest.
Destroy the forest, the rains will cease to fall.

Mālama ʻāina was practiced on both the ahupuaʻa and ʻohana levels. In the ahupuaʻa, mālama ʻāina practices were protected by the kapu (laws or restrictions). These kapu were enforced by the konohiki (land manager), a position appointed by the aliʻi. Within the ʻohana, there were values and morals that were strictly followed. These practices are still prevalent in Hawaiian communities with subsistence lifestyles, and include but are not limited to the following: take only what you need, never waste resources, and use everything you take. These ʻohana values were applicable to fishing, farming, gathering and water management. Every ʻohana practiced mālama ʻāina in order to maintain the balance of ʻāina and kānaka.

Native Hawaiians have always had a keen understanding of the finite resources of their island-ecosystem. Further, this is witnessed by the innate spiritual connection between ʻāina and kānaka. Kinolau were the physical manifestations of the gods found on the ʻāina. Many of the kinolau for Kāne and Kanaloa are found within this moku. Fresh water, kalo, kō (sugarcane), and ʻo`opu are a few of the kinolau of Kāne. The ocean, mai`a (banana), he`e (octopus), and hīhīmanu (stingray) were kinolau of Kanaloa. Hawaiian spirituality was founded in concepts of the ʻāina. Therefore, mālama āina ensured the balance between kānaka and ʻāina by taking care of the Akua and their kinolau.

Nānā i mua
Looking forward

ʻAʻole i ke`ehi kapua`i ike one o Hauiki.
Has not set foot on the sands of Hauiki.
One does not know much about a place until one has been there.

Mālama ʻāina is an integral aspect of *Tomorrow's Ahupuaʻa*, giving consideration to the rich characteristics of the region and the need to minimize the impact of development on the surrounding environment. Environmental infrastructure and green building guidelines will begin to restore the integrity of the ʻāina, as well as ensure that future development will be thoughtful, engaging both traditional practices of mālama ʻāina and the modern practices of environmentally-minded development.

The impact of the built environment, including design, construction, and operation is significant. The built environment imposes on our natural resources, and without proper planning, can destroy the very attributes that inspire us to live in these places. Similar to water metering to promote efficient water use, requirements throughout this section focus on efficient use and reuse of water and energy resources. These include direct approaches such as sharing services, managing electrical loads, water efficiencies, and water quality. They also include indirect approaches such as expanded renewable energy production and resource management during construction.

7.3.1 Energy Efficiency

The purpose is to reduce adverse environmental effects from energy used for operating public infrastructure.

7.3.1.1 Guidelines

Design, purchase, or work with the City & County of Honolulu to install all new infrastructure, including but not limited to traffic lights, street lights, and water and wastewater pumps, to achieve at least a 15% annual energy reduction below an estimated baseline energy use for this infrastructure. The baseline is calculated with the assumed use of lowest first-cost infrastructure items.

7.3.1.2 Strategies

- Conventional mercury vapor streetlights consume about twice the energy as newer high-pressure sodium (HPS), low-pressure sodium (LPS), and metal halide lamps.
- LED (light emitting diode) technology lighting is also available offering significant cost-saving opportunities (especially for traffic signals where LEDS use 82-93% less energy than incandescent bulbs).
- Complement water conservation with energy efficiency and conservation in the supply, storage, and distribution of water using appropriate energy-saving technologies and devices (e.g., high efficiency pumps). When appropriate and cost-effective, use renewable energy technologies (e.g., PV) in water supply and treatment systems.
- Install green roofs or shading to reduce heat gain on buildings thereby lowering the heat coefficient and demand for cooling.

7.3.1.3 Implementation: Master Developer Progress-to-Date

TBR has completed or is working on the following:

- Lighting retrofit throughout the resort that forecasts reducing energy demand by 20% to 25%.
- Installation of a Renewable Energy Solar Photovoltaic System that will provide clean energy for approximately 10% of the current demand.
- Installation of energy monitoring and smoothing of energy quality forecast to reduce energy demand by approximately 5%.

- Develop education and incentive programs that inform and work to change behavior of employees, guests and residents to conserve energy and resources.

- Evaluation of all energy systems for opportunities to reduce and convert to renewable energy sources.

- Require all new site development adhere to energy star and LEED standards.

- Researching feasibility of other wind and solar systems to improve energy efficiency.

- Installation of green roofs on existing hotel's lower roof areas of approximately 50,000 sq ft.

7.3.2 Renewable Energy

The purpose is to encourage on-site renewable energy production to reduce the adverse environmental and economic effects associated with fossil fuel energy production and use.

7.3.2.1 Guidelines

Incorporate on-site nonpolluting renewable energy generation, such as solar, wind, and/or biomass, with production capacity of at least 5% of the project's annual electrical and cooling energy cost.

7.3.2.2 Strategies

- Use of alternative power generation sources is one way to reduce Hawaii's major dependency on fossil fuels. On-site production should be explored including use of wind and solar.

7.3.2.3 Implementation: Master Developer Progress-to-Date

TBR has completed or is working on the following:

- See Section 7.3.1.3 (Energy Efficiency Implementation) above;

7.3.3 Wastewater Management

The purpose is to help reduce the potential for pollution from wastewater and encourage water reuse.

7.3.3.1 Guidelines

Design and construct the project to retain on-site at least 25% of the average annual wastewater generated by the project (exclusive of existing buildings), and reuse that wastewater for irrigation purposes to replace potable water.

7.3.3.2 Strategies

- Perform a soil/climate analysis to determine appropriate, adaptive landscape material and design the landscape plan accordingly to minimize or eliminate irrigation needs.

- Where irrigation is required, use efficient irrigation means. Outdoor water use can be reduced by any of the following: native Hawaiian plant species selection, irrigation efficiency, captured storm water, reused wastewater effluent or grey-water, or use of water specifically conveyed for non-potable water use (i.e., irrigation ditch).

- Consider using storm water, grey-water, and recycled wastewater effluent for irrigation.

7.3.3.3 Implementation: Master Developer Progress-to-Date

TBR has completed or is working on the following:

- TBR currently treats all wastewater to an effluent standard that allows for the safe use of the wastewater to irrigate the Palmer golf course or place excess in State Health Department approved injection wells that allows for the safe and environmentally responsible filtering of this resource into the ground for healthy reuse in the environment. As the resort expands the volume of treated effluent available for use will increase. To supplement the irrigation requirements of the golf courses, the resort owners are planning to upgrade the Wastewater Treatment Plant (under separate ownership) filter system so that the effluent can be used in other areas closer to residential zones, thus allowing responsible management of this water resource.

7.3.4 Water Usage

The purpose is to conserve Oahu's valuable water resources over the long-term and raise owner and consumer awareness of this need.

7.3.4.1 Guidelines

Verify that all projects will include metered water use in the final development to the extent possible.

For public water systems, the system shall individually meter users, and the metering shall be strictly enforced. If service to the development or structure is not provided via public water system, the individual users (i.e., irrigation users, individual wells, etc.) shall individually meter use. Where technologies allow, the intent is to raise owner and consumer awareness about their water use and potential for waste with the ultimate goal being to promote conservation and wise use of water resources.

7.3.4.2 Strategies

- For public water systems, the system should individually meter users, and the metering should be strictly enforced.
- If service to the development or structure is not provided via public water system, the individual users should individually meter use (i.e., irrigation users, individual wells, etc.).

7.3.4.3 Implementation: Master Developer Progress-to-Date

TBR has completed or is working on the following:

- All replacement fixtures for renovation projects including guestroom, spa/ fitness and restaurant renovations & future development will meet current LEED water efficiency standards.
- In process of evaluating water use by facility to determine current conservation opportunities.

7.3.5 Reuse & Recycle

The purpose is to reduce the volume of waste deposited in landfills.

7.3.5.1 Guidelines

Meet at least four of the following five guidelines below and publicize their availability and benefits:

- Include as part of the project at least one recycling or reuse station, available to all project occupants, dedicated to the separation, collection, and storage of materials for recycling; or locate the project in a local government jurisdiction that provides recycling services. The recyclable materials must include, at a minimum, paper, corrugated cardboard, glass, plastics, and metals.
- Include as part of the project at least one drop-off point, available to all project occupants, for potentially hazardous office or household wastes; or locate the project in a local government jurisdiction that provides collection services. Examples of potentially hazardous wastes include paints, solvents, oil, and batteries. If a plan for post-collection disposal or use does not exist, establish one.
- Include as part of the project at least one compost station or location, available to all project occupants, dedicated to the collection and composting of food and yard wastes; or locate the project in a local government jurisdiction that provides composting services. If a plan for post-collection use does not exist, establish one.
- Include recycling containers adjacent to other receptacles or recycling containers integrated into the design of the receptacle.
- Recycle and/or salvage at least 50% of nonhazardous construction and demolition debris. Develop and implement a construction waste management plan that, at a minimum, identifies the materials to be diverted from disposal and specifies whether the materials will be stored on-site or commingled. Excavated soil and land-clearing debris do not contribute to this credit. Calculations can be done by weight or volume.
- Use recycled content in materials for new infrastructure such as roadways, parking lots, sidewalks, unit paving, and curbs. Also include water retention and detention basins, tanks and vaults, storm water, sanitary sewer, steam energy distribution, and water piping.

7.3.5.2 Strategies

- Include recycling containers adjacent to other receptacles or recycling containers integrated into the design of the receptacle.
- Develop and implement a construction waste management plan that, at a minimum, identifies the materials to be diverted from disposal and specifies whether the materials will be stored on-site or commingled.
- Use recycled content in materials for new infrastructure such as roadways, parking lots, sidewalks, unit paving, and curbs. Also include water retention tanks and vaults, storm water, sanitary sewer, steam energy distribution, and water piping.

7.3.5.3 Implementation: Master Developer Progress-to-Date

TBR has completed or is working on the following:

- Operations currently implements recycling programs in back of house, rooms, and throughout the resort, which the Master Developer intends to enhance into future operations.

- Purchasing policy to buy when available and competitively priced, biodegradable or other environmental products which naturally breakdown or recycle easily.

7.3.6 Night Sky Protection

The purpose is to minimize light trespass from project sites, reduce sky-glow to increase night sky access, improve nighttime visibility through glare reduction, and reduce adverse effects on wildlife environments.

7.3.6.1 Guidelines

"Shared areas" of a project are spaces and facilities dedicated to common use. In residential areas, at least 50% of the external luminaries must have fixture-integrated lighting controls that use motion sensors to reduce light levels by at least 50% when no activity has been detected for 15 minutes.

In all shared areas, install automatic controls that turn off exterior lighting when sufficient daylight is available and when the lighting is not required during nighttime hours.

Stipulate *covenants*, *conditions*, *and restrictions* (CC&R) or other binding documents to require continued adherence to the requirements.

7.3.6.2 Strategies

- Adopt site lighting criteria to maintain safe light levels while avoiding off-site lighting and night sky pollution.

- Minimize site lighting where possible and model the site lighting using a computer model.

- Technologies to reduce light pollution include full cutoff luminaries, low-reflectance surfaces and low-angle spotlights.

7.3.6.3 Implementation: Master Developer Progress-to-Date

TBR has completed or is working on the following:

- Operations in the implementation of the lighting retrofit is evaluating all opportunities to replace up or heavy light pollution with down lighting and or reduce lighting fixtures;

7.3.7 Utility Construction & Resource Management

The purpose is to reduce environmental impacts and provide economic alternatives to traditional open cut methods of utility installation, rehabilitation, or replacement.

7.3.7.1 Guidelines

The development team shall demonstrate measures to:

- Monitor and reduce water system loss due to transmission system leaks.

- Reduce wastewater system infiltration and inflow (I&I).

- Have established and routinely update a "Capital Improvements Plan" (CIP) that addresses public utilities.

- Provide a written commitment to the appropriate use and implementation of Trenchless technology for the rehabilitation, replacement, or installation of water, wastewater, or storm water conveyance utilities.

- Avoid use of Poly Vinyl Chloride (PVC) in any new utility material where possible.

7.3.7.2 Strategies

- Minimize: surface disruption, trench excavation, asphalt and concrete pavement removal, and replacement.

- Reduce: fuel consumption, traffic congestion, air and noise pollution, business disruption and land fill deposits.

- If trenchless technology is an appropriate method for utility construction, the list below provides potential technologies by category.

  Rehabilitation:
  - Cured-In-Place Pipe (CIPP) / Fold-in-Form
  - Slip lining
  - Spiral Re-lining

  Replacement:
  - Pipe Bursting
  - Dynamic Pipe Bursting
  - Static Pipe Bursting
  - HDD Air Impactor Assisted Pipe Bursting

New Installations:

- Bore and Jack
- Unguided
- Guided
- Pipe Ramming
- Horizontal Directional Drilling (HDD)
- Microtunneling
- Tunneling

7.3.7.3 Implementation: Master Developer Progress-to-Date

TBR has completed or is working on the following:

- Specifying up-to-date preferred utility construction methods and systems to be incorporated into our plans and specifications where available and economically feasible.

7.3.8 Green Building Programs: LEED Certification Priority

The purpose is to design and construct sustainable buildings and structures by meeting at a minimum, the perquisites for LEED New Construction for habited structures.

7.3.8.1 Guidelines

The national green building leadership standard, LEED, was developed to elevate the design and construction industry to a more sustainable level. Use of the LEED family of products forms the basis for a sustainable, habited structure and serves as an effective measurement tool. LEED Accredited Professionals support the design and construction teams in meeting requirements and earning points, and documents the progress of the project in this third-party verified system.

Built environments encompass all constructed entities. Habited structures are enclosed, occupied, and conditioned. Non-habited include but are not limited to structures that are not enclosed, occupied or conditioned, such as transit shelters, bridges, retaining walls, and landscape features. The required LEED NC prerequisites for habited structures include:

- Construction Activity Pollution Prevention;
- Fundamental Commissioning of the Building Energy Systems;
- Minimum Energy Performance;
- Fundamental Refrigerant Management;

- Storage & Collection of Recyclables;
- Minimum Indoor Air Quality Performance; and
- Environmental Tobacco Smoke Control

7.3.8.2 Strategies

- All structures are encouraged to use the appropriate LEED rating system as their guide throughout design and construction. LEED registration and certification is a requirement for all new structures. http://www.usgbc.org

7.3.8.3 Implementation: Master Developer Progress-to-Date

TBR has completed or is working on the following:

- TBR is committed to requiring all major development structures meet the LEED certification standards for new structures on all individual site development;

7.4 Kānaka Guidelines

7.4.1 Community Engagement

Ho`okahi ka `ilau like ana.
Wield the paddles together.
Work together.

In the Hawaiian language, the term for community is kaiaulu. What is less commonly known is that kaiaulu is also the word for environment. This emphasizes the interrelationship between kānaka and ʻāina. Communities were built in harmony with the natural environment, and even the traditional governance structure of the community mirrored the division of the land: the hierarchy of leadership corresponding to the extent of responsibility (*kuleana*) over the land. In *Tomorrow's Ahupuaʻa* the emphasis on kaiaulu will be apparent both within the development area and with the larger Koʻolau Loa community.

Nānā i hope
Looking Back

Ua lehulehu a manomano ka `ikena a ka Hawai'i.
Great and numerous is the knowledge of the Hawaiian people.

The ahupuaʻa were governed by kapu established by the ali'i. Kapu were placed on all practices to ensure the highest level of resource management. In turn, kānaka guidelines were designed to protect and preserve the environment as well. Fishing

practices, for example, were regulated by strict kapu that were enforced as social norms. In the case of the ʻopelu, a highly prized fish, a specific kapu from February to July banned fishing. This kapu protected the fish during its spawning season allowing the species to replenish. This provided protection for the species and replenishment of the natural ecosystems.

Other kapu were based on location. In Ka`u, there were two fishing seasons inshore fishing and deep-sea fishing. The seasons were opposite. During the summer, inshore fishing took place; this correlated with the time the Paʻakai (sea salt) was dried and available. Much of the harvest was salted and saved to eat throughout the year. In the winter months, deep sea commenced. This allowed the in-shore fish, limu (seaweed), and shellfish to replenish.

Conservation is the key to kapu system. It provided a coordinated resource management effort, and ensured the balance between ʻāina and kānaka was maintained and ultimate efficiency was achieved.

Nānā i mua
Looking Forward

ʻA`ohe pau ka `ike i ka hālau ho`okahi.
All knowledge is not taught in same school.

In *Tomorrow's Ahupuaʻa*, a thriving community depends on a diverse cross-section of inhabitants and activities. The Koʻolau Loa Communities share a common thread: the local residents maintain strong and proud connection to the surrounding lands and to each other. For years, these communities have grown around small businesses, local agriculture, and shared recreational resources. The guidelines promote productive and balanced communities by prioritizing mixed-use developments, small businesses, employment opportunities, housing diversity, and affordable housing provisions, live-work proximity, continuity, and access to public spaces, and safe walkable developments.

Long-term community viability requires the sustainably constructed project to remain connected to the Koʻolau Loa moku. Project teams are required to develop a plan for ongoing improvement once the project is occupied. Financial investments through donations to local organizations are also recognized in this section. A sustainable project gives back to the community throughout its life cycle. Support for local and regional businesses, by ongoing employment of local designers, builders, craftsman, and service providers, are essential elements of any sustainable project. To this end Turtle Bay Resort, LLC is working to establish the Turtle Bay Foundation to provide a vehicle to socially and financially support important community causes and organizations.

7.4.2 Public Access

The purpose is to provide public spaces and encourage recreational and traditional cultural activity and interaction as well as foster and maintain community and connectedness beyond the development.

7.4.2.1 Guidelines

Develop a Community Place-Making Plan including all public spaces and connections. Develop programs to support activities such as farmers' markets, community gatherings and street parties, fun runs, community gardening, etc. Promote actions that encourage public access.

7.4.2.2 Strategies

- Create & maintain public amenities (picnic tables, restroom, etc.) at accessible points.
- Seek opportunities through local, state, and national agencies to provide safe, clean, and maintained access.
- Contact Hawaii State Park agencies to discuss partnership opportunities and information on designing recreational features, etc.

7.4.2.3 Implementation: Master Developer Progress to Date

TBR has completed or is working on the following:

- TBR proposes to increase the number of public shoreline access from the requisite 8 to a total of 12.
- TBR has removed the security gate at the resort entrance to facilitate unrestricted access and parking at the resort.
- TBR has welcomed community to access the shoreline and trail systems for cultural and recreational purposes.

7.4.3 Educational Programs

The purpose is to promote common understanding and appreciation of Hawaiʻi's bioregional resources, and minimize environmental impacts through educational opportunities that teach conservation and ecological concepts.

7.4.3.1 Guidelines

Create a comprehensive program for residents, visitors, and/or employees that accurately interprets the region's natural history and the site's specific ecological, cultural, historical, and geological features.

Institute ongoing educational programs for users and employees that will minimize user impacts upon the site and recreational facilities. These programs should demonstrate how best management practices provide for a continued functioning ecosystem and long-term resource and facility protection.

7.4.3.2 Strategies

- Encourage coordinated participation of user groups, associations, government entities, educators, etc., in the development of these programs and or facilities.
- Encourage the guide/provider to pursue additional guide training and/or certification in knowledge of site environment.
- Leave No Trace at http://www.lnt.org/index.php
- Improve, update, and maintain interpretive displays and educational opportunities for the recreational user and provider on an annual basis.
- Facilitate outdoor ethics training for operators and staff, and provide volunteer incentives/opportunities.
- Encourage different user groups and associations to cooperate in the protection of the resources as well as establish a code of ethics for each user group.
- Integrate concepts of life cycle assessments for those engaged in facility design, construction, and maintenance.
- Research opportunities to include ethics discussions and training in other (i.e., safety) educational situations.
- Create evening programs, field seminars, printed materials and websites for users.

7.4.3.3 Implementation: Master Developer Progress-to-Date

TBR has completed or is working on the following:

- Providing space and building an Ocean Education desk in the TB Hotel to be staffed by partner non-profit groups including NOAA divisions of The Whale Sanctuary, Malama Pupukea, The Monk Seal Foundation and others to promote educate residents, guests and community members on the responsible use of the shoreline and ocean consistent with *Tomorrow's Ahupua`a* principles.
- Heli Huli adventure center is providing a cultural education tour 5 days a week by renowned Waimea Valley culture expert called the Hawaiian Cultural Excursion. This one of a kind cultural experience is a 60-minute beach walk that explores Turtle Bay's majestic shoreline and its many hidden coastal wonders. Visitors learn about the rich history of the Hawaiian Islands and O'ahu 's North Shore, observe unique plants and animals which call the area their home, a d listen to ancient stories and chants that were handed down from generation to generation.
- Hosting and sponsoring Ocean Fest event for the past two (2) years that focuses on ocean and beach education and safety.

7.4.4 Community Outreach and Development

The purpose is to continue ongoing public dialogue and partnerships among all stakeholders affected by, or interested in, supporting sustainable developments and communities.

7.4.4.1 Guidelines

Choose one or several participation techniques to engage the public and public service providers in the planning and design processes. Examples include, but are not limited to: surveys, review boards, web sites, public meetings, workshops, charrettes, focus groups, public comment, citizen advisory committees, participatory decision making, open houses, and neighborhood meetings.

Basic components of any public participation program should:

- Provide comprehensive information on development and a process to keep those with an interest in the strategy informed.
- Ensure dialogue will be meaningful and influential in the decision making process.
- Provide inclusive consultative mechanisms for all stakeholders affected by, or interested in, the public participation process throughout the life of the project.

- Provide feedback to stakeholders underscoring where concerns were reflected in the decision making process.

- Build collaboration among key leaders and civic institutions to encourage successful implementation of the project.

7.4.4.2 Strategies

- Establish a *Konohiki* Council for each of the three ahupua`a that constitute the SEIS Lands to provide cultural guidance.

- Provide comprehensive information on development and a process to keep those with an interest in the strategy informed.

- Ensure dialogue will be meaningful and influential in the decision making process.

- Provide inclusive consultative mechanisms for all stakeholders affected by, or interested in, the public participation process throughout the life of the project.

- Provide feedback to stakeholders underscoring where concerns were reflected in the decision making process.

- Build collaboration among key leaders and civic institutions to encourage successful implementation of the project.

7.4.4.3 Implementation: Master Developer Progress To Date

TBR has completed or is working on the following:

- TBR has conducted a proactive public outreach program over the past two (2) years that has engaged hundreds of people in its planning and SEIS process.

- Assisted, supported, kept informed and consulted with the Ku'ilima North Shore Strategic Planning Committee (KNSSPC) Cultural Sub-Committee, Kahuku Burial Committee, Ko'olauloa Neighborhood Board, Turtle Bay Employee Groups, Ko'olau Loa North Shore Association, and others.

7.4.5 Local/Regional Support

The purpose is to support balanced communities and enhance the quality of life in the Koʻolau Loa and surrounding communities with a diversity of volunteering, donations, sponsorships, and charitable giving. Emphasize outcomes – direct benefits to the people and places in the Koʻolau Loa & North Shore Communities.

Encourage innovation in and implementation of environmental stewardship practices.

7.4.5.1 Guidelines

Build upon the existing community outreach plan that demonstrates a commitment to open, two-way communication with the surrounding community. The plan should respond to broad issues about the projects role in the community, such as:

- Job creation

- Philanthropic activities within the community

- Sustainability activities and programs

- Environmental issues

- Mentoring of other businesses

- Community development or redevelopment

7.4.5.2 Strategies

- Job creation

- Philanthropic activities within the community

- Sustainability activities and programs

- Environmental equity issues

- Mentoring of other businesses

- Community development or redevelopment

7.4.5.3 Implementation: Master Developer Progress To Date

TBR has completed or is working on the following:

- Efforts to form the Turtle Bay Foundation a 501(c)3 non-profit organization whose purpose is raise to provide resources to support and promote community wide cultural and resource education, academic education, health/ fitness, healthcare, agricultural and general wellbeing of the Ko'olau Loa community and Turtle Bay Resort Employees, Residents and their ahupua'a.

8. Stewardship of the Ahupua`a: Guidelines, Councils, and Konohiki

Cultural guidelines and management practices, based on the *Tomorrow's Ahupua'a* concept, are planned to be developed to provide a framework to implement the elements and orientations of the *ahupua'a* . The guidelines are intended to "guide" and are not proposed as "cookie-cutter" solutions to all possible situations, but rather capture the essence of the unique features of each ahupua`a. Further, it is anticipated that guidelines will evolve and change over time in a dynamic learning process.

Architectural guidelines will be proposed to achieve balance and design harmony, but not design homogeneity. These guidelines will be flexible enough to allow for individual expression but will also ensure an identifiable kinship of style among neighboring projects. Cultural guidelines will provide a comprehensive source of stories, histories, traditions, and practices that can inform projects. A premium will be placed on involving local practitioners and experts to ensure authenticity and to honor the sense of place of each ahupua'a.

Operational guidelines will be aligned with specific cultural and environmental attributes of the *ahupua'a*, and are planned to reflect the reciprocal relationships that exist between among men and between man and the natural environment.

Consistent with traditional land management principles, plans call for a *Konohiki* or responsible person to ensure that each ahupua`a was healthy. Thus, as part of the overall cohesive and consistent management of each ahupua`a, a *Konohiki* could be identified in each *ahupua'a* with the *kuleana* to ensure that project operations are consistent with the attributes of *Tomorrow's Ahupua'a*. They are envisioned to be the eyes, ears, voices, and spirit of the comprehensive plan. The *konohiki* could guide operators, residents, visitors, and *kama'aina* toward a balanced use and stewardship of the *ahupua'a* lands. Together with representatives from each region within each *ahupua'a*, the *konohiki* could facilitate meaningful discussions and resolve any disputes that may arise. The *Konohiki* could engage groups from outside the project area *ahupua'a*, paying particular attention to the Kahuku Community Association and the Kupuna – currently represented by the Kahuku Burial Committee.

The *Konohiki* could also facilitate a continuous dialogue to ensure that issues and concerns that affect the entire community will be recognized and addressed, with the goal of balancing the well-being of the project area *ahupua'a* with the needs of the greater *moku*.

B

APPENDIX B:

UNILATERAL AGREEMENT

RECORDATION REQUESTED BY:
Takeyama and Sullivan
1188 Bishop Street, Suite 3404
Honolulu, Hawaii 96813
Tel: (808)526-2416

AFTER RECORDATION RETURN TO:
Takeyama and Sullivan
1188 Bishop Street, Suite 3404
Honolulu, Hawaii 96813
Tel: (808)526-2416

RETURN BY: MAIL( ) PICKUP (X)

BUREAU OF CONVEYANCES
AUG 12 1986
3:29

Agreement No. 5522.00

UNILATERAL AGREEMENT AND
DECLARATION FOR CONDITIONAL ZONING

THIS INDENTURE, made this 12th day of August 1986, by KUILIMA DEVELOPMENT COMPANY, whose principal place of business and post office address is 1001 Bishop Street, Pauahi Tower, Suite 1900, Honolulu, Hawaii 96813, hereinafter referred to as "Declarant" and the TRUSTEES UNDER THE WILL AND THE ESTATE OF JAMES CAMPBELL, DECEASED, acting in their fiduciary and not in their individual corporate capacities, whose principal place of business and post office address is 828 Fort Street, Honolulu, Hawaii 96813, the recorded owners of certain parcels of land situated in Kahuku, Koolauloa, Oahu and more particularly described in Exhibit I, attached hereto and incorporated herein.

W I T N E S S E T H:

WHEREAS, the City Council of the City and County of Honolulu, State of Hawaii, hereinafter referred to as "Council", pursuant to the provisions of Ordinance No. 4300, Bill No. 167 (1973), relating to conditional zoning, is considering a change

EXHIBIT A

in zoning from R-6 Residential, AG-1 Restricted Agricultural, P-1 Preservation, A-1 Low-Density Apartment and H-1 Resort Hotel Districts to P-1 Preservation, H-1 Resort Hotel and B-1 Neighborhood Business Districts. The subject lands are shown on the map marked Exhibit II, attached hereto and incorporated herein, and are described as Tax Map Keys 5-6-03: 37, Por. 40, Por. 41, Por. 42, 43, Por. 44; 5-7-01: 1, Por. 13, Por. 16, Por. 17, 20, Por. 22, 30, Por. 31, Por. 33; 5-7-03: 1-25, Por. 26, 27-30, 69, Por. 72, 73-75; 5-7-08: 1-17, 19, 21, as those lands are more particularly described in said Exhibit I; and

WHEREAS, a public hearing regarding the change in zoning was held by the Council on July 9, 1986; and

WHEREAS, Declarant has willingly, independently and concurrently agreed to the following conditions; and

WHEREAS, the Council recommended by its Planning and Zoning Committee Report that the said change in zoning be approved, subject to the following conditions:

1. The Declarant shall submit a plan for phasing the development of the water system for the resort to the Manager of the Board of Water Supply and the Director of the Department of Land Utilization for their approvals and shall receive those approvals prior to the issuance of subdivision approvals and building permits. Subject to the approval of the Board of Water Supply, this plan may be modified as necessary. The necessary water source, reservoir and distribution facilities shall be installed in conformance with the plan that has been approved by the Board of Water Supply, at the Declarant's cost.

2. Declarant shall submit a plan for phasing the development of the wastewater system for the resort to the Department of Public Works for its approval and receive its approval prior to the issuance of subdivision approvals and building permits. This plant shall be built to a capacity of a minimum of 1.3 million gallons per day and shall include any improvements that may be required to cause full compliance with all Federal, State and City and County of Honolulu laws, including any rules and regulations. Subject to the approval of the Department of Public Works, this plan may be modified as necessary. The wastewater system shall be installed pursuant to this plan, at Declarant's cost.

3. Development of the project shall generally be based on the submitted schedule, identified as Exhibit III, attached hereto and incorporated herein. Development may deviate from this schedule due to the occurrence of changed economic conditions, lawsuits, strikes or other unforseen circumstances. A minimum of fifty-one percent (51%) of the 4,000 resort units shall be operated as full service hotel units. The existing Turtle Bay Hilton containing 487 units is to be included in the 4,000 resort unit count.

4. The Declarant shall provide low-moderate income housing opportunities within or outside of the project site for residents living in the Koolauloa and North Shore region by constructing and offering for sale, in cooperation with the city Department of Housing and Community Development, a number of dwelling units equal to ten percent (10%) of the number of dwelling units not a

part of a full service hotel operation to be constructed on the property as a result of this zoning action. The sales units must be available to buyers earning less than eighty percent (80%) of the current median household income, adjusted for family size, for the City and County of Honolulu. The Declarant may work with the Department of Housing and Community Development in the expedited governmental approval process and planning waivers which may be permitted under City and State ordinances, laws and rules and regulations.

5. Declarant shall provide the following public amenities:

a. Four parks shall be provided - a four and eight-tenths (4.8) acre park fronting Kawela Bay (Park P-1 on Declarant's master plan); a thirty-seven (37) acre park located from Kahuku Point to the eastern boundary of Hanaka'ilo Beach (Park P-2 on Declarant's master plan); a six (6) acre park abutting Punahoolapa Marsh (Park P-3 on Declarant's master plan); and a two (2) acre park located in the area surrounding the outlet for East Kain Drain (Park P-4 on Declarant's master plan). The shoreline park areas shall be linked, with the exception of the shoreline by the existing Turtle Bay Hilton, by a continuous shoreline easement, which will be linked to the five pedestrianway easements and the easement to Kalokoiki Beach (Kuilima Cove), as set forth herein:

b. Public park sites shall be dedicated to the city in compliance with park dedication requirements. The park to be located at Kawela Bay shall be graded, grassed, and provided with a sprinkler system and all related off-site improvements. In addition to the minimum park dedication requirements, Declarant,

at its cost, shall also provide public parking facilities and a comfort station containing restrooms and showers, at the Kawela Bay park site, in coordination with the Department of Parks and Recreation.

Upon Declarant's receipt of its first building permit for development of the first hotel to be built at the resort, Declarant shall record a document with the Bureau of Conveyances of the State of Hawaii which dedicates the Kawela Bay park site to the City and County of Honolulu. The document dedicating the park site shall provide that public use of the park area shall become effective, and improvement of the park, shall be completed, upon the issuance of a certificate of occupancy by the Building Department of the City and County of Honolulu for the first hotel to be constructed at the resort as a result of this zoning action; and shall reserve Declarant's right to manage and control the park site in the time period prior to issuance of the certificate of occupancy.

c. Upon Declarant's receipt of its first building permit for development of the first hotel to be built at the resort, Declarant shall record a document with the Bureau of Conveyances of the State of Hawaii which dedicates park P-2, said park being located at Kahuku Point as designated on Declarant's master plan, to the City and County of Honolulu. The document dedicating the park site shall provide that: (1) offsite improvements leading to the park will not be improved or provided until final subdivision approval for the condominiums to be built in Phase III is granted; (2) public use of this park site shall become effective

upon said subdivision approval; and (3) Declarant reserves the right to control and manage the park site prior to said subdivision approval.

Prior to said subdivision approval Declarant shall also: (1) record a document with the Bureau of Conveyances of the State of Hawaii which provides permanent access for the public to park P-2. Declarant shall obtain and provide this access at its own cost; and (2) provide the following improvements for the park site - one full comfort station with shower facilities; full improvements up to the boundary of the park; a coral surface parking lot providing parking for a minimum of thirty automobiles.

d. The parks to be located adjacent to Punahoolapa Marsh and the East Main Drain outlet shall be privately-owned and maintained. These parks shall be open for use by the general public. Declarant will work with the U.S. Fish and Wildlife Service to implement improvements to the marsh that will enhance the marsh ecosystem. Improvements shall be made pursuant to a plan that has been approved by the U.S. Fish and Wildlife Service;

e. A series of publicly-owned and privately-maintained easements encompassing a minimum of twenty-six (26) acres of land shall be provided along and to the shoreline and shall be open to use by the general public. These easements shall be established in the public's favor, in perpetuity, in the following manner:

(1) Upon Declarant's receipt of its first building permit for development of the first hotel to be built at the resort, Declarant shall record a document with the Bureau of Conveyances

of the State of Hawaii which establishes easements in the public's favor, running with the land, covering: the land area extending one hundred (100) feet inland from the certified shoreline (hereinafter "shoreline easement area"), in the general areas designated on the map identified as Exhibit IV, attached hereto and incorporated herein; the right of way connecting a parking lot that will be located adjacent to the existing parking lot at the Turtle Bay Hilton to Kalokoiki beach (hereinafter "Kalokoiki easement"); and the right of way connecting Turtle Bay and Kaihalulu beach through the existing Turtle Bay Hilton site (hereinafter "Turtle Bay Hilton easement");

(2) Upon Declarant's receipt of its first building permit for major building development on a parcel that is adjacent to or that contains the following easements, Declarant shall record a document with the Bureau of Conveyances of the State of Hawaii which establishes easements in the public's favor, running with the land, covering: the five rights of way that extend from adjacent parking areas to the shoreline easement area, in the general locations designated as Exhibit IV, attached hereto, providing one pedestrianway to Kawela Bay, two pedestrianways to Turtle Bay, and two pedestrianways to Kaihalulu beach (Kuilima Bay) (hereinafter "pedestrianway easements");

(3) The document establishing the the shoreline easement area shall contain the following provision - "The one hundred (100) foot wide shoreline easement area is to maintain open space along the shoreline for the use and enjoyment of the general

public, guests at the resort and resort condominium owners. Management of the use of this area will make no distinctions between resort guests and resort condominium owners, and the general public, and shall at a minimum, allow sunbathing, picnicking, swimming and walking in this area, except where not permitted for safety purposes";

(4) The documents establishing the shoreline easement area and the pedestrianway easements shall provide that public use of each easement shall become effective, and improvement of each easement area shall be completed, upon the issuance of a certificate of occupancy by the Building Department of the City and County of Honolulu for a parcel that is adjacent to or that contains one of these easements;

(5) The documents establishing the Kalokoiki easement and the Turtle Bay Hilton easement shall provide that public use of these easement areas shall become effective, and improvement of these easement areas shall be completed, upon development of the portion of the resort's major internal roadway that fronts the Turtle Bay Hilton area;

(6) The documents establishing the easements referred to herein, shall also establish a means for Declarant, its successors and assigns, and subsequent grantees to maintain the easement areas encumbered thereto, with said maintenance to be required at the time that public use of each of the easement areas becomes effective;

(7) The five pedestrianway easements shall be fifteen feet wide, and shall contain restroom and shower facilities. Each pedestrianway easement shall be located adjacent to a public

parking area containing eighteen (18) parking stalls, which shall provide parking free of charge to the public;

(8) Improvements in the easement areas shall accommodate public access, and signage shall be installed to facilitate such access.

5. Public parking at each of the parking areas for the public pedestrianway easements shall be free of charge. Employees shall be prohibited from parking in these public parking areas. Each of the hotel/condominium areas shall contain parking areas for its employees.

6. Historic and archaeological sites located within the subject property which are identified by the State and/or subsequent archaeological assessment shall be treated in accordance with recommendations made by the State Historic Preservation Officer of the Department of Land and Natural Resources.

Prior to the issuance of grading permits, the Declarant shall submit a Data Recovery Plan to the State Historic Preservation Officer, and shall obtain approval of the plan. The State Historic Preservation Officer shall also be made aware of sites not yet identified on the property, which may be discovered during grading and construction. The Officer shall determine whether these sites require preservation, relocation, mitigation, or further study.

Declarant shall submit its completed archaeological findings to the State Historic Preservation Officer for review and comment before commencing with the proposed development of the property.

Declarant shall comply with the State Historic Preservation Officer's recommendations in implementing Declarant's archaeological plan.

Above-ground archaeological features present within the project area will be relocated by the applicant to site(s) within the resort. Human remains that have been uncovered or that may be uncovered during the course of this project shall be disinterred, relocated to an alternative site(s) within the resort, and reinterred in accordance with the relevant provisions of Chapter 338, Hawaii Revised Statutes, as amended, and in compliance with requirements of the State Department of Health.

7. A development implementation plan related to the proposed roadway modifications, shall be approved by the Director of the Department of Land Utilization in consultation with the City Department of Transportation and the State Department of Transportation, prior to tentative subdivision approval. Improvements which will be phased throughout the development of the entire project, and which will be implemented at the Declarant's cost, include the following items:

a) Channelizing the intersection of West Kuilima Drive and Kamehameha Highway;

b) Constructing left-turn storage and deceleration lanes on Kamehameha Highway at Kuilima and West Kuilima Drives;

c) Upgrading the intersection of Kamehameha Highway and Kahuku Airport Road (Marconi Road) with left-turn storage and deceleration lanes on Kamehameha Highway;

d) Signalizing Kamehameha Highway at Kahuku Airport Road and at West Kuilima Drive.

a) Providing a total of six bus turnouts along the portion of Kamehameha Highway fronting the resort. The bus turnouts shall be located near each of the entrances to the resort, on both sides of Kamehameha Highway.

All roadways and intersections within the Turtle Bay Resort expansion project to be dedicated to the City and County shall be designed in accordance with City and Federal standards for City roadways and State and Federal standards for improvements along Kamehameha Highway. All major roadways to be constructed by the Declarant, as reflected on Exhibit IV, whether private or public, shall be open to the public. Kahuku Airport Road (Marconi Road) shall be open to the public.

Declarant shall minimize the use of automobiles by visitors at the resort by implementing alternative transportation modes which may include the following: shuttle service between Honolulu International Airport and Waikiki to the resort area; shuttle service or expanded MTL operations to accommodate resort visitor trips to and from the Polynesian Cultural Center and Haleiwa; jitney service within the resort.

The Declarant and its successors or assigns, shall provide transportation services, at a reasonable cost to employees, for employees commuting to and from the resort. The employee transportation service shall pick up and drop off employees at specified points in the areas from Kaleiwa to Kawela. This area of service may be modified by, and with the approval of, the State Department of Transportation, upon the request of Declarant, its successors or assigns. The employee

transportation service shall be established at the completion of Phase II of the resort, set forth in Exhibit III attached hereto.

The resort association shall work, in conjunction with the State Department of Transportation, to coordinate the transportation needs of the guests and employees of the resort.

B. An overall urban design plan and landscape plan for the resort shall be submitted to and approved by the Department of Land Utilization prior to tentative subdivision approval or issuance of building permits. In addition, at each phase of development, the Declarant shall submit site plans and preliminary architectural drawings for the development to the Department of Land Utilization for review and approval to insure that the urban design objectives set forth herein, are adhered to.

Specific design standards that shall be complied with, but which shall not be applied to the existing Turtle Bay Hilton and the Kuilima East and West condominiums, include the following:

a. General height limits shall be as provided in Section 1.c. of the Koolauloa Development Plan, as amended (Ordinance 85-50).

b. All structures shall generally be set back a minimum distance of three hundred (300) feet inland from the certified shoreline. Structures located between one hundred (100) feet and three hundred (300) feet inland from the certified shoreline will be subject to design review and approval by the Department of Land Utilization.

c. No structure shall be located between the certified shoreline and one hundred (100) feet inland of the certified

shoreline, with the following exceptions: pedestrian bridges, pedestrian walkways, or other access improvements; drainage-related improvements; park benches, showers or other structures that may be required by State or Federal agencies. In no event shall any concession or comfort station be located between the certified shoreline and one hundred (100) feet inland of the certified shoreline.

d. Structures in the parcels fronting Kawela Bay and Kawela Point fronting Turtle Bay over fifty (50) feet in height shall be set back a minimum distance of three hundred (300) feet inland from the certified shoreline.

e. For each increment fronting Kawela Bay and Kawela Point fronting Turtle Bay that is located between one hundred (100) feet and three hundred (300) feet from the shoreline, there shall be a maximum building to land coverage ratio of ten percent (10%) of the land area makai of the three hundred (300) foot line to the property line and buildings shall have staggered heights with a maximum height of fifty (50) feet. The percentage of any given section shall not be clustered.

9. General architectural and design goals that the resort will strive to achieve include following:

a. The general architectural character of the resort will be similar to that of a "kamaina estate" - displaying hospitality and elegance, overlaid with fundamental simplicity and timelessness.

b. The resort will strive to implement extensive, lush landscaping to enhance the estate-like quality of the low density

buildings, and to provide a sense of visual continuity throughout the resort. Existing ironwood trees, and other existing vegetation will be preserved and incorporated into the landscaping scheme where possible.

c. The public walkway that provides access throughout the shoreline easement area will be configured in an undulating line throughout the easement area.

d. Each of the public pedestrianways to the shoreline, with the exception of the pedestrianway to Kalokoiki beach, will be approximately fifteen (15) feet wide, and will contain a slightly undulating walkway to allow for plantings of coconut trees.

10. Declarant shall comply with all of the conditions set forth in the Findings of Fact, Conclusions of Law and Decision and Order of the State Land Use Commission, dated March 27, 1986, in relation to the approval of the district boundary amendment for Kuilima Development Company, as the same may be amended from time to time.

11. Declarant shall establish a child care center with applicable resources and/or service providers within the region, and shall dedicate approximately one-half acre of land within or outside of the project site to the North Shore Career Training Corporation for the purpose of establishing a child care center to service children of employees of the resort. Declarant's proposal for the child care center shall be reviewed and approved by the Kuilima North Shore Strategy Planning Committee and the City and County of Honolulu's Office of Human Resources prior to completion of the first hotel.

12. Declarant shall establish an employment program for residents of surrounding communities in coordination with applicable resources and/or service providers in the region. Declarant's proposed employment program shall be reviewed and approved by the Kuilima North Shore Strategy Planning Committee.

Declarant shall contribute a minimum of Five Hundred Thousand Dollars ($500,000.00) towards the establishment and implementation of the employment program that has been approved.

Payments shall be made to a community-based non-profit, charitable corporation or association, or governmental body, as determined by Declarant and the Office of Human Resources. Payments shall be made in the following manner:

Annual payments in the amount of ONE HUNDRED TWENTY-FIVE THOUSAND DOLLARS ($125,000.00), payable in increments over the course of one year, for four (4) years, with the first payment to be made upon the granting of Declarant's requested zone change, and with subsequent payments payable on the first day of each successive year thereafter.

13. Declarant shall use its best efforts to perpetuate, work with, and obtain input from the Kuilima North Shore Strategy Planning Committee, throughout the development of the resort.

14. Declarant shall use its best efforts to promote the creation of a Marine Life Conservation District at Kawela Bay.

NOW, THEREFORE, Declarant hereby makes the following Declaration:

A. This Declaration is made pursuant to the provisions of Ordinance No. 4300, Bill No. 167 (1973), relating to conditional zoning. This Declaration shall become fully effective on the effective date of the zoning ordinance approving the change of zoning from A-2 Residential, AG-1 Restricted Agricultural, P-1 Preservation, A-1 Low-Density Apartment and H-1 Resort Hotel Districts to P-1 Preservation, H-1 Resort Hotel and B-1 Neighborhood Business Districts for the land described in said Exhibit 1; and

B. Development of said parcels by Declarant shall conform to the aforesaid conditions with the understanding that, at the request of Declarant, and upon the satisfaction of the condition(s) set forth in this Unilateral Agreement, the Department of Land Utilization may fully or partially release any of the foregoing conditions that have been fulfilled; and

C. That the conditions imposed are reasonably conceived to fulfill public service demands created by the requested zoning and rationally relate to the objective of preserving the public health, safety and general welfare and the further imposition of the General Plan of the City and County of Honolulu.

AND IT IS EXPRESSLY UNDERSTOOD AND AGREED that the conditions imposed in this Declaration shall run with the land and shall bind and constitute notice to all subsequent lessees, grantees, mortgagees, lienors, successors and assigns, and any other persons who claim an interest in the land, and the City and

County of Honolulu of the State of Hawaii shall have the right to enforce this Declaration by appropriate action at law or suit in equity against all such persons. Changes or alterations of conditions shall be processed in the same manner as petitions for zone changes.

UNILATERAL AGREEMENT AND
DECLARATION FOR CONDITIONAL ZONING
for Kuilima Development Company

IN WITNESS WHEREOF, the parties hereto have executed this agreement on the day and year first above written.

KUILIMA DEVELOPMENT COMPANY,
a Hawaii general partnership
By: PIC Realty Corporation

By _____
Its:

By _____
Its:

Trustees Under the Will and
the Estate of James Campbell,
deceased, acting in their
fiduciary and not their
individual corporate capacities

P.R. CASSIDAY, INC.

By _____
Its:

H.C. COONUELLE, INC.

By _____
Its:

(7) U? TG-283597
RECORDATION REQUESTED BY:

TITLE GUARANTY ESCROW SERVICES, INC.

AFTER RECORDATION, RETURN TO:

Title Guaranty Escrow

RETURN BY: MAIL ( ) PICKUP (X)

86-189713

22730 23

SPACE ABOVE THIS LINE FOR REGISTRAR'S USE

AMENDMENT TO UNILATERAL AGREEMENT

This Amendment to Unilateral Agreement ("Agreement") made this ___ day of December, 1989, by and between F. E. TROUTMAN, INC., W. M. MCVAY, INC., F. M. CARDIMAN, INC. and M. C. COMPOSELLO, INC., all Hawaii professional corporations, the duly appointed, qualified and acting TRUSTEES UNDER THE WILL AND OF THE ESTATE OF JAMES CAMPBELL, DECEASED, acting in their fiduciary and not in their individual corporate capacities, whose place of business and post office address is Suite 500, 828 Fort Street Mall, Honolulu, Hawaii 96813, ("Estate") and KULIMA RESORT COMPANY, a Hawaii general partnership, whose place of business and post office address is 1001 Bishop Street, Suite 2000, Honolulu, Hawaii 96813, ("KRC"):

RECITALS:

1. On or about August 12, 1988 and September 15, 1988, Kulima Development Company, a Hawaii registered general partnership ("KDC"), as "Declarant", and Estate entered into that certain Unilateral Agreement and Declaration for Conditional Zoning ("Unilateral Agreement"), which Unilateral Agreement was recorded in the Bureau of Conveyances of the State of Hawaii in Liber 19798, Page 709 and filed in the Office of the Assistant Registrar of the Land Court of the State of Hawaii as Document No. 1402662.

2. Under the Unilateral Agreement, KDC made certain Declarations relevant to certain lands located at Kuilima, Oahu, Hawaii ("Resort Lands").

3. KDC subsequently assigned its interests in the Resort Lands together with certain other interests to KRC.

4. KRC and Estate now desire to subject certain additional lands as more fully described on Exhibit A attached hereto and incorporated herein ("Additional Lands") to the Unilateral Agreement.

NOW, THEREFORE, for good and valuable consideration, the receipt and sufficiency of which is mutually acknowledged, KRC and Estate do hereby acknowledge and agree that the

Additional Lands are and hereafter shall be subject to the Unilateral Agreement.

IN WITNESS WHEREOF, the parties hereto have executed this agreement on the day and year first above written.

MAUNA KEA RESORT COMPANY,
a Hawaii general partnership

By Amfac Plans Hawaii, Inc.,
a Hawaii corporation,
its General Partner

By _____
Its Vice President

By A.J. Plans Hawaii Co., Ltd.,
a Hawaii corporation,
its General Partner

By _____
Its Vice President

"GRANTEE"

THE TRUSTEES UNDER THE WILL AND OF THE ESTATE OF JAMES CAMPBELL, DECEASED, acting in their fiduciary and not in their individual corporate capacities

F. S. TROUTER, INC.

By _____
Its President

W. H. MOVAY, INC.

By _____
Its President

F. H. CARDIDAY, INC.

By _____
Its President

H. C. CORNUELLE, INC.

By _____
Its President

"GRANTOR"

STATE OF HAWAII)
) SS:
CITY AND COUNTY OF HONOLULU)

On this 24th day of December, 1988 before me appeared F. S. TROUTER, W. H. MOVAY, F. H. CARDIDAY and H. C. CORNUELLE, to me personally known, who, being by me duly sworn, did say that F. S. TROUTER, W. H. MOVAY, F. H. CARDIDAY and H. C. CORNUELLE are President, sole shareholder and sole director of F. S. TROUTER, INC., W. H. MOVAY, INC., F. H. CARDIDAY, INC. and H. C. CORNUELLE, INC., respectively, Hawaii professional corporations and Trustees under the Will and of the Estate of James Campbell, Deceased; that the foregoing instrument was signed by each of the persons listed as appearing before me in the respective capacity as President of a Hawaii professional corporation which is a Trustee; that said corporations are corporations without seals; that the President of each and every corporation which is a signatory hereto acknowledged that the aforesaid instrument was signed on behalf of said corporation with the authority of the sole shareholder and director and as the free act and deed of said corporation as such Trustee.

Notary Public
State of Hawaii

My Commission Expires: 3/6/90

STATE OF HAWAII)
) SS.
CITY AND COUNTY OF HONOLULU)

On this 28th day of December, 1988 before me personally appeared Takashi Ito, to me known, who, being by me duly sworn, did say that he is the Vice President of KAANAPALI PLAZA HAWAII, INC., a Hawaii Corporation; that KAANAPALI PLAZA HAWAII, INC. is a general partner of BUILDING RESORT COMPANY, a Hawaii registered general partnership; that the foregoing instrument was executed in the name of and on behalf of said corporation, as general partner of and on behalf of said partnership; that the seal affixed to the foregoing instrument is the corporate seal of said corporation; that said instrument was signed and sealed in behalf of the corporation by authority of its Board of Directors and that said officer acknowledged said instrument to be the free act and deed of said corporation, as said general partner of said partnership.

Rita Simplicio
Notary Public, State of Hawaii

My Commission expires: 8-21-92

STATE OF HAWAII)
) SS.
CITY AND COUNTY OF HONOLULU)

On this 28th day of December, 1988 before me personally appeared Takashi Ito, to me known, who, being by me duly sworn, did say that he is the Vice President of A. J. PLAZA HAWAII CO., LTD., a Hawaii corporation; that A. J. PLAZA HAWAII CO., LTD., is a general partner of BUILDING RESORT COMPANY, a Hawaii registered general partnership; that the foregoing instrument was executed in the name of and on behalf of said corporation, as general partner of and on behalf of said partnership; that the seal affixed to the foregoing instrument is the corporate seal of said corporation; that said instrument was signed and sealed in behalf of the corporation by authority of its Board of Directors and that said officer acknowledged said instrument to be the free act and deed of said corporation, as said general partner of said partnership.

Rita Simplicio
Notary Public, State of Hawaii

My Commission expires: 8-21-92

PARCEL 1

All of that certain parcel of land situate at Kahuku, District of Koolauloa, City and County of Honolulu, State of Hawaii, being Lot 598, area 0.202 acre, as shown on Map 26 filed in the Office of the Assistant Registrar of the Land Court of the State of Hawaii with Land Court Application No. 1095 of the Trustees under the Will and of the Estate of James Campbell, deceased, and as described in Transfer Certificate of Title No. 214,127 issued to Sullivan Resort Company, a registered general partnership.

Oahu TMK: 5-2-3-72

PARCEL 2

All of those certain parcels of land designated as the Sewage Treatment Plant site on Schedule E attached to that certain Indenture dated June 9, 1988, filed as Document No. 1555355, and recorded in Liber 22001, Page 457 (the "Fifth Amendment") of that certain Lease dated November 21, 1969, by and between the Trustees under the Will and of the Estate of James Campbell, deceased, as lessor, and Del E. Webb Corporation, an Arizona corporation, and Fin Realty Corporation, a Delaware corporation, doing business as Investment Development Company, a joint venture, as Lessee, filed as Document No. 457500, and recorded in Liber 6867, Page 183, and noted on Original Certificate of Title No. 17,854, and Del) No. 136 on Schedule F attached to the Fifth Amendment, being portions of a parcel of land situate at Kahuku, District of Koolauloa, City and County of Honolulu, State of Hawaii, described as follows:

Lot 327-A, as shown on Map 59 filed in said Office with Land Court Application No. 1095 of the Trustees under the Will and of the Estate of James Campbell, deceased. Being a portion of the land described in Original Certificate of Title No. 17,854 issued to the Trustees under the Will and of the Estate of James Campbell, deceased.

Oahu TMK: 5-7-1-31

PARCEL 3 (Sullivan Estates East)

All of that certain parcel of land situate at Kahuku, District of Koolauloa, City and County of Honolulu, State of Hawaii, described as follows:

Lot 561, area 14.865 acres, as shown on Map 68 filed in said Office with Land Court Application No. 1095 of the Trustees under the Will and of the Estate of James Campbell, deceased. Being a portion of the premises described in Original Certificate of Title No. 17,854 issued to the Trustees under the Will and of the Estate of James Campbell, deceased.

Oahu TMK: 5-7-1-27

PARCEL 4 (Additional Hotel Property)

All of those certain parcels of land situate at Kahuku, District of Koolauloa, City and County of Honolulu, State of Hawaii, described as follows:

(A) Lot 587, area 4.800 acres, and Lot 418, area 1.309 acres, as shown on Map 68 filed in said Office with Land Court Application No. 1095 of the Trustees under the Will and of the Estate of James Campbell, deceased. Being a portion of the premises described in Original Certificate of Title No. 17,854 issued to the Trustees under the Will and of the Estate of James Campbell, deceased.

Oahu TMK: 5-7-1-31

(B) Lot 468, area 0.414 acre, as shown on Map 68 filed in said Office with Land Court Application No. 1095 of the Trustees under the Will and of the Estate of James Campbell, deceased. Being a portion of the premises described in Original Certificate of Title No. 17,854 issued to the Trustees under the Will and of the Estate of James Campbell, deceased.

Oahu TMK: 5-7-1-28

(C) Lot 477, area 0.258 acre, as shown on Map 68 filed in said Office with Land Court Application No. 1095 of the Trustees under the Will and of the Estate of James Campbell, deceased. Being a portion of the premises described in Original Certificate of Title No. 17,854 issued to the Trustees under the Will and of the Estate of James Campbell, deceased.

Oahu TMK: 5-7-1-30

PARCEL 5 (Sullivan Estates West)

All of that certain parcel of land situate at Kahuku, District of Koolauloa, City and County of Honolulu, State of Hawaii, being Lot 412, area 17.324 acres, as shown on Map 68 filed in said Office with Land Court Application No. 1095 of the Trustees under the Will and of the Estate of James Campbell, deceased. Being a portion of the premises described in Original Certificate of Title No. 17,854 issued to the Trustees under the Will and of the Estate of James Campbell, deceased.

Oahu TMK: 5-7-1-29

PARCEL 6

All of that certain parcel of land designated as the Opana well site 1 on Schedule E attached to the Fifth Amendment, being a portion of a parcel of land situate at Kahuku, District of Koolauloa, City and County of Honolulu, State of Hawaii, described as follows:

Lot 9A; as shown on Map 513 filed in said Office with land Court Application No. 1295 of the Trustees under the Will and of the Estate of James Campbell, deceased. Being a portion of the premises described in Original Certificate of Title No. 17,554 issued to the Trustees under the Will and of the Estate of James Campbell, deceased.

Oahu TMK: 5-2-2-1

PARCEL 7

All of those certain parcels of land situate at Kahuku, District of Koolauloa, City and County of Honolulu, State of Hawaii, of the "KAHUKU TRACT SUBDIVISION" as shown on File Plan Number 1486, filed in the Bureau of Conveyances of the State of Hawaii, described as follows:

(A) Lot Number 7, area 0.235 acre, being a portion of the premises conveyed to Hollins Resort Company, a registered Hawaii general partnership by Deed dated June 3, 1980, recorded in Liber 15001, Page 100.

Oahu TMK: 5-7-5-72

(B) Lot Number 18, area 0.080 acre, being a portion of the premises described in Original Certificate of Title No. 17,854 issued to the Trustees under the Will and of the Estate of James Campbell, deceased.

Oahu TMK: 5-7-1-91

PARCEL 8

All of that certain parcel of land (being portion of the land described in and covered by Royal Patent Number 516, Land Commission Award 8559, Apana 2 to Kekai), situate, lying and being at Kawela, District of Koolauloa, City and County of Honolulu, State of Hawaii, being a PORTION OF EXCLUSION 1A, of Land Court Application No. 1095, and thus bounded and described as follows:

1.	S.	15° 30' E.	100.00	feet along the land of Pauloa;
2.	S.	74° 00' W.	32.80	feet along remnant of this award;
3.	N.	15° 30' W.	100.00	feet along Kaneohki;
4.	N.	74° 00' E.	32.80	feet to the initial point and containing an area of 3,280 square feet, more or less.

Being the premises described in Limited Warranty Deed by and between T. G. Exchange, Inc., a Hawaii corporation, as Grantor, and Hollins Resort

Company, a Hawaii general partnership, as Grantee, dated July 8, 1988, recorded in Liber 21174, Page 455.

5-7-5-68 (1)

PARCEL 9

All of that certain parcel of land (being all of the land described in and covered by Royal Patent Number 8005, Land Commission Award Number 2116, Apana 2 to Kekauai) situate, lying and being at Kahuku, District of Koolauloa, City and County of Honolulu, State of Hawaii, being EXCLUSION 17, and thus bounded and described:

Beginning at a pipe in concrete marked "PP" at the northeast corner of this piece of land, the true azimuth and distance from a pipe in concrete marked "PUHU" being 180° 2s' 1,118.80 feet, the coordinates of said point of beginning referred to Government Survey Triangulation station "PUHU" being 12,216.79 feet North and 3,442.99 feet West, and running by true azimuths measured clockwise from South:

1.	18°	00'	124.30	feet to a pipe in concrete marked "BB";
2.	108°	00'	124.30	feet to a pipe in concrete marked "BC";
3.	180°	00'	124.30	feet to a pipe in concrete marked "CD";
4.	280°	00'	124.30	feet to the point of beginning and containing an area of 1.00 acre, more or less.

Being a portion of the premises described in Original Certificate of Title No. 17,854 issued to the Trustees under the Will and of the Estate of James Campbell, deceased.

Oahu TMK: 5-7-1-13

C

APPENDIX C:

DRAFT SUPPLEMENTAL ARCHAEOLOGICAL INVENTORY SURVEY

DRAFT

SUPPLEMENTAL ARCHAEOLOGICAL INVENTORY SURVEY

TURTLE BAY RESORT

LANDS OF KAHUKU, PUNALAU, ULUPEHUPEHU, ʻŌIʻO, HANAKAʻOE, KAWELA AND ʻŌPANA

KOʻOLAULOA DISTRICT, ISLAND OF OʻAHU

(TMK: [1] 5-6-003: 033, 040, 041, 042, 043, 044, 048; 5-7-001: 001, 016, 017, 020, 022, 030, 031, 033, 037; and 5-7-006: 001, 002, 022, 023)

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Haun & Associates Report 822-081812

DRAFT

SUPPLEMENTAL ARCHAEOLOGICAL INVENTORY SURVEY

TURTLE BAY RESORT

LANDS OF KAHUKU, PUNALAU, ULUPEHUPEHU, ʻŌIʻO, HANAKAʻOE, KAWELA AND ʻŌPANA

KOʻOLAULOA DISTRICT, ISLAND OF OʻAHU

(TMK: [1] 5-6-003: 033, 040, 041, 042, 043, 044, 048; 5-7-001:001, 016, 017, 020, 022, 030, 031, 033, 037; and 5-7-006: 001, 002, 022, 023)

By:

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August 2012

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Management Summary

At the request of Turtle Bay Resort Development (TBR), Haun & Associates completed a Supplemental Archaeological Inventory Survey (SAIS) for the c. 840-acre resort property situated in Kahuku, Koʻolauloa District, Island of Oʻahu in conjunction with a Supplemental Environmental Impact Statement. The resort area spans seven traditional land divisions (Kahuku, Punalau, Ulupehupehu, ʻŌiʻo, Hanakaʻoe, Kawela, and ʻŌpana) and numerous (20) tax map parcels (TMK: [1] 5-6-003: 033, 040, 041, 042, 043, 044, 048; 5-7-001:001, 016, 017, 020, 022, 030, 031, 033, 037; 5-7-006:001, 002, 022, 023). The fieldwork was guided by a Supplemental Archaeological Inventory Survey Plan (SAIS) that was approved by the Department of Land and Natural Resources-State Historic Preservation Division (DLNR-SHPD).

Fieldwork consisted of a systematic pedestrian survey of undeveloped portions of the resort including the Kahuku Point Archaeological Preserve and seven subsurface testing areas (Test Areas A-G) where development is planned. Twenty-nine surface sites with 35 features were documented as a result of the pedestrian survey. Seven future development areas also were subjected to systematic, mechanical excavation of 345 trenches.

The SAIS Plan made predictions regarding expected site types based on previous archaeological research and historical documentary evidence. As expected, prehistoric to early historic remains documented in the project area include subsurface cultural deposits and subsurface features including a house floor, fire pit, post mold, and burials. Also as expected, historic remains dating to the 1800s to 1900s were documented including the OR&L railroad, and at least one probable Kahuku Ranch-related wall. Other expected sites are the extensive WW II military-related remains of Kahuku Army Airfield including the main runway, revetments, defensive fortifications and a variety of support facilities.

The 39 sites identified during the project consist of 29 surface sites with 35 features and ten subsurface sites with 11 features. The surface features consist of concrete structures, concrete blocks, concrete slabs, asphalt pavements, artifact scatters and one each of the following: transit bus, concrete cylinder, a pair of metal gateposts, metal tank, railroad grade, revetment, stone mound and wall. Subsurface trenching and test excavations documented ten subsurface sites. Human remains were identified in three locations; two *in situ* burials and a secondarily deposited human metatarsal. Feature function includes antenna support, foundation, habitation, gun position, transportation, burial, trash disposal, storage, and several miscellaneous functions.

The 39 sites are all assessed as significant under Criterion "d". The sites have yielded information important for understanding prehistoric and historic land use in project area. One site is assessed as significant under Criterion "c" as good site type example of a defensive feature associated with Kahuku Army Airfield. Three sites are additionally assessed as significant under Criterion "e" because human burials of probable Hawaiian ancestry are present.

Mapping, written description and photography at 16 sites provide adequate documentation and no further work or preservation is recommended. Treatment of the human remains at two sites, and a third site where data recovery is also proposed for the non-burial portion, will be determined by the Oʻahu Island Burial Council in consultation with the Kahuku Burial Committee, other SHPD-recognized lineal or cultural descendants, and TBR. The determination process will require preparation of a Burial Treatment Plan.

Thirteen sites are recommended for preservation. Measures to protect the non-burial sites recommended for preservation would be described in an Archaeological Site Preservation Plan prepared for DLNR-SHPD review and approval. The eight remaining sites and the non-burial portion of another site retain the potential to yield information important for understanding prehistoric and early historic land use. These sites are recommended for data recovery. The plans for data recovery would be detailed in a Data Recovery Plan prepared for DLNR-SHPD review and approval.

It is also recommended that all ground disturbing activities within the project area be monitored by an archaeologist. The extent and nature of this monitoring activity would be described in an Archaeological Monitoring Plan prepared for DLNR-SHPD review and approval.

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INTRODUCTION

At the request of Turtle Bay Resort Development, Haun & Associates completed a Supplemental Archaeological Inventory Survey (SAIS) for the c. 840-acre resort property situated in Kahuku, Koʻolauloa District, Island of Oʻahu (*Figure 1*). The resort area spans seven traditional land divisions (Kahuku, Punalau, Ulupehupehu, ʻŌiʻo, Hanakaʻoe, Kawela, and ʻŌpana) and numerous (20) tax map parcels (TMK: [1] 5-6-003: 033, 040, 041, 042, 043, 044, 048; 5-7-001:001, 016, 017, 020, 022, 030, 031, 033, 037; 5-7-006:001, 002, 022, 023 – *Figure 2* and *Figure 3*).

The SAIS fieldwork was guided by a Plan for Supplemental Archaeological Inventory Survey (Haun *et al.* 2011). The plan was reviewed and approved by the DLNR-SHPD on December 12, 2012 (Letter from Pua Aiu to Alan Haun, Log No. 2011.3197, Doc. No. 1112PA02 – ***Appendix A***).

The SAIS fieldwork was conducted between December 5, 2011 and February 3, 2012 under the direction of Principal Archaeologist Alan Haun, Ph.D. Approximately 165 days of labor were required to complete the fieldwork portion of the project. This SAIS report was prepared in accordance with the requirements for an archaeological inventory survey report detailed in Hawaiʻi Administrative Rules (HAR) §13-13-276-5. This report contains a description of the project area, a summary of previous archaeological work within the Turtle Bay Resort, the SAIS Plan research design that guided the fieldwork, the surface and subsurface findings from the project and a conclusion section containing significance assessments of the sites with recommended treatments. Historical documentary research and archaeological background sections from the SAIS Plan are omitted from this report in conformance with HAR §13-276-5(b)(3).

Turtle Bay Resort

Turtle Bay Resort (TBR) is currently owned and operated by Turtle Bay Resort LLC. The resort was constructed in the early 1970s by casino developer Del Webb and opened its doors in May 1972 as the Kuilima Resort and Country Club. Hyatt Hotels operated the resort in the mid-1970s. Hilton Hotels and Resorts purchased it in August 1983 and renamed it The Turtle Bay Golf and Tennis Resort.

Today the resort encompasses the Turtle Bay Hotel located at Kuilima Point, the adjacent Ocean Villas and Beach Cottages, the Kuilima Estates development, restaurants, beachside amenities, two 18-hole golf courses, a clubhouse, ten tennis courts, several swimming pools, a horseback riding facility and parking lots (*Figure 4*). Access to the resort is from Kamehameha Highway via Kuilima Drive. The proposed resort expansion plans includes two hotels, 590 resort residential units, 160 affordable housing units and additional parks, shoreline setback areas and public shoreline access.

Summary of TBR Archaeological Studies

The Bernice Pauahi Bishop Museum (BPBM) conducted the first systematic archaeological survey of all undeveloped TBR property (649 acres) in 1977 for Prudential Insurance Company (Dye 1977). This pedestrian survey was followed by a series of subsurface testing projects conducted by Paul H. Rosendahl, Ph.D. Inc. (PHRI) in the mid-1980s. Beginning in 1984, PHRI (Bath *et al*. 1984) conducted a subsurface reconnaissance survey of thirteen areas throughout the resort property including further investigation of subsurface deposits initially identified by Dye. The initial reconnaissance testing project was followed by three intensive subsurface testing projects conducted in 1986 that focused on cultural deposits identified by Bath *et al.* at Kawela Bay (Walker *et al.* 1988a), Kahuku Point (Walker *et al*. 1988b), and Punahoʻolapa Marsh (Davis *et al.* 1986).

In 1987, PHRI prepared an archaeological Data Recovery Plan (DRP; Walker *et al*. 1987) to mitigate the effect of resort expansion on archaeological sites at Kawela Bay, Kahuku Point, and Punahoʻolapa Marsh. The Plan was incorporated into a Memorandum of Agreement (MOA) executed in 1988 by the U.S. Army Corp of Engineers – Honolulu District (COE), the Hawaiʻi State Historic Preservation Department (SHPD) Officer, the Office of Hawaiian

Figure 1. Portion of 1998 USGS Kahuku Quadrangle showing project area

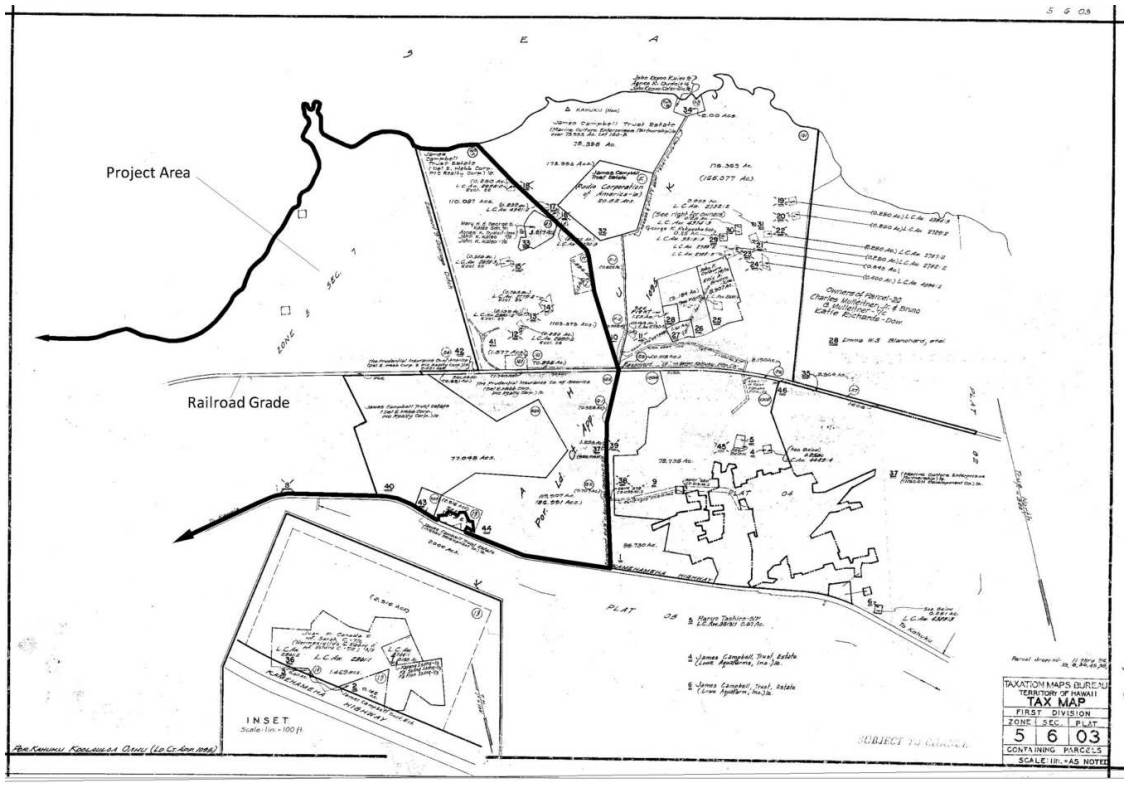


Figure 2. Tax Map Key 5-6-03 showing portion of project area

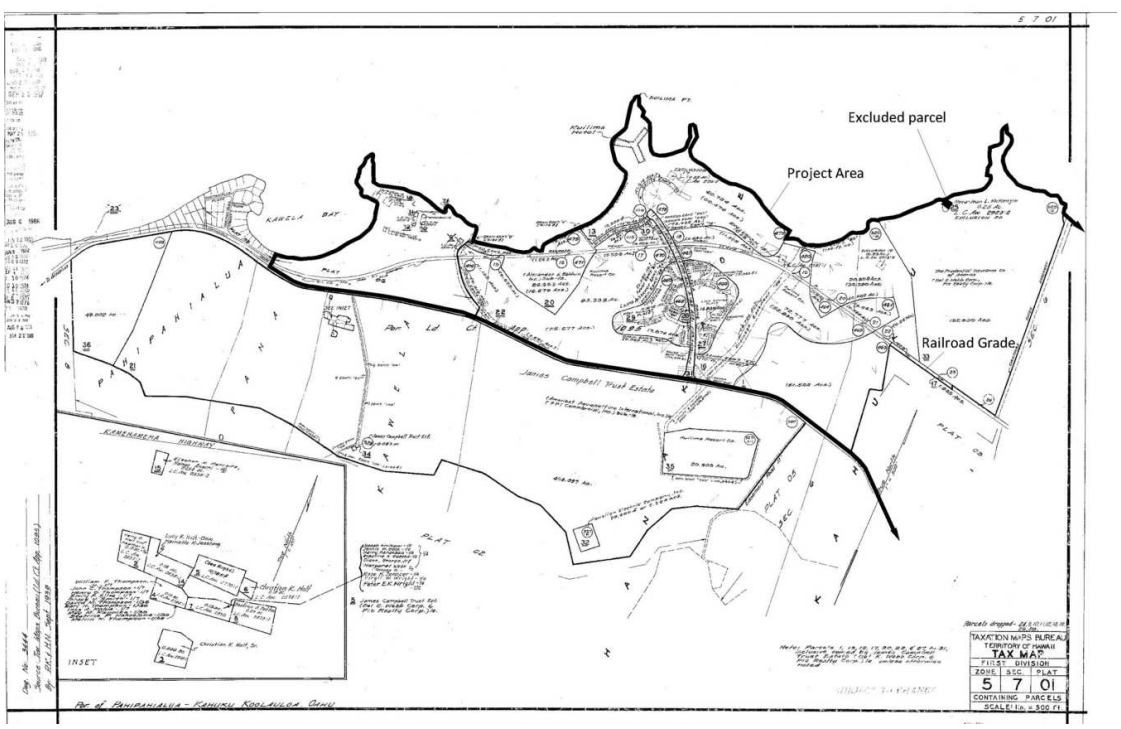


Figure 3. Tax Map Key 5-7-1 showing portion of project area

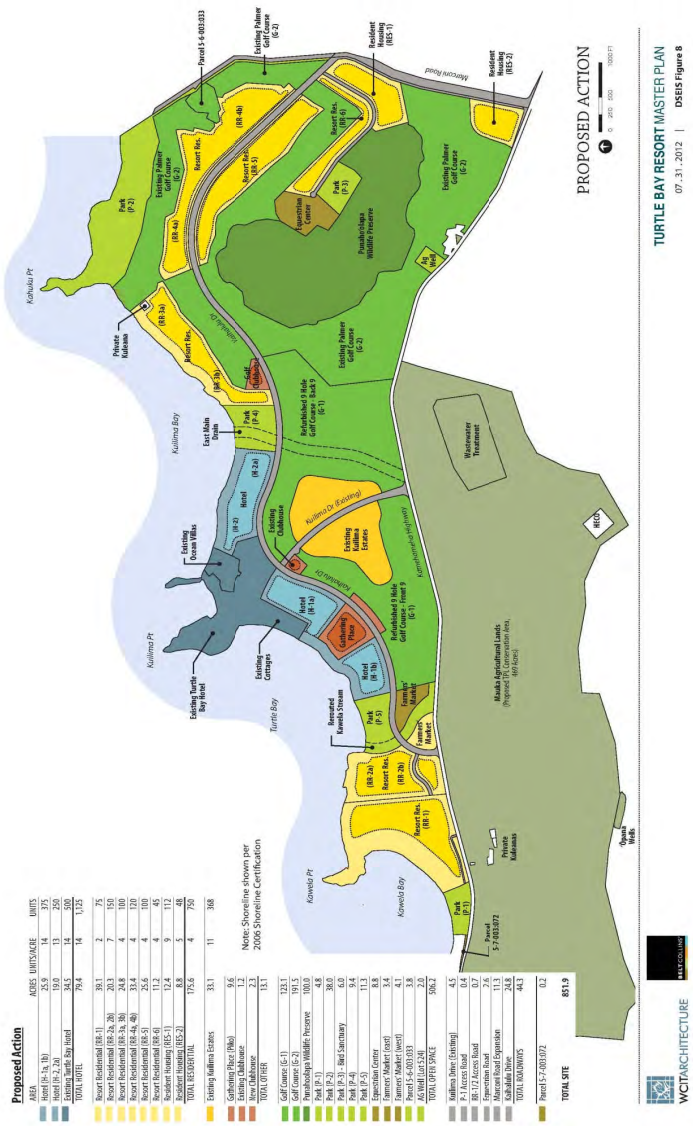


Figure 4. Turtle Bay Master Plan

Affairs (OHA), the Advisory Council on Historic Preservation (ACHP), and the City and County of Honolulu (CCHONO). In addition to implementation of the DRP, the MOA required development and implementation of plans for archaeological monitoring and for burial disinterment and reburial. PHRI prepared the plans for monitoring and burial treatment (Jensen 1989) that were approved by the Department of Land and Natural Resources (DLNR) State Historic Preservation Program Director in 1990 (January 9, 1990 letter from Don Hibbard to Paul Rosendahl).

The archaeological data recovery work and monitoring were conducted by PHRI from late 1990 to 1991. After initial data recovery excavations at the Kahuku Point Site were initiated, the landowner decided to halt further work and preserve the site. Monitoring fieldwork results were reported in a series of monthly status reports prepared by PHRI (Sullivan 1990, 1991; Dunn 1991; Donahue 1991). Corbin (2003) reported the findings of the PHRI data recovery and monitoring fieldwork and subsequent analyses. DLNR-SPHD approved the Corbin (2003) report in 2005 (letter from Melanie Chinen to Paul Rosendahl March 11, 2005 Log No: 2005.0110; Doc No: 0501SC05).

In 1992, PHRI prepared a Burial Treatment Plan (Maly and Rosendahl 1992) for the reburial and preservation of remains recovered during previous data recovery and monitoring. The plan was prepared to comply with legislation enacted in 1990 pertaining to the treatment of traditional Hawaiian burials under Hawai'i Revised Statutes (HRS) Chapter 6E:43, Act 306. The plan also included reburial of remains inadvertently discovered in 1992 near the resort hotel (Kennedy 1992) and in the mid-1980s at Kahuku Point (Neller 1984, 1989). MOA mandated osteological analysis of human remains by PHRI is reported by Kalima (1993).

In 1996 and 1999, a report on the inadvertent discovery of additional burials was prepared by Archaeological Consultants of the Pacific (ACP) for human remains in 1996 (Carson *et al*. 1996, 1999). Cultural Surveys Hawai'i (CSH) conducted archaeological monitoring for golf course refurbishment in 2001 but encountered no cultural deposits (Borthwick *et al*. 2001).

Environment

The Turtle Bay Resort project area is a c. 840-acre ocean-front parcel located on a broad, low-lying coastal plain at the north end of the Island of O'ahu. Kamehameha Highway borders the property on the south (inland) side. The west side terminates at the center of Kawela Bay, while Marconi Road and undeveloped land border the east side. The land is generally level, with the terrain sloping gently to the north towards the shoreline. Elevation rises from sea level at the coast to a maximum of c. 40 ft at the southeast corner of the property, extends from one-quarter mile to just over a mile inland. Some dunes at the coast rise 20 ft above mean sea level (amsl), but much of the property is significantly less than 20 ft amsl, and Punaho'olapa Marsh is only c. 3 ft amsl. An aerial view of the project area is depicted in *Figure 5*.

The property spans seven traditional land divisions within the Ko'olauloa District (*Figure 6*). From east to west these consist of Kahuku, Punalau, Ulupehupehu, 'Ōi'o, Hanaka'oe, Kawela and 'Ōpana. Only the boundaries of Kahuku, 'Ōpana and Kawela are individually defined on current USGS quadrangle and tax maps of the area. The Land of Kahuku occupies the largest portion of the project area, encompassing 480-acres or 57% of the total area; Kawela encompasses 68-acres (8%) and 'Ōpana 9-acres (1%). The four remaining *ahupua'a* are depicted on the maps with no boundary divisions between them. These *ahupua'a* (Punalau, Ulupehupehu, 'Ōi'o, Hanaka'oe) encompass 283-acres (34%).

Kawela Stream originates at the base of the coastal bluff in the Land of Kawela at c. 800 ft elevation and enters the property beneath the Kawela Bridge at the Kamehameha Highway and empties into the central portion of Kawela Bay; its original channel has long been covered by sediments and the stream course has been artificially channeled for quite some time. 'Ōi'o Stream originates in Waialua District 'Ōi'o Gulch at c. 1,400 ft elevation; it empties into the ocean at Kaihalulu Bay, between Kuilima and Kahuku Points. The 120-acre freshwater Punaho'olapa Marsh is located in the east half of the property. The James Campbell National Wildlife Refuge, administered by the US Fish

Figure 5. Aerial view of project area showing Test Areas (from Google Earth)

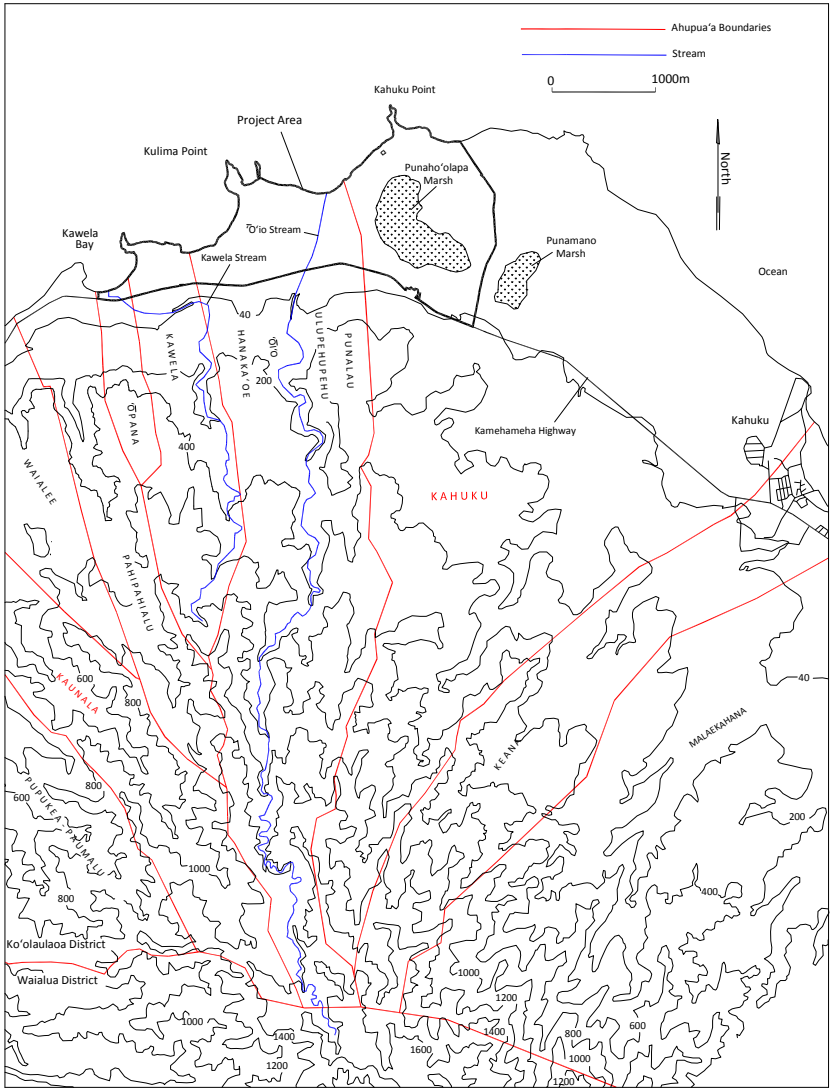


Figure 6. Ahupua'a boundaries

and Wildlife Service (FWS), was established in 1976 and encompasses 1,100 acres, including Punamanō Marsh and Ki'i Pond, adjacent to the resort's east boundary.

Climate in the vicinity of the project area is typically mild with average year-round temperatures ranging from 71 to 79 degrees (city-data.com). Rainfall in the area varies from 30 to 40 inches along the coast and 40 to 60 inches per year in the inland areas (Juvik and Juvik 1998:56). The adjacent National Wildlife Refuge (FWS 2011) protects habitat for over 120 species, including four of six endangered native Hawaiian birds. It preserves coastal habitat for the endangered Hawaiian monk seal (*'ilio holo i ka uaua*) and nesting habitat for threatened green sea turtles (*honu*) and important seabirds. The Refuge provides a strategic landfall for migratory birds coming from the northern Pacific Rim and wetlands birds including Northern pintail (*koloa mapu*), Northern shoveler (*koloa moha*), lesser scaup, Pacific golden plover (*kolea*) and ruddy turnstone (*'akekeke*). The migratory populations represent some of the largest concentrations of these species in Hawai'i and the Pacific. Other native species that benefit from the protected refuge habitat include the Hawaiian owl (*pueo*) and a species of rare damselfly.

Undeveloped portions of the TBR property support a variety of introduced plant species. The most prevalent are *koa haole* (*Leucaena glauca*), ironwood (*Casuarina equisetifolia*), Christmas berry (*Schinus terebinthifolius*) and banyan (*Ficus* sp.). Native plants include *hau* (*Hibiscus tiliaceus*), *naupaka* (*Scaevola sericea*), coconut palms (*Cocos nucifera*) and *milo* (*Thespesia populnea*). Sedges (*Scrious lacustris*), saw grass (*Cladium leptostachyum*) and ferns (*Cyclosoro interruptus*) dominate the Punaho'olapa Marsh vegetation; Christmas berry and *hau* surround the perimeter. The adjacent National Wildlife Refuge marsh supports stands of bulrush and cattail. Invasive alien species targeted for removal on the adjacent refuge include California grass (*Urochloa mutica*), marsh fleabane (*Pluchea x fosbergii*), bullfrogs and feral mallards.

Geology, Hydrology and Soils

O'ahu is just less than six million years old and encompasses two extinct shield volcanoes: Wai'anae in the west and Ko'olau in the east (Juvik and Juvik 1998:41). The underlying bedrock on the TBR property was formed by lava deposited 1.7 to 2.5 million years ago from Ko'olau Volcano (*ibid*.:42). The Kahuku Plain is composed of an uplifted fossilized limestone reef formed underwater on the volcanic substratum. The reef formed during inter-glacial periods of higher sea level in the Pleistocene, 12,000 to 2,500,000 years ago (Macdonald *et al*. 1983). Sea level in the northern main Hawaiian Islands reached its Holocene maximum height (c. 2.00 m greater than present) 3,500 years before present (B.P.); subsequent sea level reduction, coupled with island uplifting, exposed the reef bench to high-intensity waves that eroded the reef surface and created the fossilized, stabilized and active sand dunes that formed along the shore (Grossman 1998, Grossman and Fletcher 1998).

The emerged limestone reef surface was eroded by waves and freshwater flows that created karstic features consisting of sinkholes, subterranean streams, fissures and caverns. The karst topography resulted in pools, ponds and marshes inland of the coastal dune fields on the nearly level Kahuku Plain. The water table is close to the surface. Small areas of limestone outcrop are still visible inland of Kawela Bay and Kuilima Point, where they are erroneously called "coral" outcrops (*Figure 7*).

Ground surface weathering also subsequently modified the uplifted limestone reef surface after the sea level receded. Accelerated weathering combined with alluvial deposition of sediments and rock derived from the volcanic uplands to essentially cover the Kahuku Plain's limestone surface with a mantel of silt and clay sediments. Talus and alluvial deposits are interbedded, bordered along the coast by wind and wave deposited sands, especially at Kahuku Point where extensive relict and modern dunes are present (Takasaki and Valenciano 1969; SOEST 2011). At Kahuku Point, lithified dunes are "shaped by chemical weathering, intertidal bioerosion, and the northeast trade winds to which they are fully exposed" (Takasaki and Valenciano 1969). Lithified clay (laterite) covers the marine bench inland of the shore at Kahuku Point (Chapman 1946).

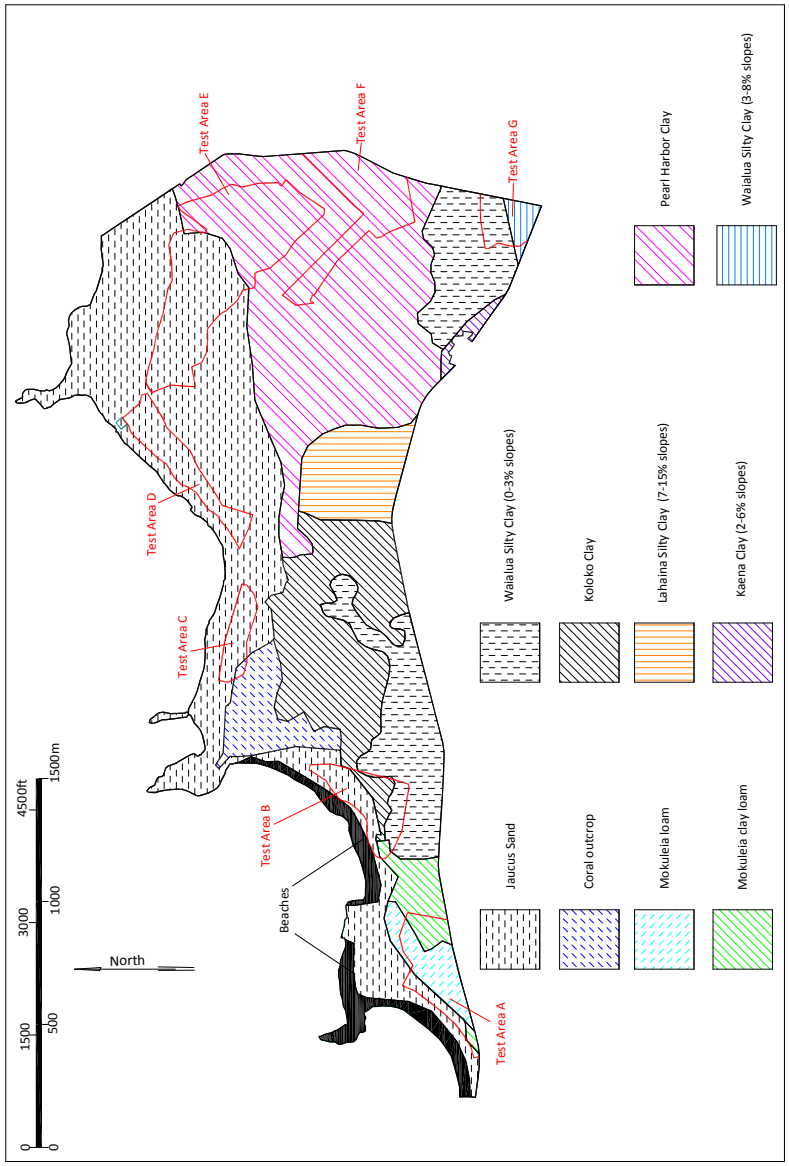


Figure 7. Distribution of soils within the project area

The north shore of O'ahu receives the full brunt of massive waves from the North Pacific Swell in the winter, which move large quantities of sand to the shore. Beach sands are calcareous (calcium-rich) and coarse-grained, typical of high-energy waves that move detritus from the submerged reefs to shore. Active dunes at Kahuku Point "exist seaward of vegetated Holocene dunes" and "sand dunes and perched beaches along Kahuku Point are continuously reshaped by the persistent trade winds" (USGS 2011a). Catastrophic tidal waves and stream flooding from winter storm runoff are known hazards around the Kahuku Point coastline (*ibid*.):

> During the 1946 and 1957 tsunamis, flood inundation heights of 27 and 23 ft were recorded at Kahuku Point. The hazard associated with high waves is ranked high around the entire Kahuku Point, but…[t]he storm threat is ranked moderately low along the Kahuku coast because it is partly sheltered from the impact of the majority of tropical storms that historically track to the west and south of Oahu. Erosion is ranked moderately low for the small embayments lining the western portion of Kahuku Point, except along the rocky point immediately northeast of Kawela Bay beach where it is low.

On the Kahuku Plain freshwater constitutes a major natural resource. Perennial and intermittent streams once provided ample water across the plain. Coastal brackish marshes on the Kahuku Plain formed in the elevated limestone reef, fed by the numerous streams originating in the uplands to the south, by rainfall, springs and seeps (Hunt and De Carlo 2000; Takasaki and Valenciano 1969:48). Subterranean seawater extends inland from Kahuku west to Kawela and beyond, naturally contaminating the basal freshwater body (Takasaki and Valenciano 1969). Basal water channeled from volcanic dikes in the Ko'olau Range recharges the shallow water table underlying the Kahuku Plain and is perched above the infiltrating seawater (*ibid.*). This provides sufficient pressure for springs, seeps and artesian wells. Flooding is most prevalent in March, but can occur throughout the year (*ibid*.:16).

Eleven soil types have been described and mapped in the property (Foote *et al*. 1972). These consist of beach sands, coral outcrops, Jaucus sand (0-15% slopes), Pearl Harbor clay, Waialua silty clay (0-3% and 3-8% slopes), Kaloko clay, Lahaina silty clay (7-15% slopes), Mokuleia loam and clay loam, and Kaena clay (2-6% slopes). The distribution of these soils is shown in Figure 7 and their characteristics are summarized in *Table 1*.

Jaucus Sand is the most widespread sediment, which encompasses 278 acres, or 33% of the property. It is exposed along the coastal margins and is characterized by well-drained single-grained sand to depths exceeding more than 60 inches. It is considered suitable for pasture, sugarcane, truck-crops, and urban development.

Pearl Harbor Clay is the next most extensive sediment, encompassing 227 acres, or 27% of the property. It largely coincides with the former extent of Punaho'olapa Marsh and consists of poorly drained, mottled clay overlying mottled clay subsoil, formed on layers of muck or peat. Pearl Harbor clay is classified as suitable for pasture, sugarcane, taro and bananas.

Waialua Silty Clay (0-3 and 3-8% slopes) covers 110 acres, or 14% of the total on gentle slopes in the southeastern corner of the property. It is moderately well drained and characterized by a silty clay surface layer overlying a subsoil of blocky silty clay formed on a mottled silty clay substratum. It is suitable for pasture, sugarcane and truck crops.

Kaloko Clay covers 96 acres, or 11% in the central portion of the property. It is developed in alluvium derived from igneous rock and is poorly drained. It consists of clay overlying multiple layers of clay and silt clay. It is classified as suitable for pasture and sugarcane.

Lahaina Silty Clay covers 39 acres (5%) in the east-central portion of the property. It is derived from weathered igneous rock and is well drained, and is typically exposed on slopes above the coastal plain. The surface layer is severely eroded and overlies a blocky silty clay and silty clay loam subsoil, formed on weathered igneous parent material. It is classified as suitable for sugarcane and pineapple.

Table 1. Summary of Soils within Project Area

Soil Type	Acres	% of Project Area	Description	Permeability	Runoff	Erozion Hazard	Suitability
Jaucus Sand (0-15% slope)	278	33	Single grained sands	Rapid	Very slow to ponded	Slight	Pasture, sugarcane, truck crops, urban development
Pearl Harbor Clay	227	27	Mottled clay surface layer over mottled clay subsoil, over muck or peat	Very slow	Very slow to ponded	Slight	Pasture, sugarcane, taro, bananas
Waialua Silty Clay (0-3% slope)	105	13	Silty clay surface layer over subsoil of blocky silty clay over mottled silty clay substratum	Moderate	Slow	Slight	Pasture, sugarcane and , truck crops
Kaloko Clay	96	11	Clay surface layer over clay and silt clay subsoils	Moderately slow to slow	Slow to very slow	Slight	Pasture and sugarcane
Lahaina Silty Clay (7-15% slope)	39	5	Severely eroded silty clay surface layer over blocky silty clay and silty clay loam subsoil over weathered igneous rock substratum	Moderate	Medium	Moderate	Sugarcane and pineapple
Limestone outcrop	27	3	Cemented coral or calcareous sand	n/a	n/a	n/a	Military installations, quarries, urban developemtn
Mokulei Clay Loam	20	2	Clay loam surface layer over sand and loamy sand subsoils	Moderate	Very slow	Slight	Pasture, sugarcane and truck crops
Beaches	19	2	Sandy, gravelly or cobbly areas	n/a	n/a	n/a	Recreation
Mokulei Loam	18	2	Clay loam surface layer over sand and loamy sand subsoils	Moderate	Very slow	Slight	Pasture, sugarcane and , truck crops
Kaena Clay (2-6% slope)	6	1	Clay surface layer over clay subsoil over highly weathered gravel	Slow	Slow	Slight	Pasture, sugarcane, homesites
Waialua Silty Clay (3-8% slope)	5	1	Silty clay surface layer over subsoil of blocky silty clay over mottled silty clay substratum	Moderate	Slow	Slight	Pasture, sugarcane and truck crops
Total	840	100					

Limestone Outcrops cover 27 acres, or 3% of the area, inland of Kuilima Point. The outcrops are composed of crushed and cemented coral or calcareous sand that formed in shallow ocean waters when the sea levels were higher and is classified as suitable for military installations, quarries and urban development.

Mokuleia Loam and Clay Loam encompasses 38 acres or 4% of the project area (18-acres, 2%) and is located in the southwest portion of the parcel. This soil is characterized as well-drained clay loam surface layers, over sand and loamy sand subsoils (1972:96). These soils are classified as suitable for pasture, sugarcane and truck crops.

Beaches cover 19 acres or 2% of the total property area and are restricted to Turtle Bay and Kawela Bay. The coastal strands in these bays are characterized as sandy, gravelly or cobbly and are classified as suitable solely for recreation.

Kaena Clay encompasses 6 acres, or 1% of the property, and is found only along the southeast edge of the resort. The clay is very deep, poorly drained, and is exposed on alluvial fans and talus slopes. It is characterized by a clay surface layer overlying clay subsoil, formed on a highly weathered gravel substratum. It is classified as suitable for pasture and sugarcane.

Research Design

The research design presented in the SAIS Plan (Haun *et al.* 2011) identified seven areas for proposed test excavations that were designated Test Areas A-G. Most of the remaining resort lands were excluded from the proposed testing because these are already developed with golf courses and other resort facilities. Most test areas are densely vegetated with *koa haole*, ironwood, Christmas berry and *hau*. Two forested areas, a proposed hotel site at Kawela Bay and a proposed golf clubhouse site in the central coastal portion of the property overlooking Kaihalulu Beach were graded to bedrock and filled during construction activity in 1990-1991. These areas are considered to lack any potential for significant intact subsurface cultural remains. Testing also excluded areas fronting the shoreline ranging from 200 to 300 ft wide where no development is planned.

Figure 8 is an overlay of the original proposed test excavation areas that were presented in the SAIS Plan (*ibid*.) plan, on the updated TBR master plan preferred alternative map. The combined test area extent was 173.2 acres. The pre-fieldwork boundaries of the test areas were defined using available aerial photographs and maps provided by TBR; however, on-site inspection of the areas required slight modifications of the test area boundaries. The revised test area extent is 167.9-acres. These modifications result in a 5.3-acre reduction in the total area. *Figure 9* presents the revised test excavation areas, overlain onto the TBR map.

The test areas are located where future development is planned. No additional testing was proposed for parks and other open spaces where development impacts are anticipated to be minimal, primarily consisting of landscaping that would have very shallow, less than 1 ft (30 cm) deep impact. All ground disturbing activity in the open space areas would be subject to archaeological monitoring done in accordance with a monitoring plan prepared for SHPD review and approval.

Moderate to dense vegetation covers all of the test areas, except Areas B and C. To facilitate access by excavating equipment, most transects were mechanically cleared prior to trenching. The initial clearing effort for all test areas, except Area B, involved clearing a baseline that paralleled the long axis of each test area. Next, transects were laid out perpendicular to the baseline. Transects were sequentially numbered as were the trenches within each transect. For example, BT-A-1-1, indicates backhoe trench (BT), Area A, Transect 1, Trench 1.

Baselines and transects were cleared using a mechanical flail attached to a Komatsu PC130 excavator. A total of 14,293 linear meters or nearly 9 miles of transect were cleared. Transects varied in width from 5.0 to 10.0 m. The extent of vegetation clearing is presented in *Figure 10.* No clearing was necessary for Test Area B because it is open

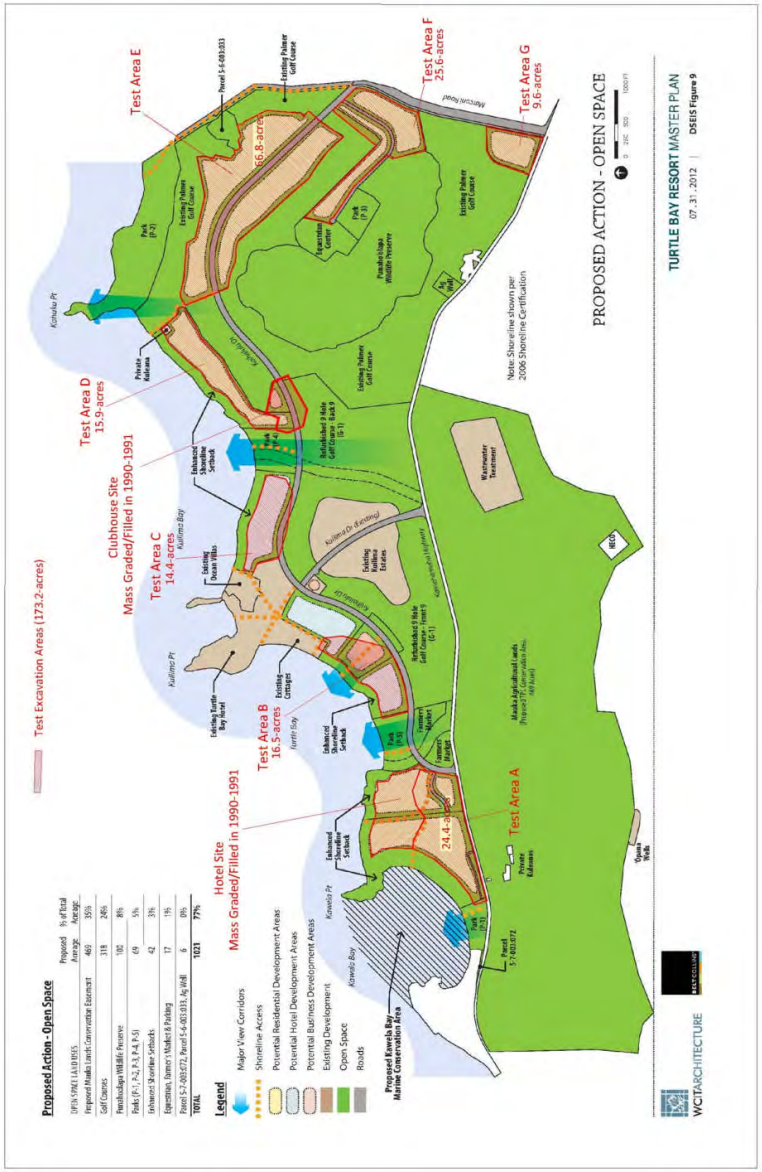


Figure 8. Proposed Test Excavation Areas and Turtle Bay Lands - Open Space Lands

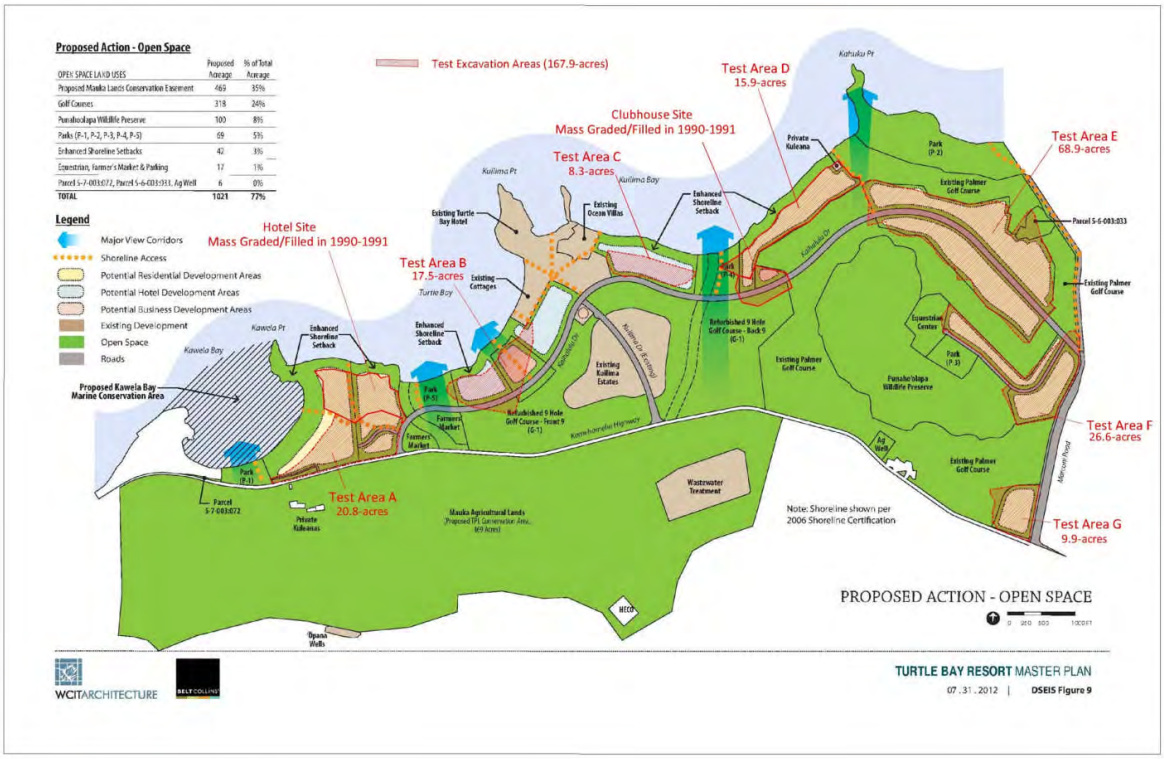


Figure 9. Revised Test Excavation Areas and Turtle Bay Lands - Open Space Lands

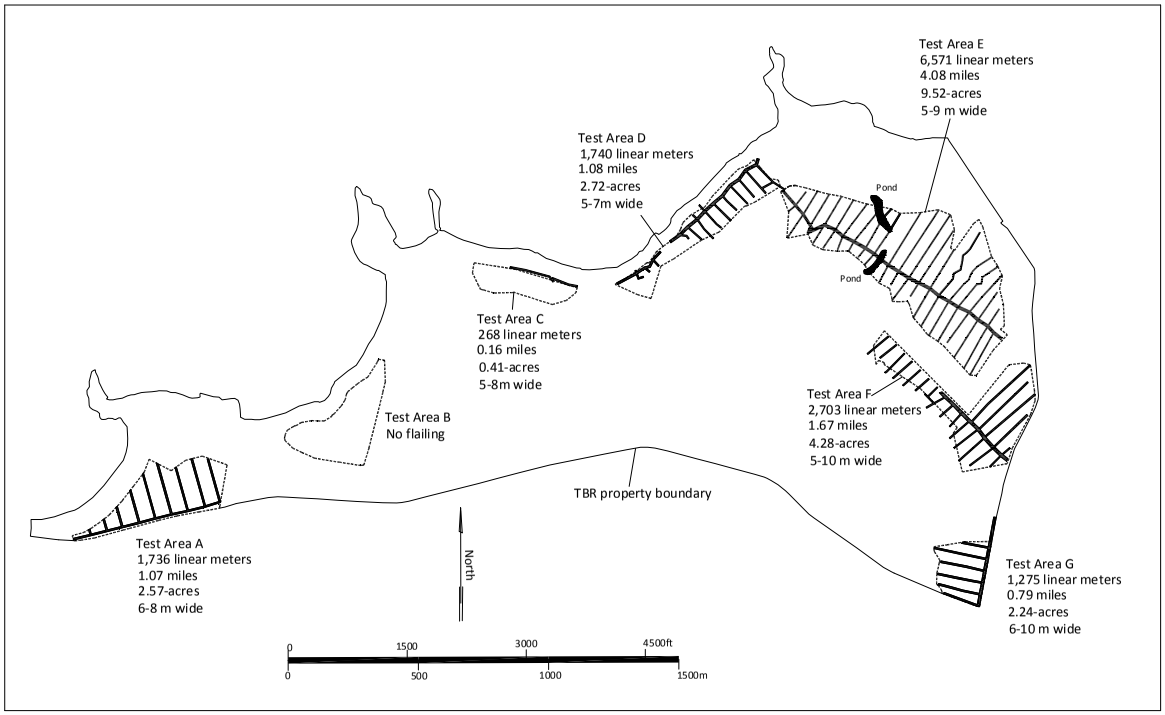


Figure 10. Extent of mechanical flailing

lawn and occupied by an equestrian facility. Test Area C is relatively open beneath a canopy of ironwood trees and mechanical clearing was limited to the baseline.

Previous archaeological studies for the TBR property established a higher potential for encountering subsurface cultural remains including burials in mapped Jaucus Sand and Pearl Harbor Clay deposits. These two soil types were subjected to higher intensity testing. Lower intensity testing sampled the various clay and loam soil types elsewhere on the TBR property.

Low density testing of 1 trench per acre sampled the Waialua/Mokuleia Clay soils at Kawela Bay (Test Area A) and the planned residential housing development (Test Area G). The remaining test areas are characterized by Jaucus Sand and Pearl Harbor Clay sediments, where high-intensity testing density of 2 trenches per acre were sampled. This sampling strategy resulted in excavation of 314 systematically placed trenches.

The SAIS Plan proposed additional discretionary trenches as needed for:

- specific areas that might be missed by the systematic transect trenching such as Land Commission Awards (LCAs);
- the location of a former plantation worker housing (Camp 3) in Area B;
- areas where subsurface cultural remains were documented by previous archaeological studies (Areas D and E);
- segments of the proposed Kaihalulu Drive outside the potential test excavation areas that are undeveloped; and
- defining the extent of subsurface cultural deposits identified in systematically placed trenches.

Field conditions required some adjustments to test area extent and trench placement. No segments of the proposed Kaihalulu Drive were tested because undeveloped sections were either in tested areas or developed portions of the resort. These modifications are discussed below.

Test Area A was reduced in size from 24.4 to 20.8-acres, to accommodate a wider (300 ft) coastal setback than the 150 ft-wide setback used in the SAIS Plan. Prior archaeological excavations in and adjacent to Test Area A reached a maximum depth of 1.15 m below surface without identifying any cultural layers (Walker *et al.* 1988b, Bath *et al.* 1984). Prior testing identified two to three non-cultural sand layers in the seaward portion of Area A and three non-cultural sandy clay and clay loam layers in the inland portion. Evidence of plowing was observed in the eastern portion of the area where the test excavations reached the water table. The plow zone is a 0.35 m thick clay loam underlain by two layers of sand.

The SAIS Plan proposed excavation of 25 systematically placed trenches and five discretionary trenches for Area A. Two discretionary trenches were proposed to test areas within adjacent LCA parcels, and three were proposed to test sand areas along the seaward side of Area A. These discretionary trenches were excluded during the fieldwork because the shoreline setback was expanded to 300 ft. Twenty-four trenches were excavated during the SAIS fieldwork in Test Area A and no intact cultural deposits were identified.

Test Area B was increased from 16.5 to 17.5-acres by the inclusion of additional areas along the south and west sides. No cultural layers were observed in prior excavations conducted adjacent to the west side of Test Area B (Bath *et al.* 1984). Previous excavations extended to a maximum depth of 2.1 m below the surface, exposing 3-4 layers of sand.

The SAIS plan proposed excavation of 33 systematically placed trenches in Test Area B and two discretionary trenches: one in the eastern portion of the area where an LCA parcel (LCA 235M) is located and one where Kahuku Plantation Camp 3 was formerly located. Thirty-seven systematically-placed trenches were excavated in Test Area B. Slight deviations in trench orientation and placement were necessitated by the equestrian stables, corrals and

associated facilities. No discretionary trenches were necessary because the systematically placed trenches adequately sampled the LCA parcel and the plantation camp.

Test Area C was reduced from 14.4 to 8.3-acres as a result of an increase in the shoreline set back from 150 ft to 200 ft and other adjustments along the southern boundary, where a golf course fairway and other facilities are located. Previous excavations by Bath *et al.* (1984) in Test Area C documented three sand layers extending to a depth of 2.1 m below the surface in Test Area C. These sand deposits were highly disturbed, containing mixed prehistoric and modern debris. Site 4488 is located in the western portion of this test area, where past sand mining led to the inadvertent discovery of several burials that were documented by Kennedy (1992) and Carson *et al.* (1996). The SAIS Plan proposed excavation of eight or more manual test units in the vicinity of Site 4488. These test units were to be excavated manually until the stratigraphy in this area was well documented and the potential for encountering additional burials was evaluated. Twenty-nine systematically placed trenches were also proposed for Test Area C, with one discretionary trench to be excavated at the west end of Area C.

Several large deep depressions were identified in Test Area C, where sand mining occurred in the past. It was apparent from these deep depressions, and from a TBR-provided topographic map, that the sand deposit in some areas exceeded 6 m in depth. The depth and unconsolidated nature of the sand deposit rendered unfeasible the SAIS Plan proposal to manually excavate test pits. The alternative test excavation strategy employed was manual excavation of sand pit sides to expose vertical faces for profile documentation. Accompanying mechanical excavations adjacent to the manual profiles were used to expose the deepest portions of the deposit and the underlying bedrock. As a result of the reduced area and modified testing strategy, a total of ten manual profiles and 18 systematically placed and mechanically excavated trenches documented the subsurface deposits in Test Area C.

Test Area D retained its original size (15.9 acres) and its configuration was not changed during fieldwork. Previous excavations within and adjacent to this area documented multiple (2-6) sand layers extending to a maximum depth of 1.6 m below the surface (Walker *et al.* 1988b, Bath *et al.* 1984, Corbin 2003). An intact cultural deposit was identified at the northeast end of Area D (Site 6411, Feature C), consisting of black loamy sand that varied in depth from 1.16 to 1.41 m. The central portion of Area D contains highly disturbed sand deposits with at least some cultural material, although Corbin (2003) does not indicate which layer(s) contained cultural material. Two non-cultural sand layers are present in the southwest portion of Test Area D (Corbin 2003).

The SAIS Plan proposed 33 systematically placed trenches for Test Area D and additional discretionary trenches in the eastern and central portions to further examine previously identified cultural deposits. During the SAIS fieldwork, 36 systematically placed trenches and 3 discretionary trenches were excavated. The systematic trenches identified inland extent of the previously identified cultural deposits along the shoreline. The discretionary trenches were excavated in the western portion of the area to define the extent of a subsurface cultural deposit.

Test Area E increased from 66.8 to 68.9-acres by the inclusion of additional areas along the east and west sides during the SAIS fieldwork. Previous excavation in and adjacent to the area reached a maximum depth of 3.6 m below surface (*ibid.*). Most of the test excavations reached bedrock. An intact cultural layer was identified in the southeast portion of the area (Site 6414). This deposit was described by Corbin (2003) as dark brown silty clay loam that varied in depth from 0.59 to 0.89 m. Remnant wetland deposits were present at the northwest and west ends of the area. Sediments were impacted by airfield construction at the north end. Relatively shallow Pearl Harbor Clay deposits border Area D to the east, west and south.

The SAIS Plan proposed excavation of 133 systematically placed trenches for Test Area E and least three discretionary trenches in former LCA parcels (LCA 2698:3, 2880:2, and 3958:2). During fieldwork, 137 systematic and 20 discretionary trenches were excavated. The systematically placed trenches identified the remnants of five cultural deposits, but none of these can be correlated with previously identified Site 6414 cultural deposit. The discretionary trenches were excavated at three of the five cultural deposits to define cultural deposit extent.

Test Area F increased from 25.6 to 26.6 acres as a result of the additional areas along the northwestern side. Prior excavations adjacent to Area F extended to a maximum depth of 4.93 m below the surface. Most of these excavations extended to bedrock or the water table (Bath *et al.* 1984, Davis *et al.* 1986, Corbin 2003). Stratified cultural deposits were identified in excavations adjacent to the northeast end of the area (Site 6422). The upper cultural deposit consisted of a very dark grayish brown silty clay loam that is 0.12 to 0.31 m in depth over a brown silty clay loam cultural layer that is 0.31 to 0.42 m in depth. The SAIS Plan proposed excavation of at least two discretionary trenches next to the reported location of the stratified deposits. Remnant wetland deposits associated with Punahoʻolapa Marsh are located west of Area F and non-cultural Pearl Harbor Clay is present to the north and northwest.

The SAIS Plan proposed excavation of 52 systematically placed trenches and the two previously mentioned discretionary trenches. Fifty-eight systematically placed trenches were excavated during fieldwork. No intact prehistoric cultural deposits were identified in Test Area F.

Test Area G was increased slightly from 9.6 to 9.9-acres by the inclusion of additional areas along the west side during the SAIS fieldwork. No previous excavations were conducted in or near Test Area G. The closest prior test excavations consist of two cores located more than 100 m to the northwest by Bath *et al.* (1984). These cores extended to a depth of 3.6 m and identified multiple layers of loam, clay and silt with an intervening peat layer. No cultural deposits were present. The SAIS plan proposed 10 systematically placed trenches in Area G. Twelve trenches were excavated. No intact cultural deposits were identified in Test Area G.

Methods

An archaeologist monitored all mechanical trench excavations. The trenches were excavated using Komatsu PC 130 and Hitachi ZX200 excavators. Most trenches were excavated either to a basal limestone deposit or the water table. Two were terminated when human remains were identified (BT B-6-2 and BT D-2-1b) and two trenches were terminated when conditions made further excavation unfeasible (BT E-15-6 and F-3-4). Trenches that measured greater than 1.0 m in depth were widened and stepped for safety. Trench location was determined with a Magellan Mobile Mapper using Global Positioning System (GPS) data.

Following excavation, the trench walls were manually scraped to examine and document the stratigraphy. A profile drawing was prepared using the Munsell soil color notation system and U.S. Soil Conservation Service descriptive terminology. The depth, time and date when the water table was encountered was recorded, if present. If no intact cultural deposits were present, an average 1 meter-wide profile drawing was prepared depicting the representative stratigraphy. When cultural deposits or unique, atypical features or complex stratigraphy were encountered, larger sections, and in some cases, the entire trench wall was documented.

When cultural deposits were observed, these layers were carefully examined for portable remains. Collected remains were placed in paper bags labeled with the appropriate provenience information. When charcoal was encountered it was deposited in an aluminum foil pouch and placed in a layer bag. Following their documentation, the trenches were backfilled as expeditiously as possible.

Following completion of fieldwork, analysis of all recovered remains and data followed standard archaeological methods. All recovered artifacts were analyzed to determine morphological type, condition/degree of completion and material. Metric measurements included weight, length, width, and thickness. Standard typological classifications were used for all artifacts. Food remains were identified to the Family level, or to the Genus/species level, when possible. Quantitative analysis included a determination of total weight and total number of fragments (TNF) per taxon. All cultural material and samples collected during fieldwork are presented in the project Accession Record in Appendix D.

Human remains were identified in three locations during the project. These consist of *in situ* burials noted in trenches in Areas B and D, and a secondarily deposited human metatarsal identified on the surface of a sand pit in

Area C. Trench excavations were immediately terminated when human remains were identified and the find was immediately reported to SHPD. Profiles of the trenches were prepared and the remains carefully and respectfully documented. No photographs were taken of any burial or isolated human bone. The *in situ* burials were carefully backfilled following consultation with SHPD. After consultation with SHPD, the isolated and displaced human metatarsal was collected for temporary storage at the adjacent TBR office trailer to protect it because it was lying on the ground surface in an area frequented by hotel guests and the general public. The Kahuku Burial Committee was also consulted concerning identification of all human remains. Committee members provided appropriate cultural protocols.

Another SAIS fieldwork task was relocation and documentation of previously identified sites. This task sought to evaluate the current status of seven sites. These consist of sites that were previously assigned State Inventory of Historic Places (SIHP) site designations and ones that retain the original field temporary designations. The four SIHP sites are the Site 5791 OR&L railroad grade, a walled pool (Site 6421), and two stone walls (Sites 6424 and 6426). Sites with no prior SIHP site designation consist of Kahuku Army Airfield remnants, including a concrete structure (Site T-4), the Site T-2 wall and the Site T-3 cattle enclosure. The relocation effort confirmed the presence of the OR&L railroad grade (Site 5791), the Site T-4 military structure and portions of the Kahuku Army Airfield. Site T-4 and the airfield remnants were assigned SIHP site designations during this project. The remaining previously identified sites were destroyed, presumably by golf course related construction activity.

During the mechanical clearing of transects for subsurface testing, it became apparent that there were a number of concrete structures and structural remains that were not documented during earlier surveys. The lack of documentation was likely because these remains are mostly World War II era military-related features that had not attained sufficient age (50 years) to be considered historic resources when the earlier surveys were conducted in late 1970s to mid-1980s. To rectify this situation, the seven test areas and adjacent undeveloped lands, Kahuku Point Archaeological Preserve and the Kawela Bay shoreline were subjected to 100% pedestrian archaeological survey prior to commencing subsurface testing.

The pedestrian surface survey methodology involved walking survey transects spaced approximately 10 m apart. Identified site locations were plotted with the aid of a hand-held Magellan Mobile Mapper GPS device using the NAD 83 datum. The accuracy of this GPS device for a single point is less than one meter. Intact or predominately intact structures were subjected to detailed recording consisting of mapping, preparing standardized site and feature forms and photographic documentation. Displaced structural remnants were described and photographed, but no plan maps were made. Sites were flagged with pink and blue flagging tape and a metal site tag was placed at each site datum and the tag location was plotted on the site plan map.

FINDINGS

Fieldwork consisted of a systematic pedestrian survey of undeveloped portions of the resort including the Kahuku Point Archaeological Preserve and seven areas (Test Areas A-G) where development is planned. Twenty-nine surface sites with 35 features were documented as a result of the pedestrian survey. Seven future development areas also were subjected to systematic, mechanical excavation of 345 trenches totaling 2,045 linear meters (1.27 miles). Subsurface trenching and test excavations documented an additional ten subsurface sites with 11 features. Human remains were identified in three locations; two *in situ* burials in Areas B and D, and a secondarily deposited human metatarsal (toe bone) on the surface of a previously mined sand pit in Area C. The following describes the work conducted for the SAIS.

Surface Survey

The survey identified 29 surface sites with 35 features. These sites are summarized in *Table 2.* The features consist of 9 concrete structures, 8 concrete blocks, 5 concrete slabs, 3 asphalt pavements, 2 artifact scatters and one each of the following: transit bus, concrete cylinder, a pair of metal gateposts, metal tank, railroad grade, revetment, stone mound and wall. Feature function includes antenna support (8), foundation (4), gun position (4), transportation (3), trash disposal (2), storage (2), gate (1), livestock control (1), possible agriculture (1), possible light fixture base (1), pavement (1), runway remnant (1), water storage (1) and indeterminate (5). The majority of the sites are associated with the World War II era use of the area as an Army Airfield.

Surface sites were identified in Test Areas A, E and F, the Kahuku Point Archaeological Preserve and the northern portion of Kawela Bay. No surface sites were present in Test Areas B, C, D or G. The absence of sites in these areas is due primarily to extensive ground altering activities associated with historic agriculture, ranching and golf course-related construction.

The SAIS Plan called for relocation and evaluation of seven previously identified sites. These consist of the OR&L railroad grade, remnants of the Kahuku Army Airfield, the Site 6421 walled pool, the Site 6424 and 6426 rock walls, the Site T-2 wall, the Site T-3 cattle enclosure and the Site T-4 military structure (*Figure 11*). The OR&L railroad grade and the Kahuku Army Airfield runway were depicted on maps of the area by various researchers, but were never formally documented. Sites 6421, 6424 and 6426 were reported by Corbin (2003) and Sites T-2, T-3 and T-4 were identified by Bath *et al*. (1984).

The surface survey relocated portions of the OR&L railroad grade (Site 5791) and portions of the Kahuku Army Airfield (Sites 7275-7278, 7280-7281). An additional previously identified site (Site T-5), consisting of a stone wall (Bath *et al*. 1984) was also relocated. This wall was recorded and assigned a SIHP Site designation (Site 7299). The remaining previously identified sites have been destroyed, presumably by golf course-related construction. Descriptions of the sites identified during the project area presented below.

OR&L Railroad

Site 5791 is the portion of the OR&L Railroad grade that formerly crossed the TBR property (see *Figure 11*). The original alignment of the grade is depicted on current tax maps that show the project area (see *Figures 2* and *3*). The railroad bed was under construction from 1890 to 1900 and was operational from 1900 to 1946, when significant sections of the bed were destroyed by the April 1, 1946 tsunami. None of the previous archaeological projects documented this historic transportation route or assigned the railroad grade an SIHP site designation. The railroad was formally abandoned in 1954 (Haun and Henry 2001).

A portion of the railroad grade west of the project area in the Land of Kaunala and was assigned SIHP Site 5791 by Haun and Henry (2001:15), where a 525-meter long section of the railroad grade and several bridge foundations

Table 2. Summary of Identified Sites

SIHP Site No.	Formal type	Function	Area	TMK	Age	No. of Features	Formal Type: Concrete structure	Cultural deposit	Concrete block	Concrete slab	Human remains	Asphalt area	Artifact scatter	Transit bus	Concrete cylinder	Metal posts	Metal tank	Railroad grade	Revetment	Stone mound	Wall	Habitation	Antenna support	Foundation	Gun position	Burial	Transportation	Trash disposal	Storage	Gate	Livestock control	Possible agriculture	Possible light fixture base	Pavement	Runway remnant	Water storage	Indeterminate	H&A Temp Field No.
4488	Human remains	Burial	C	5-7-01:013	Prehistoric/ early historic	1					1															1												
5791	OR&L Railroad grade	Transportation	A, B, F, Punaho'olapa Marsh	5-7-01:033	1899-1946	1												1									1											-
7261	Concrete structure	Gun position	Kawela Bay	5-7-06:23	1942-1946	1	1																		1													69
7262	Concrete slab	Indeterminate	Kahuku Point	5-7-01:033	1942-1946	1				1																											1	58
7263	Concrete pier block	Antenna support?	Kahuku Point	5-7-01:033	1942-1946	1			1													1																60
7264	Revetment	Storage	Kahuku Point	5-7-01:033	1942-1946	1													1										1									70
7265	Concrete slab	Foundation	F	5-7-01:033	1942-1946	1				1													1															71
7266	Concrete pier blocks	Antenna support?	Kahuku Point	5-7-01:033	1942-1946	3			3													3																63
7267	Transit bus	Transportation	A	5-7-01:033	1950s-1973	1								1												1												68
7268	Concrete structure	Indeterminate	Kahuku Point	5-7-01:033	1942-1946	1	1																													1		61
7269	Concrete structure remnant	Indeterminate	Kahuku Point	5-7-01:033	1942-1946	1	1																													1		56
7270	Metal tank	Storage	Kahuku Point	5-7-01:033	1942-1946	1											1												1									57
7271	Asphalt area	Transportation	Kahuku Point	5-7-01:033	1942-1946	1						1																										51
7272	Concrete structure	Gun position?	Kahuku Point	5-7-01:033	1942-1946	1	1																				1											52, 55
7273	Concrete block	Indeterminate	Kahuku Point	5-7-01:033	1942-1946	1			1															1												1		64
7274	Concrete cylinder	Possible light fixture	Kahuku Point	5-6-03:41	1942-1946	1									1																	1						53
7275	Asphalt area	Runway remnant	E	5-7-01:033	1942-1946	1						1																						1				6
7276	Concrete block	Anchor base	E	5-6-03:41	1942-1946	1			1														1															10
7277	Concrete slab	Foundation	E	5-6-03:41	1942-1946	1				1													1															67
7278	Concrete structure	Gun position?	E	5-6-03:41	1942-1946	1	1																		1												1	18
7279	Concrete block	Antenna support?	E	5-6-03:41	1933	1	1		1													1																19
7280	Concrete structure	Antenna support?	E	5-6-03:41	1930s	1	1															1			1													65
7281	Concrete structure	Gun position?	E	5-6-03:41	1942-1946	1	1		1														1															49
7282	Concrete block	Antenna support?	E	5-6-03:41	1930s	1																																46
7283	Stone mound	Possible agricultural	F	5-6-03:44	Prehistoric	1														1											1							37
7284	Complex	Barracks complex	F	5-6-03:44	1942-1946	5	1			2																	2									1		32, 34, 35,
7285	Metal posts	Gate	F	5-6-03:44	1942-1946	1							2																	1								21
7286	Asphalt area	Pavement	F	5-6-03:44	1942-1946	1						1																						1				20
7287	Concrete structures	Gun position?	F	5-6-03:44	1942-1946	1	1																		1													25
7288	Human remains	Burial	B	5-7-01:020	Prehistoric	1					1											1				1												BT-B-6-2
7289	Cultural deposit with human remains	Habitation/Burial	D	5-7-01:01	Prehistoric	2		1			1											1				1												B'b D-2-1, 2-1b, 2-1d
7290	Cultural deposit	Habitation	D	5-7-01:01	Prehistoric	1		1																														BTs D-5, -6-1, -7-1
7291	Cultural deposit	Habitation	D	5-7-01:033	Prehistoric	1		1																														B'b D-1-2, 1-3, 1-4-2, 1-4-3, 1-5-3
7292	Cultural deposit	Habitation	E	5-7-01:033	Prehistoric	1		1																														BT-E-2-3, -3-2, -3-3, -4-1, -4-2, -4-2b, 4-3
7293	Cultural deposit	Habitation	E	5-7-01:033	Prehistoric	1		1																														BT-E-10-2
7294	Cultural deposit	Habitation	E	5-7-01:033	Prehistoric	1		1																														BT-E-13-6, 13-6b, 13-6c, 13-6d, 136e
7295	Cultural deposit	Habitation	E	5-6-03:041	Prehistoric	1		1																														BT-E-15-3, 15-3a, 15-3b, 15-3d
7296	Cultural deposit	Habitation	E	5-6-03:044	Prehistoric	1		1																														BT-E-22-4
7299	Wall	Livestock control	Punaho'olapa Marsh	5-6-03:044	pre-1900	1															1									1								5
						46	9	8	8	5	3	3	2	1	1	1	1	1	1	1	1	8	4	4	4	3	3	2	2	1	1	1	1	1	1	1	5	

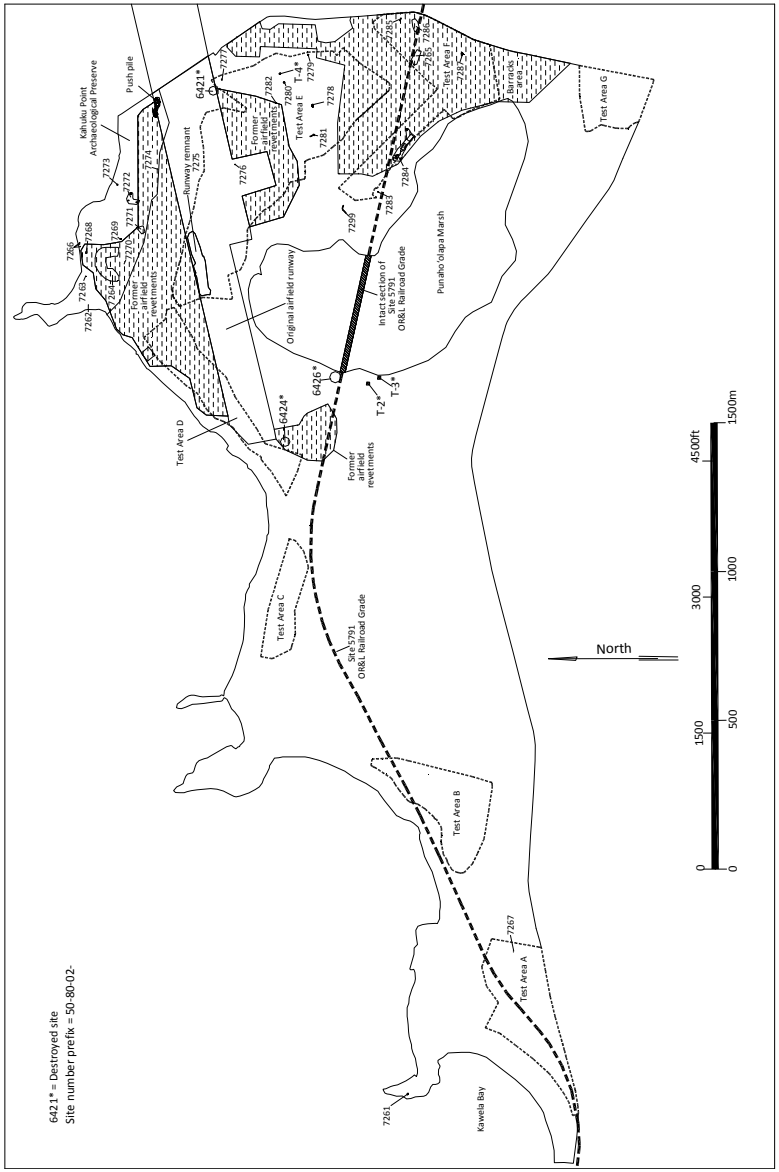


Figure 11. Surface sites and Test Areas showing extent of Kahuku Army Airfield complex (hatched areas)

were recorded. Another section of the railroad grade in the vicinity of Ewa Beach was documented as SIHP Site 9714 and that segment of the OR&L railroad grade was listed on the National Register of Historic Places on December 1, 1975 (NRHP n.d.).

Formerly, a c. 3,950 m segment of the railroad grade spanned the TBR property, extending from inland of Kawela Bay across Kahuku Plain in a northeasterly direction for c. 2,120 m and then to the east-southeast for an additional 1,830 m where it exited the property. The railroad continued east to Kahuku Mill. The railway was completed in 1899 and terminated at the Kahuku Mill.

Only one intact section of the railroad grade was encountered during the SAIS fieldwork. This consists of a 475 m long section that extends through Punaho'olapa Marsh in a west-northwest by east-southeast direction (see *Figure 11*). This section consists of a raised causeway across the marsh that is 7.5 to 9.0 m wide and averages 1.5 m in height. The causeway surface is level soil, basalt and limestone gravel. No rails or ties remain. The railroad grade formerly extended through Areas A and B; however, no surface evidence of the site was encountered in these areas. Site 5791 is a historic transportation route. It is largely destroyed but a single intact section in Punaho'olapa Marsh is in fair condition and retains substantial physical integrity.

Kawela Bay

Site 7261 is the only site identified in the Kawela Bay area. It consists of an intact concrete structure located on a sand beach at the northern side of Kawela Bay (see *Figure 11*). The structure is square, measuring 10'2" long (north-northwest by south-southeast) and 10' wide (*Figure 12*). The concrete sides were constructed with 6" form boards, indicating it was likely constructed in place. The roof is a flat 6" thick concrete slab (*Figure 13*) and there is an entrance 2'4" wide by 3'3" high on the south side. The interior ceiling height is 6'1". An alignment of concrete cinder blocks extends south from the east side of the entrance, and is likely a modern addition.

There are three embrasures (openings) in the seaward-facing walls. These openings are 1' in height and taper, narrowing toward the interior. The embrasure on the north side is the largest, measuring 8'2" wide on the exterior and 5'11" on the inside. The east opening is 4'7" wide on the exterior and 2'10" on the interior. The exterior of the embrasure is 3'11" wide and the interior is 1'11" wide. There are triangular-shaped recessed areas inside the east and west openings with metal rods extending vertically from the centers (*Figure 14).* These rods probably functioned as gun mounts. The interior and exterior walls of the structure are covered in graffiti and modern trash is scattered throughout the area.

Site 7261 is a World War II era military defensive position that Bennett (2011:59) identifies as "one of the last remaining vestiges of the Kahuku AAB defenses…a machine gun pillbox". The site is in fair condition and retains substantial physical integrity.

Kahuku Point Archaeological Preserve

The Kahuku Point Archaeological Preserve is a 32-acre undeveloped parcel located inland of Kahuku Point. In addition to the prehistoric sites, the Kahuku Army Airfield runway formerly spanned the area and airplane storage revetments were situated here (see Figure 11). Portions of the Preserve, primarily the south side, were impacted by the construction of the adjacent golf course. A large push pile of soil, stones, and concrete and asphalt rubble is present in the eastern portion of the Preserve. This 32-acre parcel was preserved as a park following identification of human remains (Walker *et al.* 1988).

The surface survey identified 11 sites in the Preserve. These consist of a concrete slab (Site 7262), three concrete block sites (Sites 7263, 7266 and 7273), an earthen revetment (Site 7264), the remnants of three disturbed concrete structures (Sites 7268, 7269 and 7272), a metal tank (Site 7270), a section of intact asphalt (Site 7271) and a concrete cylinder (Site 7274). The sites are described below.

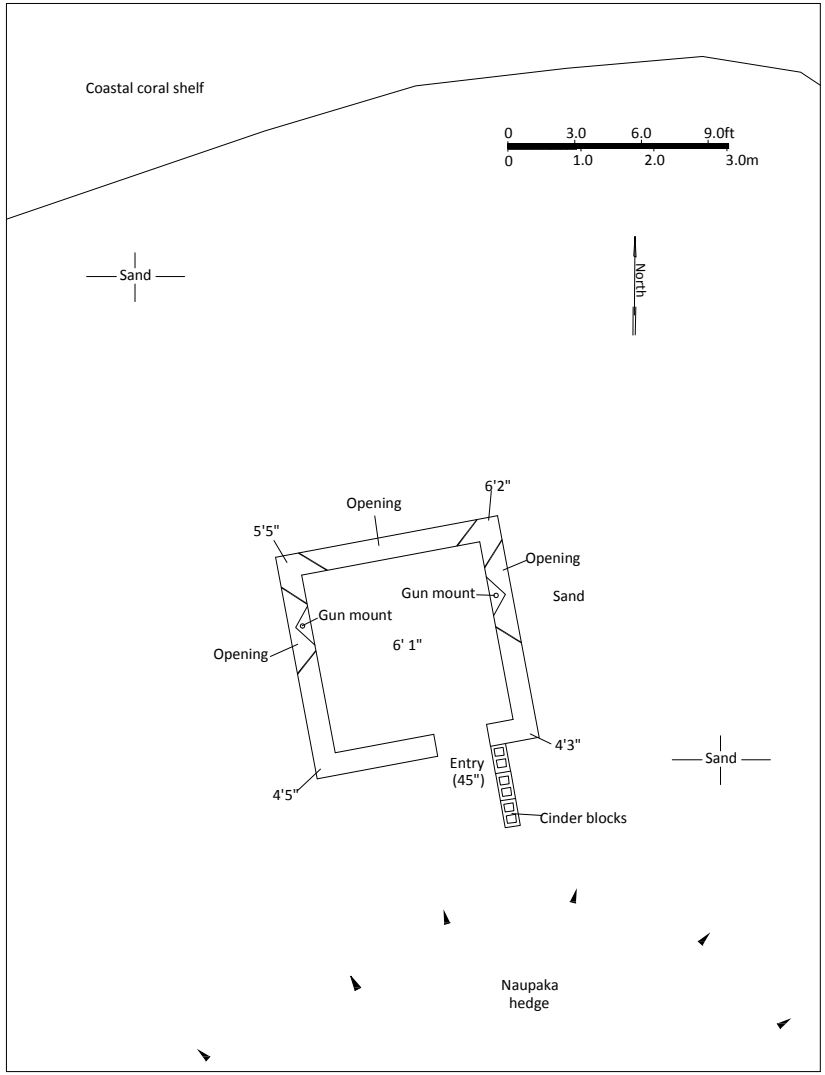


Figure 12. Site 7261 plan map

Figure 13. Site 7261 pillbox, view to west-northwest

Figure 14. Site 7261 gun mount, view to north

Figure 15. Site 7262 disturbed concrete slab, view to west

Site 7262 is a displaced concrete slab remnant that is partially buried in a sand dune on the western side of Kahuku Point. The exposed portion of the slab is 1' thick and protrudes from the sand at an angle (*Figure 15*). The exposed portion is 7' 9" long (north-northeast by south-southwest) and 3'4" wide. Metal rebar is visible in the broken edges of the slab, which was made using basalt aggregate. The exposed surface is smooth with no form board impressions visible. No other cultural material was observed. The slab is interpreted as a tsunami-displaced remnant of a World War II era structure based on its appearance and condition; however, the specific function of the slab is undetermined. The site is in poor condition and no longer retains physical integrity.

Site 7263 is a concrete block located on the sand beach just inland from the coast along the seaward portion of the Kahuku Point Preserve. The block appears to be in place and intact. It is 36 ½" square and 15" in height above the sand surface (*Figure 16*). There is a metal plate 17" square by 2" high on the top. Two 6" metal bands extend around the upper edge of the plate, with a second band 7" below it. No associated artifacts were observed. The block is probably an anchor for a guy wire support for a tower of some type, potentially an antenna. It was likely used in conjunction with the WW II use of Kahuku Army Airfield. The block is in an upright position and probably in its original location. The site is in fair condition and retains limited physical integrity.

Site 7264 is a revetment located in the west part of the Kahuku Point Preserve and is one of twenty revetments formerly situated north of the Airfield runway (*Figure 17*). This revetment is also depicted as a crescent-shaped mound on the coast immediately east of the Kahuku Point on the USGS Kahuku Quadrangle (see *Figure 1*). The revetment is a U-shaped earthen mound, open to the south. It is 375' long (east-west) and 260' wide. The walls of the revetment vary from 49' to 75' wide with a maximum height of 6'6"above the surrounding ground surface (*Figure 18*). The interior floor is level, reddish brown silty clay loam that was probably imported to the site. The revetment berm is covered with sand. There is a depression located in the interior northeast corner that is 8.35 m long by 4.9 m wide and 1.3 m deep, containing broken concrete slab fragments. No other cultural material was observed. Site 7264 is a WW II-era defensive storage area for aircraft. The site is in fair condition and retains substantial physical integrity.

Figure 16. Site 7263 concrete block, view to south

Site 7266 consists of three concrete blocks located on the sand beach 100 m east-northeast of Site 7263 in the Kahuku Point Preserve (*Figure 19*). The apparently displaced blocks are exposed over an area 45' long (east-west) by 6' wide. The blocks are identical in size to the Site 7263 concrete block, measuring 36-½" square. The Feature A block (located at the eastern end) is buried in the sand at an angle with the upper surface exposed and extends 30" above the surface of the sand (*Figure 20*). The rusted remnants of metal plates are visible on the weathered upper surface of Feature A and a 6" wide metal ban extends around the upper sides. The Feature B and C blocks are upside-down, possibly displaced by the 1946 or 1957 tsunami, with an irregular bottom surface exposed. This uneven surface indicates that the blocks were likely formed and poured in place on the ground surface. These blocks vary in height from 12" to 15" above the sand surface. No other cultural material was observed in association with the blocks. The Site 7266 blocks are displaced and likely served the same function as the Site 7263 block, interpreted as a guy wire anchor. The site is in poor to fair condition and retains limited physical integrity.

Site 7268 is the displaced remnant of a concrete structure located in a dense thicket of *naupaka* in the coastal portion of the Kahuku Point Preserve. The concrete material is located in a pile that is 5.0 m long (northwest by southeast) and 3.6 m wide (*Figure 21*). The remnants include what appear to be a domed roof and wall with an opening in it. The walls and roof are 1' in width. Rebar reinforcing is visible in the broken edges. No artifacts were observed in association with the structural remnant. *Figure 22* is a sketch depicting the estimated original shape and dimensions of the structure based on the fragmentary remnants. The structure was approximately 10' 4" long, 7' wide and 6'8" in height. There is a low opening on one side that is 48" in height and 43" wide. There are two 4" diameter ceramic inserts in the ceiling. Site 7268 is located on the coastal side of a military revetment (see *Figure 11*). The site is the probable remnant of a World War II era structure. The specific function of the structure is undetermined; however, the thick, reinforced concrete walls and roof indicate it was likely part of a defensive position, probably a bunker. The site is in poor condition and no longer retains physical integrity.

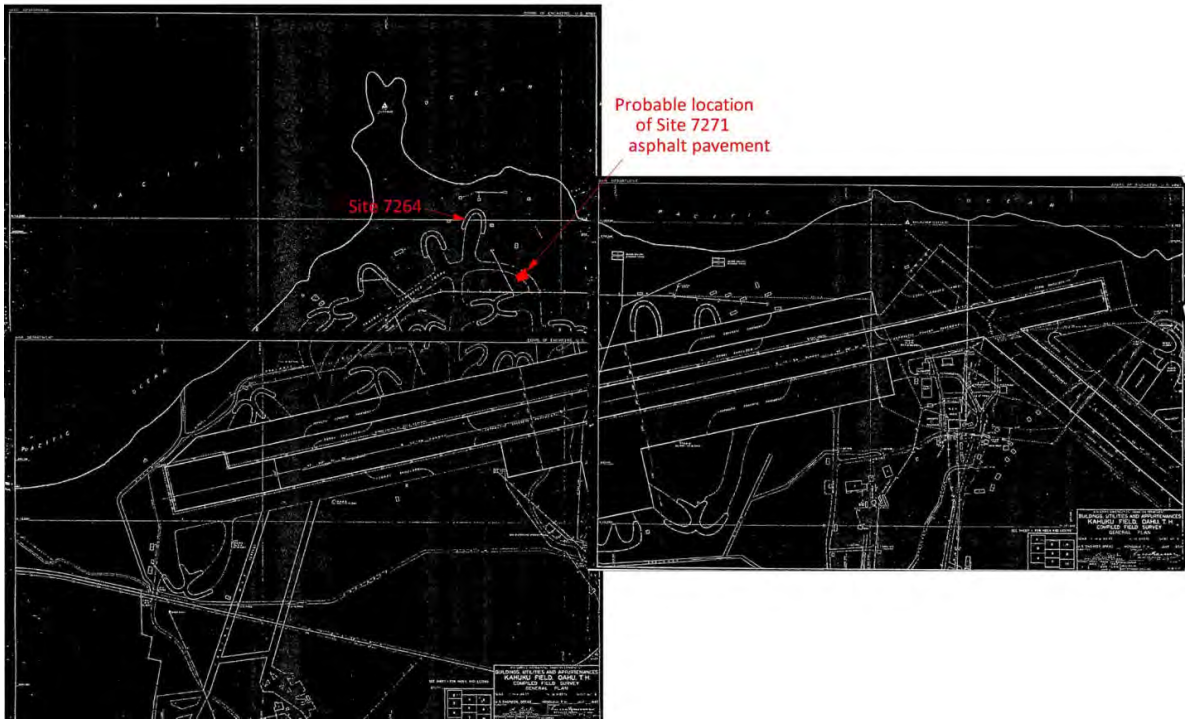


Figure 17. Composite plan map of Kahuku Army Airfield

Figure 18. Site 7264 revetment, view to north

Figure 19. Site 7266 concrete blocks, view to west-northwest

Figure 20. Site 7266, Feature A concrete block, view to south

Figure 21. Site 7268 concrete structural remnant, view to south

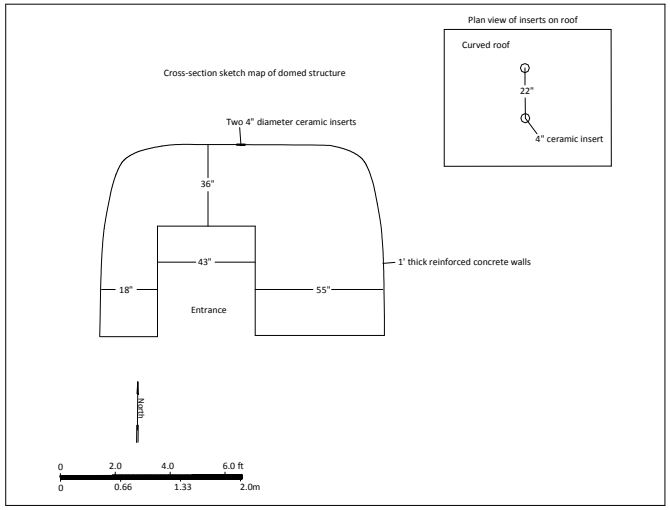


Figure 22. Sketch map showing estimated original cross-section of Site 7268

Figure 23. Site 7269 concrete structural remnant, view to east

7269 is the tsunami-displaced remnant of a concrete structure located on the crest of a sand dune, in the central portion of the Kahuku Point Preserve. The remnant is partially buried by sand. The exposed portion is 10′ long (east-west) and 4′2″ wide (*Figure 23*). The impressions of 5″ wide form boards are visible on the side of the structure. No artifacts were observed in association with the structure. The appearance and condition of the concrete indicates the structure likely dates to the World War II use of the area; however, its original size, shape and function are undetermined. The site is in poor condition and lacks physical integrity.

Site 7270 is a rusted rectangular metal container, or tank, located on a level soil deposit on the inland side of the Kahuku Point Preserve. The tank is 47″ long, 39¼″ wide and 34½″ in height (*Figure 24*). It is constructed of ¼″-thick sheets of steel that are welded together. The tank interior is divided into compartments by metal sheets perforated with 6″ diameter holes (*Figure 25*). There is a 1 ½″ diameter hole present near the top of the tank and a 3″ diameter metal drainpipe at the base. No artifacts were observed in association with the container. The tank is a probably a fuel storage tank based on the compartmentalized interior, which served to reduce fluid movement during transportation. Its condition and appearance suggests it was utilized during World War II. The site is in poor condition and lacks physical integrity.

Site 7271 is a level segment of asphalt pavement located in an ironwood grove along the south side of the Kahuku Point Preserve. The exposed pavement is 76′ 6″ in length (north-northwest by south-southeast) and 72′10″ wide. The sides of the asphalt pavement are disturbed, with jagged edges. A section is buried beneath mechanically piled berms of soil and stone. The pavement surface is level and covered with scattered leaves and ironwood needles (*Figure 26*). Recent aluminum cans and golf balls are scattered on the surface. The Site 7271 pavement is located in an area of aircraft revetments on the north of the main Kahuku Army Airfield runway. The location of the site on Figure 17 indicates that the pavement probably is a remnant of a road that connected the revetments to the airfield. The site is in poor condition and retains limited physical integrity.

Site 7272 consists of three displaced sections of a concrete structure located in an area 15 m long by 6 m wide on the dunes in the central portion of the Kahuku Point Preserve. The sections are rectangular formed-concrete pieces that range from 10′6″ to 11′4″ in length and 5′10″ to 6′1″ in width (*Figure 27*). There is a 2′10″ wide L-shaped projection on one end of the sections and a 2′ wide "T" shaped projection on the other. Linear grooves 1″ wide are present on the exterior side of the L-shaped projections. The sections where constructed using 6″ wide form boards. Rebar is visible in the broken edges. No artifacts were observed in association with the structural remnant. The concrete sections are similar to the walls of an intact structure at Site 7278 located in Area E, discussed below. The intact structure is U-shaped and is 15′10″ long by 14′2″ wide. The concrete walls are also 1′ wide and exhibit impressions from 6″ wide form boards. The grooves noted on the Site 7272 L-shaped projections also are present at Site 7278. Site 7278 is a World War II era military structure that may have functioned as a gun position, or ordnance storage area. By analogy, Site 7272 represents a military gun position, or potentially an ordnance storage area based on the similarities in construction to Site 7278. Site 7272 is located just north of the area of revetments that border the north side of the Airfield runway. The site is extensively disturbed and in poor condition, and no longer retains physical integrity.

Site 7273 is a tsunami-displaced concrete block located on the seaward slope of a coastal sand dune, in the eastern portion of the Kahuku Point Preserve. The block is trapezoidal and measures 28″ wide at the base, 16″ wide at the top with sides that vary in length from 25″ to 26″ (Figure 28). The block is lying on its side. There is an 8″ diameter pipe embedded in the block with a 1′ diameter flange at one end. The concrete has basalt aggregate inclusions. No artifacts were observed in association with the block. Site 7273 likely dates to the World War II use of the area based on the appearance of the concrete. The flanged pipe indicates it potentially had a plumbing-related function. The site is in poor condition and no longer retains physical integrity.

Site 7274 is a tsunami-displaced concrete cylinder exposed on level terrain on the south side of the Kahuku Point Preserve. The cylinder is 55″ long by 27″ in diameter (*Figure 29*). The concrete is rough and contains limestone gravel aggregate. A copper cable extends out of one end of the cylinder. A plastic milk crate is located adjacent to the cylinder. The shape of cylinder suggests it was originally set in a vertical position and the copper wire indicates

Figure 24. Site 7270 metal box, view to west

Figure 25. Site 7270 interior of metal box, view to northeast

Figure 26. Site 7271 asphalt area, view to east

Figure 27. Site 7272 concrete structure remnant, view to south

Figure 28. Site 7273 concrete block, view to south

Figure 29. Site 7274 concrete cylinder, view to north

an electrical function, perhaps a support for a light fixture. The site is located within an area of former revetments adjacent to the north side of the Kahuku Army Airfield runway (see *Figure 11*), potentially lending support to a light fixture support function. Site 7274 is poor condition and no longer retains physical integrity.

Test Area A

Test Area A encompasses 20.8-acres in the west portion of the TBR property, seaward of the Kamehameha Highway and inland of the east side of Kawela Bay (*Figure 30*). Test Area A was extensively disturbed by agricultural use for sugarcane cultivation (Haun *et al.* 2011). A section of the OR&L railroad grade (Site 5791) formerly extended through the area but no evidence of it was identified during the pedestrian surface survey of Test Area A. A 1950s era bus was identified during the surface survey. *Figure 31* depicts the bus location and the former extent of the railroad grade.

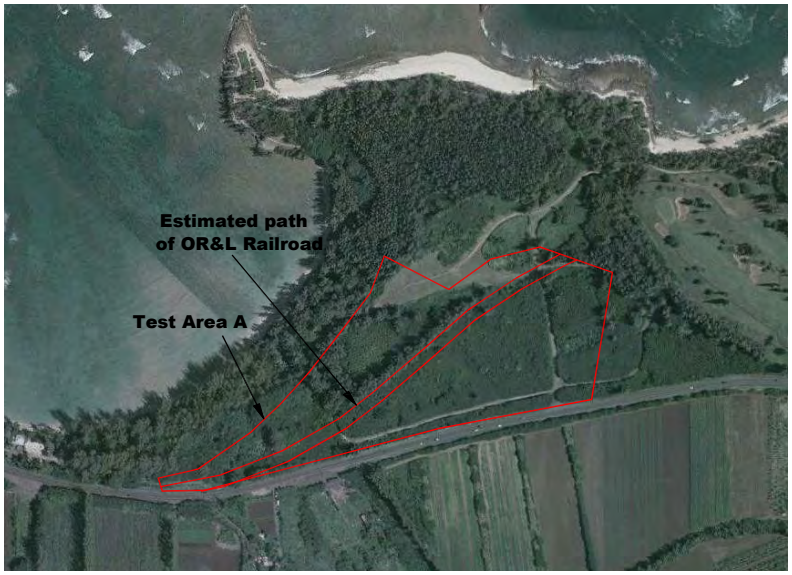


Figure 30. Aerial view of Test Area A (from Google Earth)

Site 7267 is an abandoned bus located in the eastern portion of Test Area A. The bus is a public transit vehicle made by the "White" company with nine side windows, a driver's side window and front and rear windows (*Figure 32*). A bus with a similar design is depicted on a 1950s era brochure for the Honolulu Rapid Transit Company (*Figure 33*). The bus is 32'6" ft long, 8' in wide and 8'10" high. A folding entry door provided access on the right side of the vehicle opposite the driver seat. There are blue vinyl-covered benches inside the bus. A "stop" cord extends along the interior sides above the windows. A sign reading "44 seating capacity and 30 standing" is present at the front of the bus interior. The bus license plate indicates it was in use until at least 1973, operated

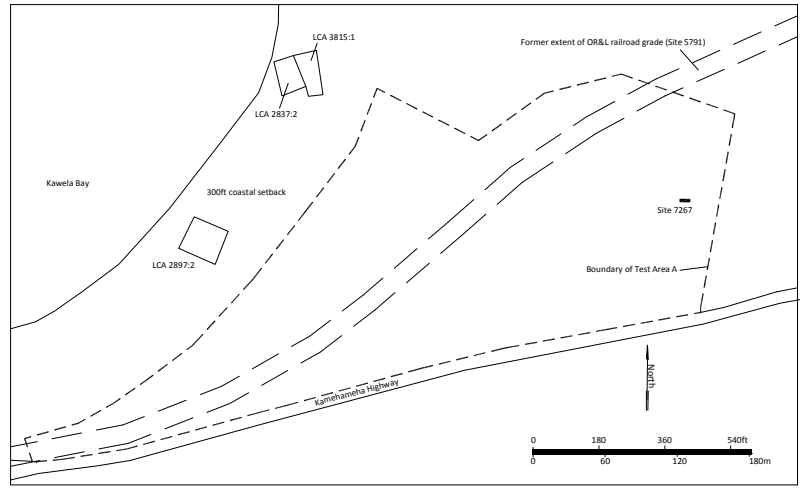


Figure 31. Surface of Test Area A

Figure 32. Site 7267 transit bus, view to south

Figure 33. Honolulu Rapid Transit Company brochure

Figure 34. Site 7267 license plate

by the City and County of Honolulu (*Figure 34*). The bus was probably sold by the CCHONO, repurposed as a temporary dwelling or farm crew vehicle and abandoned in place. The vehicle is completely deteriorated and lacks physical integrity.

Test Area B

Test Area B encompasses 17.5-acres just inland of the coastal dunes and is bordered by the Fazio golf course fairways on all but the seaward side (*Figure 35*). No surface sites were identified in this area. Test Area B was extensively disturbed by sugarcane cultivation and subsequently by its current use as a horse stable and corral facility. A Land Commission Award (LCA 235M) parcel for Kaili was formerly located at the north end of the area. The OR&L railroad grade once extended through the north end of the area and a plantation workers camp (Camp 3) was located adjacent to the inland side of the railroad grade. No surface evidence of these historic features was identified. The locations of the stables and former historic features are depicted in *Figure 36.*

Figure 35. Aerial view of Test Area B (from Google Earth)

Test Area C

Test Area C encompasses 8.3-acres located on east side of the TBR hotel and is inland of the beach front and bordered by the Palmer golf course fairways on all other sides (*Figure 37*). No surface sites were identified in Area C. A series of twelve pits were previously excavated to obtain sand from the dune that covers Area C. These pits, labeled SP-1 through SP-12 range in length from 2.8 to 47.1 m, in width from 1.8 to 15.7 m and in depth from

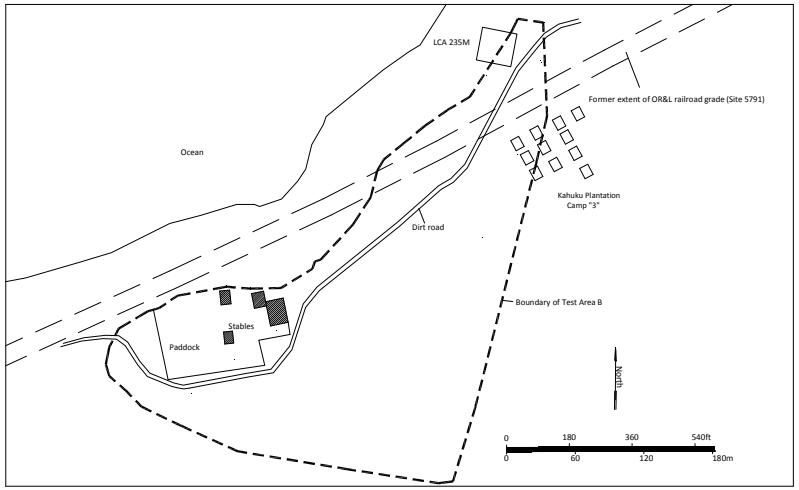


Figure 36. Surface of Test Area B

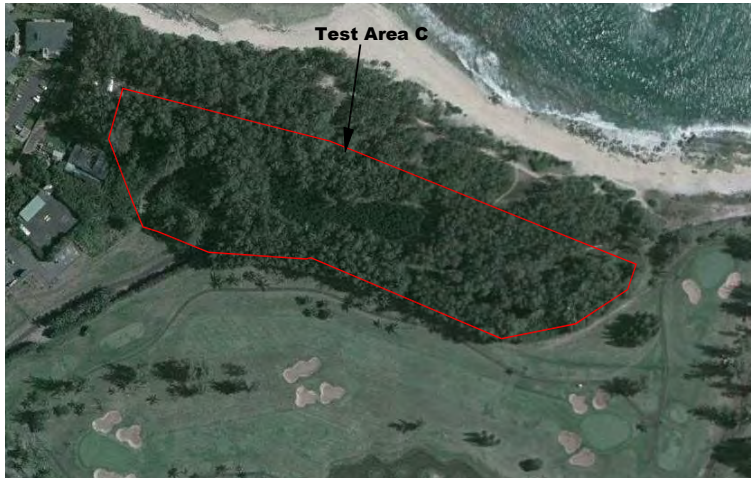


Figure 37. Aerial view of Test Area C

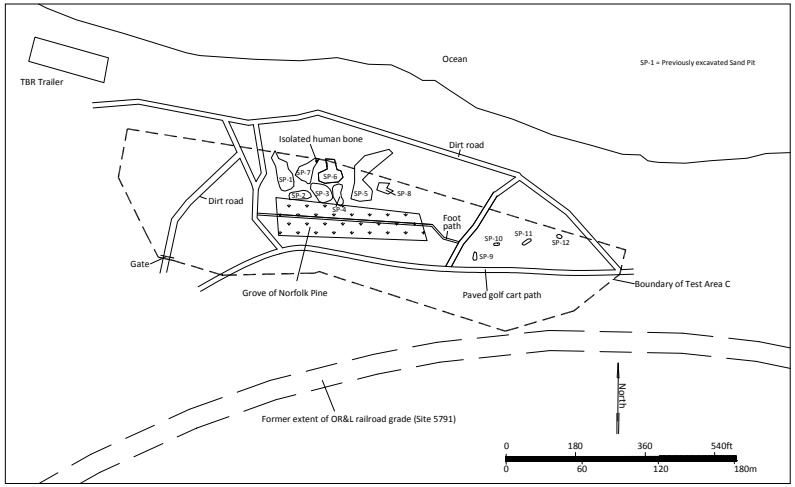


Figure 38. Surface of Test Area C

Figure 39. Area C, Sand Pit 1 showing mechanical excavation, view to south

Figure 40. Area C, Sand Pit 6 showing manual profiling, view to southeast

approximately 0.5 to 6.0 m (*Figure 38*). A secondarily deposited human metatarsal (toe bone) was identified on the surface of Sand Pit 7, displaced during previous sand mining activity from a subsurface burial. Two sand pits are illustrated in *Figures 39* and *40*. A grove of Norfolk pines trees is planted in a rectangular 0.71-acre area in the central portion of Area C, and was formerly part of a nursery. A series of dirt roads, paths and a paved golf cart road cross the area.

Test Area D

Test Area D encompasses 15.9-acres and is parallel to the shoreline, bordered on the other sides by the Palmer golf course fairways (*Figure 41*). No surface sites were identified in Test Area D. The Kahuku Point Army Airfield runway, taxiways, and airplane storage revetments formerly occupied the northeastern portion of the area and a second revetment area was located adjacent to southern end of Test Area D (*Figure 42*). No surface manifestations of these facilities were encountered. An area of scattered asphalt in the central portion of Area D, is located in an area 205 m long northeast by southwest, and 30 to 70 m wide. A series of dirt roads cross Area D and a golf course cart path borders the east side. A privately owned LCA parcel (TMK: 5-7-01:028) is located at the north end of Area D.

Test Area E

Test Area E encompasses 68-.9-acres and is surrounded by the Palmer Golf Course (*Figures 43* and *44*). The surface of Test Area E was extensively modified from 1942 to 1946 for the Kahuku Army Airfield (see *Figure 43).* The main runway formerly extended across the northern portion of Area E. An intact portion of the runway was recorded as Site 7275. Scattered pieces of asphalt are still present in the central portion of Area E. Revetments were once located just south of the runway and barracks were once located in the southern part of Area E.

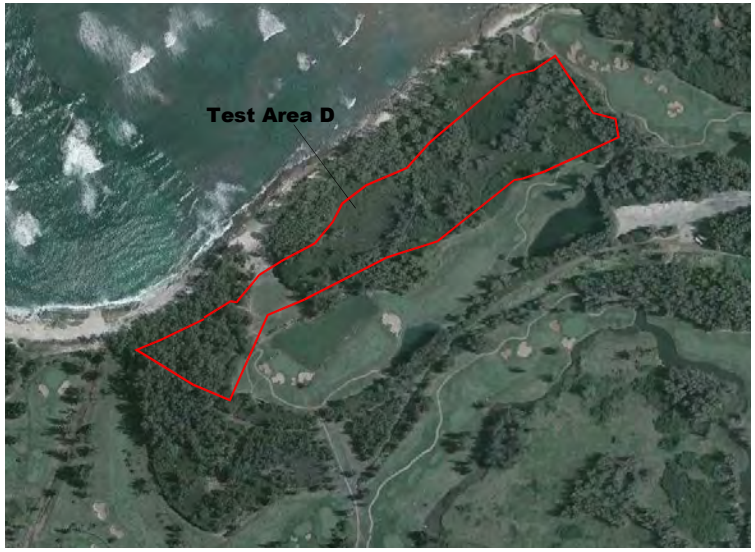


Figure 41. Aerial view of Test Area D (from Google Earth)

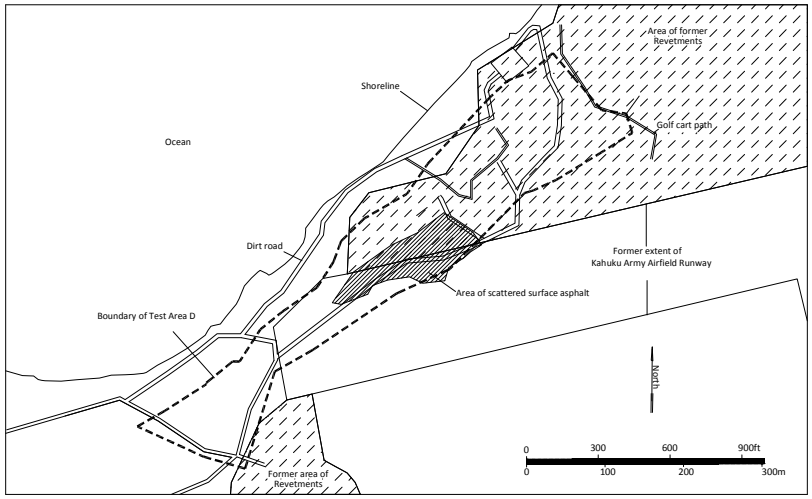


Figure 42. Surface of Test Area D

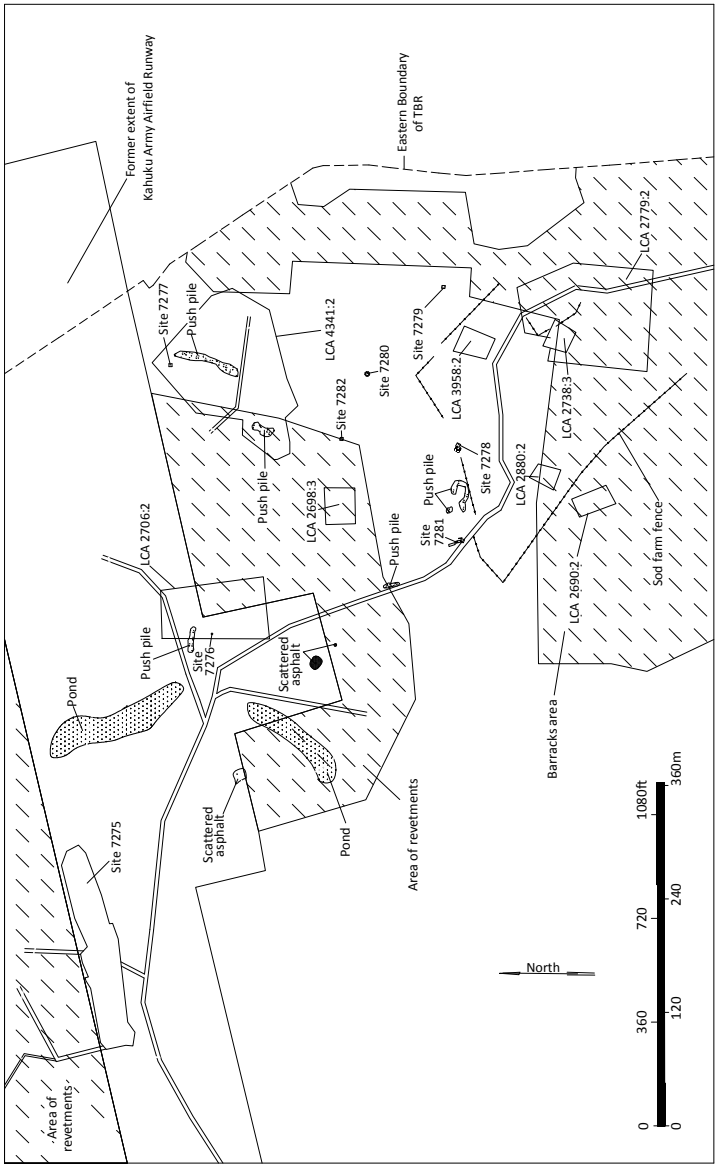


Figure 43. Surface of Test Area E

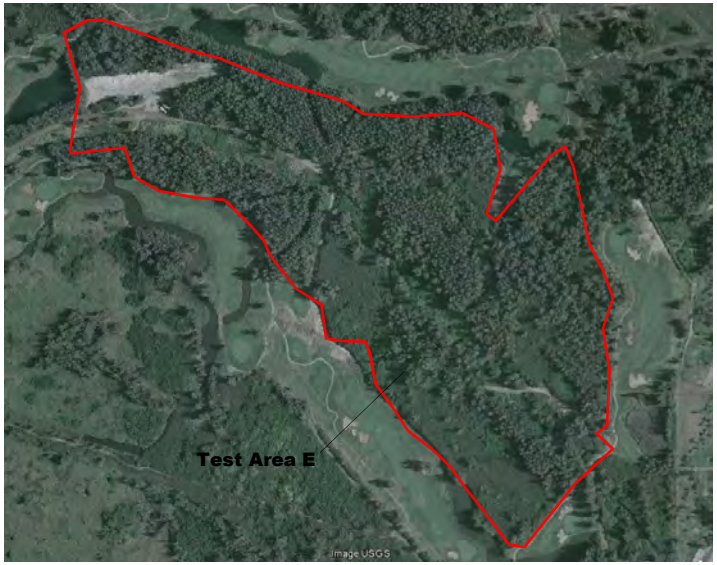


Figure 44. Aerial view of Test Area E (from Google Earth)

Eight LCAs are located within Area E: LCA 2690:2 to Luiki (Luihi), 2698:3 to Waanui, 2706:2 to Holoaia, 2738:3 to Paiu, 2779:2 to Makilo, 2880:2 to Kupau, 3958:2 to Nakuhao (Nakuhae), and 4341:2 to Kaukaha. No extant cultural features were identified within the LCA parcels.

Two artificial ponds in Area E were built in conjunction with the Palmer Golf Course constructed in 1990-1991. One pond occupies an area of approximately 0.58 acre and the other is just under an acre in size. There are six large bulldozed push-piles of soil, stones, concrete and asphalt rubble that occupy approximately 0.29 acres in Area E. These features also appear to be related to golf course construction. Several dirt roads cross Area E and a 10.7-acre roughly rectangular parcel bordered a wire fence in the south portion of Area E represents the former extent of a sod farm and nursery.

Eight sites associated with the Kahuku Army Airfield were identified during the surface survey of Area E. These consist of the runway remnant (Site 7275), three concrete blocks (Sites 7276, 7279 and 7282), a concrete slab (Site 7277) and three concrete structures (Sites 7278, 7280 and 7281). The sites are described below.

Site 7275 consists of an exposed asphalt pavement located at the northwestern end of Area E. The pavement is a portion of the main Kahuku Army Airfield runway (see *Figure 43*). The extant pavement is 717' long (east-northeast by west-southwest) and from 104' to 138' wide. Originally, the runway was 6,500' in length; however, large portions were destroyed during golf course construction (Trojan n.d.). The pavement is currently used as storage for sand and soil stockpiles and five metal shipping containers (*Figure 45*). No artifacts associated with the World War II era use of the runway were identified. The site retains limited physical integrity, representing only a portion of the former extent of the runway, and is in fair condition.

Figure 45. Site 7275 runway with shipping containers, view to east

Figure 46. Site 7276 concrete block, view to west

Site 7276 is a concrete block located in the approximate center of Area E. The block is 4' square at the base and 3' square at the top, with 1.2' high tapering sides (*Figure 46*). Form board impressions are visible on the sides and a projection on the base indicates it was poured in place. Braided wire loops are embedded on each side of the block and a rusted metal remnant of a possible hook or eye protrudes from the top. Fragments of asphalt are scattered around the block. Site 7276 is a probable anchor, potentially used to secure guy wires. It is unclear if the block is in its original location and is in fair condition.

Site 7277 is a rectangular concrete slab located on the northwest side of Area E. The slab is 10' 9 ¼" long (north-south) and 9' 8¼" wide (*Figure 47*). The sides are mostly broken although linear, intact edges are present along each of the four sides. The slab is formed concrete and the surface is level and smooth. Modern debris is scattered throughout the area although no remains were in direct association with the slab. The slab presumably served as a foundation likely associated with the Kahuku Army Airfield. It is altered and in fair condition.

Figure 47. Site 7277 concrete slab, view to southwest

Site 7278 is an intact U-shaped concrete structure located in the southeast portion of Area E, north of the barracks and south of the revetment bordering the main runway (see *Figure 43*). The structure is 15'10" long (northeast-southwest) by 14'2" wide and open to the southeast (Figure 48). The walls are 4'2" to 4'7" high and 1' thick, with impressions from 6" form boards. The walls were constructed with reinforcing steel bars visible in broken edges. The top of the structure is open with eave-like overhanging sections 2'10" wide on the interior (Figure 49). Two linear, parallel grooves 1" wide and ¾" deep are located on the underside of the overhanging sections; remnants of wood are still visible in the grooves. The floor of the structure is covered with soil and displaced concrete slab fragments. The structure is extensively damaged. Damage to the north and west corners resulted in the complete destruction of the exterior corners and in holes through the concrete to the interior of the structure (*Figure 50*), a pattern that might be the result of an explosive charge detonated in an attempt to destroy the structure. A water

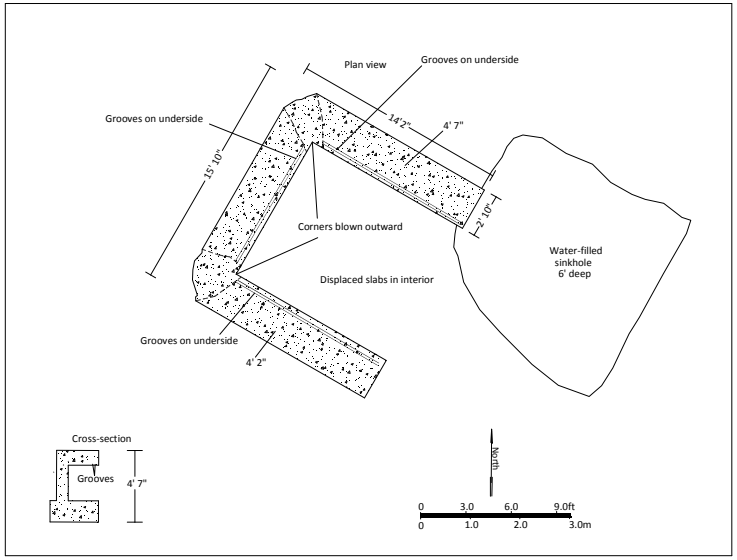


Figure 48. Site 7278 plan map

Figure 49. Site 7278 concrete structure, view to northwest

Figure 50. Site 7278 blown out corner of concrete structure, view to southwest

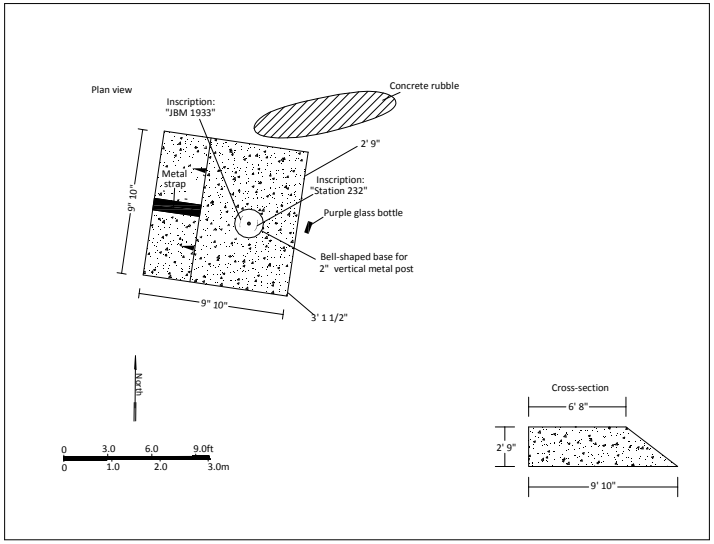


Figure 51. Site 7279 plan map

filled sinkhole roughly 13' square and 6' deep is located adjacent to the southeast side of the structure. No artifacts were observed in association with the structure. Site 7278 is interpreted as a World War II era facility based on formal type and condition. Its specific function is undetermined, but its peripheral location and thick reinforced concrete walls might indicate use as a defensive structure, perhaps a gun position, or an ordnance storage facility. Site 7278 is in poor condition and lacks substantial physical integrity.

Site 7279 is a square concrete block located on level ground on the east side of Area E. The block is intact and measures 9'10" on each side (*Figure 51*). The east two-thirds of the block has a level upper surface 2'9" high. The west side slopes to the ground surface (*Figure 52*). An 8" wide metal strap is imbedded in the sloping surface (*Figure 53*). A conical concrete mound on the upper surface of the block is 1'7" in diameter and 1' high. A 2" rusted metal pipe extends vertically from the center of the mound. Two inscriptions are present on the sides of the mound: "Station 232" is inscribed on the east side (*Figure 54*) and "JBM 1933" is inscribed on the west side (*Figure 55*). A purple glass bottle is present on the ground surface east of the block and a pile of concrete rubble is located adjacent to the north side of the block.

Figure 56 is a 1932 U.S. Coast and Geodetic Survey Map of the Kahuku Point Area that depicts 5 poles that appear to be related to the Marconi Wireless Station. Marconi Station is located east of the TBR property, but the poles depicted on the 1932 map were located within it. When Sites 7279 and 7282 (another concrete block) are plotted on the 1932 map, they rough align with the poles and are positioned between the easternmost pair of poles and the Marconi "Power house". *Figure 57* is a plan map depicting the transmitting aerials on the north side of Marconi Station. The power plant provided electricity to the Marconi Wireless Station, which was one of a series of stations that provided world-wide wireless telegraph communication. Similar facilities were located in Canada, Ireland, Newfoundland, the United States and the United Kingdom. Construction of the Marconi Station began shortly after World War I began in Europe in 1914. According to the Honolulu newspaper, the *Pacific Commercial Advertiser* (terrastories.com):

> We celebrate today opening Marconi radio plant of O'ahu. The radius of action is upwards of 5,000 miles, and insures communication in time of war, regardless of any cutting of the cable.

Site 7279 is interpreted as a support for an antenna that was installed in 1933 as part of the Marconi Wireless Station communication facility. The site is in fair condition retains substantial physical integrity.

Site 7280 is a low, octagonal concrete structure 6' 3" wide and open on the top, located on a level ground surface in the east portion of Area E (*Figure 58*). The walls are formed concrete, 1' thick and 2'2" to 2'8" high. A tapered opening in the southwest side is 1'9" wide on the exterior and 1'1" wide on the interior (*Figure 59)*. The corners and upper edges of structure are broken, exposing the interior wall surfaces, where steel rebar is exposed. The floor is level soil. No artifacts were observed in association with the feature. Site 7280 appears to be in its original location, but is severely damaged. The site is in fair condition and retains limited physical integrity.

Site 7280 is identical in construction and shape to Site T-4 reported by Bath *et al.* (1984:37), which was not mapped or assigned a SIHP site designation. Bath *et al*. describe T-4 as "a roofless, poured concrete octagonal structure, 2.25 m in diameter and 1.22 m high. About 45 cm below the top of the structure is a small rectangular aperture, 45 cm wide by 77 cm high. Wall thickness is 50 cm." The dimensions reported by *Bath et al*. are larger than the ones for recorded for Site 7280 and the reported location is approximately 90 m east of the plotted location for 7280. These differences suggest that T-4 is not the same feature as Site 7280, but one that had similar morphological characteristics and function. The morphology and construction size and shape of both features suggest they may have functioned as an antenna supports. Further support for this interpretation comes from their location in an area that was in between the seaward runway and revetments and the inland barracks in an area where two other sites (7279 and 7282) that were part of the Marconi communication facility are situated.

Figure 52. Site 7279 concrete block, view to south

Figure 53. Site 7279 showing metal strap, view to west

Figure 54. Site 7279 concrete mound with inscription, view to east

Figure 55. Site 7279 concrete mound with inscription, view to west

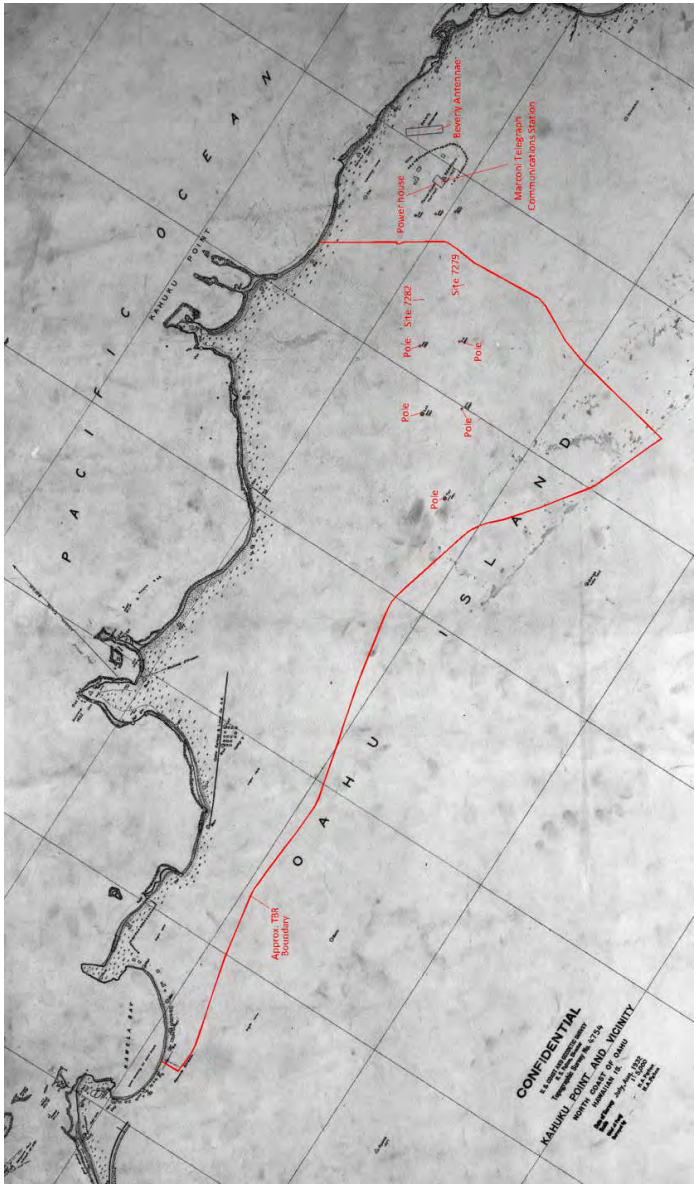


Figure 56. 1932 U.S. Coast and Geodetic Survey Map

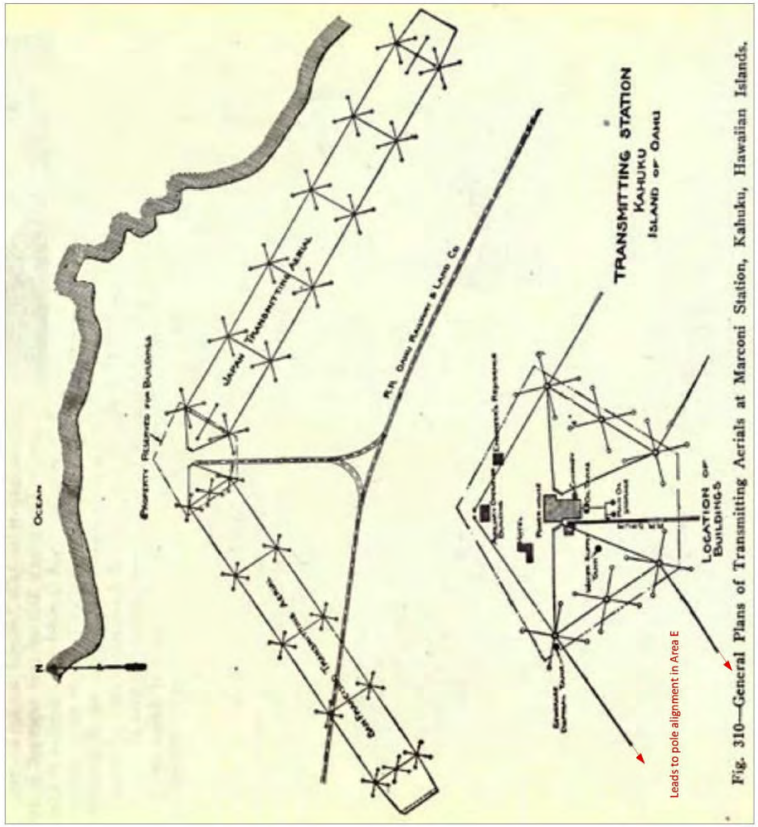


Figure 57. Transmitting aerials at Marconi Station (from terrastories.com)

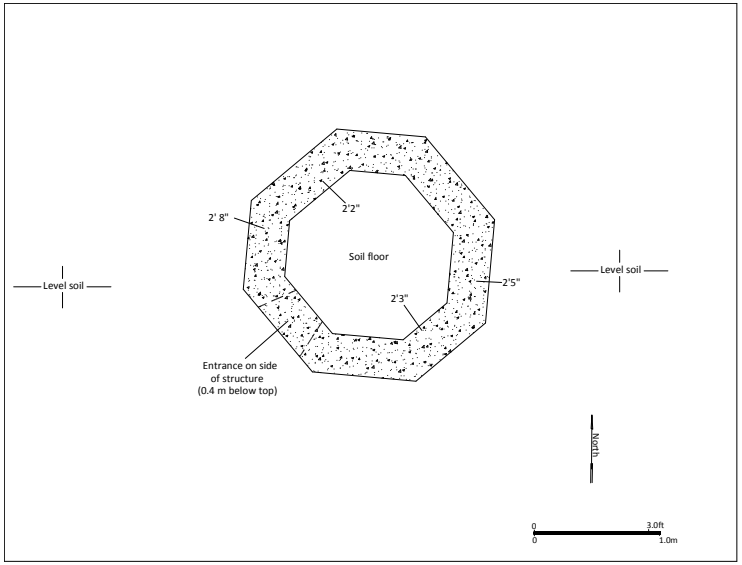


Figure 58. Site 7280 plan map

Figure 59. Site 7280 concrete structure, view to northeast

Site 7281 consists of a predominantly buried pile of concrete structural elements in an area 16 m long (north-northwest by south-southeast) by 4 m wide. The debris pile is located adjacent to a dirt road on level ground in the south portion of Area E. Some concrete structural elements are similar in form and appearance to the standing concrete structure documented at Site 727. Visible elements consist of three wall segments 1' thick with the same 2'10" wide overhanging interior eaves as those at Site 7278, and the same two parallel grooves on the underside of the overhanging eave-like projections (*Figure 60*). The broken walls vary in length from 13' to 14'. A displaced concrete slab is positioned on top of one of the disturbed walls adjacent to the dirt road. The slab is 12' square and 1' 4" thick, with reinforcing rebar visible along the edges (*Figure 61*). A similar slab was not present at Site 7278, which suggests it could represent a displaced element of a second structure.

Site 7281, like Site 7278, is also located in the area between the barracks and the revetments on the south of the main runway. The two sites are located 300' apart. Site 7278 was interpreted as a possible gun position or ordnance storage facility for the WW II-era Airfield. Based on the similarity of the structural elements previously documented at Site 7278, the destroyed concrete structural elements at Site 7281 probably represent a similar feature used in the same capacity. Obviously, efforts to destroy the structure at Site 7278 were only partially successful; Site 7281 also might have been intentionally destroyed, possibly quite near to its original location. The site is in poor condition and no longer retains physical integrity.

Site 7282 is a square concrete block located on a low knoll in the east-central portion of Area E. The block is nearly identical to the block documented at Site 7279, located 192 m (630') to the southeast, although it lacks a conical concrete mound on the upper surface. The Site 7282 block appears to be intact and measures 9'10" on each side (*Figure 62*). The southern two-thirds of the upper surface is level and 3' to 3'3" high. The northern side slopes to the ground surface. An 8" wide metal strap is embedded into the sloped surface of the block. A 3½" metal bracket is welded onto the strap with a series of rusted metal projections extending along the length of the strap. The same strap is present at 7279, but the bracket and projections have rusted away (see *Figure 53*). Site 7279 was interpreted as a possible base for a power pole with a 1933 inscription. The Site 7282 block is nearly identical to Site 7279 and it is likely of similar age and function. The site is in fair condition and retains substantial physical integrity.

Test Area F

Test Area F encompasses 26.6-acres and is located south of Test Area E, bordered on the west by Punahoʻolapa Marsh and by the Palmer golf course on the north and south (*Figure 63*). A series of dirt roads cross Area F, which provide off-fairway access to various parts of the property. Area F was extensively disturbed during construction of the golf course. Nine large bulldozer push-piles of soil, stone, pieces of concrete and other debris are attributable to golf course construction activities and cover 1.89-acres (*Figure 64*). Concrete remains are similar in appearance to the concrete used in the World War II era military structures elsewhere in Area F. Examples of the displaced concrete elements are presented in *Figure 65* and *Figure 66.*

Several small water-filled limestone sinkholes are located within and adjacent to the northwest end of Test Area F and peripheral to the marsh. These sinkholes were carefully examined during the project but no cultural material or evidence of previous use was identified.

A portion of the Site 5791 OR&L railroad grade once extended through portions of Area F. No surface evidence of the railroad grade was identified in Area F, although an intact section of the grade was identified to the west where it crosses Punahoʻolapa Marsh. A large enclosure with a possible house inside is depicted on the 1890 Loebenstein map of the area (see *Figure 64*), but no evidence of the enclosure or house was identified during the surface survey.

The surface survey of Area F identified seven sites described below: a concrete slab (Site 7265), an agricultural clearing mound (Site 7283), a complex of concrete structures (Site 7284), a pair of metal gateposts (Sites 7285), an asphalt pavement (Site 7286), a displaced concrete structure (Site 7287), and an historic rock wall (Site 7299).

Figure 60. Site 7281 concrete structural remnant, view to northeast

Figure 61. Site 7281 concrete structural remnant, view to south

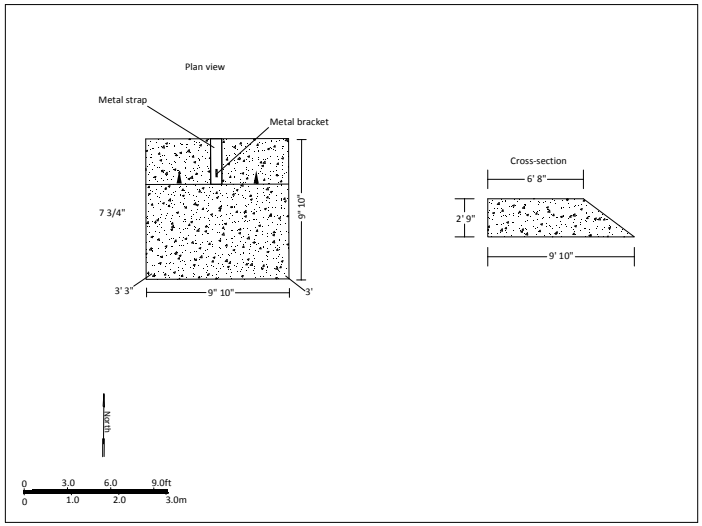


Figure 62. Site 7282 plan map

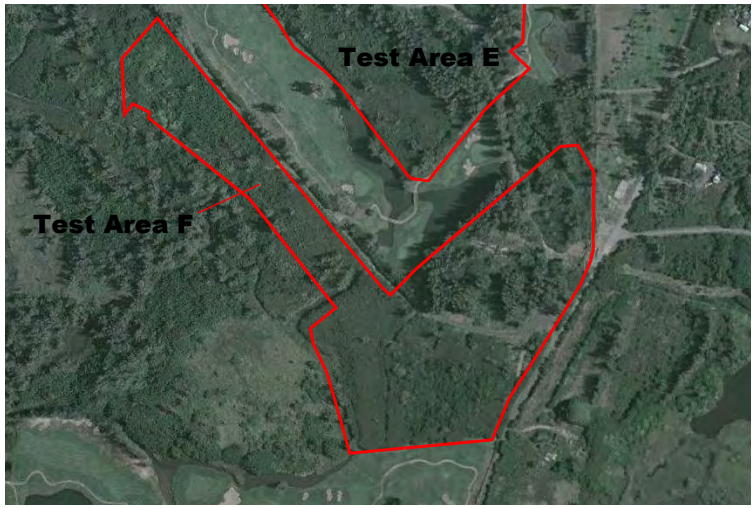


Figure 63. Aerial view of Test Area F (from Google Earth)

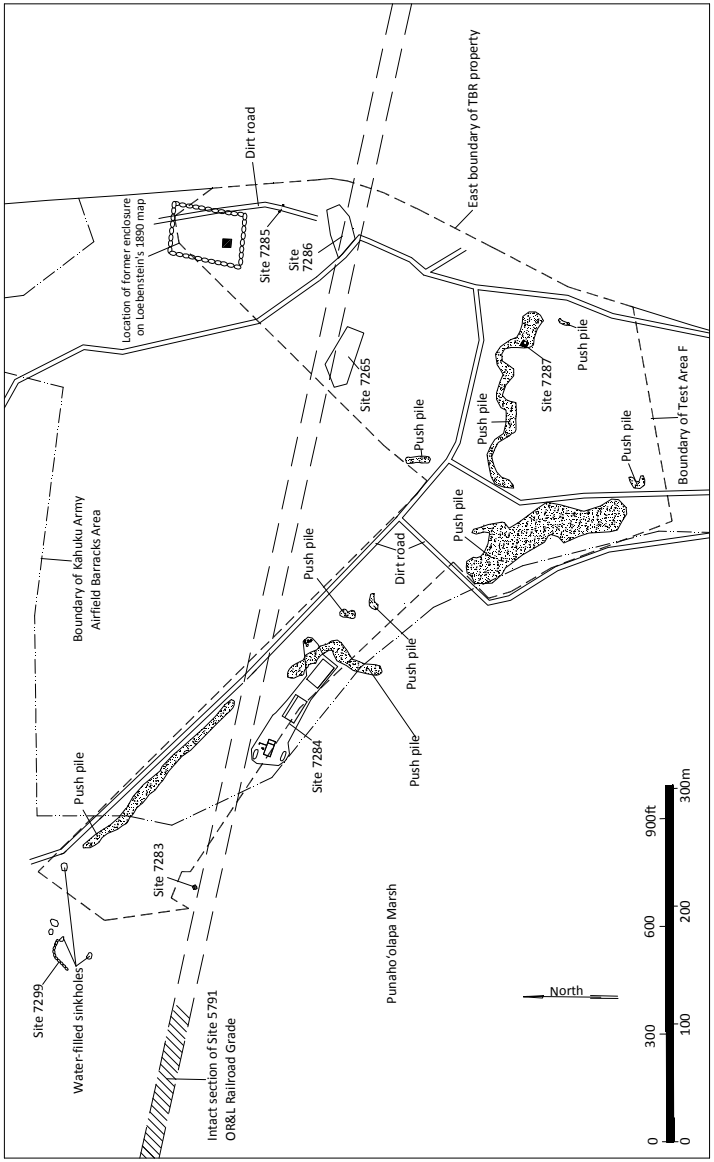


Figure 64. Surface of Test Area F

Figure 65. Push piles with concrete debris, view to south

Figure 66. Push piles with concrete debris, view to southwest

Site 7265 is a large disturbed concrete slab covered with fallen trees and vegetation, located in the southeast portion of Area F, on level ground in an ironwood grove. The exposed portion of the slab is 168' 7" long (west-northwest by east-southeast) and 49'6" to 74'5" wide (*Figure 67*). Intact edges are present on the south and east sides. The remaining sides have been damaged by a bulldozer and are characterized by broken concrete rubble or are buried beneath soil push piles. The intact sides of the slab vary in height from 5" to 8". No artifacts are present on or around the slab. The Site 7265 slab is located within the former army airfield barracks facility depicted in Figure 64. The slab likely served as the foundation for a barracks or other military support structure. The slab is in fair condition and retains limited physical integrity.

Site 7283 is an irregularly shaped stone mound located on the eastern periphery of Area F, 5.0 m north of a dirt road. The mound is built of roughly stacked and piled weathered limestone boulders and cobbles on a surface of undulating terrain characterized by limestone outcrops (*Figure 68*). The mound is 3.0 m long (east-west) by 2.6 m wide and 0.95 m high with an uneven irregular surface. No artifacts were observed in association with the feature. The mound is interpreted as possible agricultural clearing feature based on its formal type and informal construction. It is in poor to fair condition and retains limited physical integrity.

Site 7284 is a complex of five features located on the southwest side of Area F, adjacent to Punaho'olapa Marsh (*Figure 69*). The features consist of two large slabs (Features A and C), a concrete structure (Feature D) and two concentrations of historic debris (Features B and E). The site covers an area 111 m long (northwest by southeast) by 38 m wide.

Feature A is a rectangular concrete slab 73'6" long (northwest by southeast) and 40' wide, located at the southeast end of the site (*Figure 70*). The sides vary in height from 1'11" to 3'8" above the surrounding ground surface. The northwest quarter of the slab is raised 4" above the rest of the surface. A second, 10" high raised surface is located in the eastern corner. Two ½" bolts are present in the north and east corners, while two ¾" bolts are present at the south and west corners. A recessed channel 3 5/16" wide extends along the southwest side and portions of the northwest and southeast sides. A dense stand of Christmas berry covers and obscures the slab surface; it is possible that the channel continues but is obscured. The surface of the main slab is 10" above the channel (*Figure 71*). A second set of recessed channels extends at least 16' toward the center of the slab, but is buried beneath soil and Christmas berry so its full extent might be greater. A 1 ¾" metal pipe is suspended from the side of the slab along the northwest side. One-half inch diameter steel rebar is visible in broken edges of the slab. A mound of soil and a large boulder are located on the southwest side of the large slab. A smaller concrete slab adjoins the west-central side of the main structure and is 25' long (northwest by southeast) by 6'4" wide and 1" above the surrounding ground surface. The surface of the main slab is 2'6" higher than the surface of the smaller slab. A large displaced slab fragment is present on the east end of the surface of the lower slab. A backhoe trench was excavated on the southwest side of Feature A. Excavation of BT-F-9-1, a 5.0 m long trench, documented 0.2 m of fill over weathered limestone (see *Figure B-320* in **Appendix B**). A 2" galvanized metal pipe in the northwest wall of the trench likely originated at the slab. No other cultural remains were present.

Feature B is a concentration of discarded historic structural elements, predominantly fragments of concrete, located 18 m northeast of Feature A (see *Figures 69-70*). A large bulldozed push pile of soil, stones, asphalt and concrete fragments separates Feature B and Feature A. Debris is scattered over an area 7 m long (north-northwest by south-southeast) by 4 m wide. Feature B consists of two concrete pads (each is 4'3" long by 3'1" wide), a cluster of twisted metal pipes, a concrete block with a 4" metal pipe extending from the top (3' long by 2'8" wide) and two small concrete pads with four raised, roughly hemispherical projections (*Figure 72*). The pads at the north end of the concentration are 4' square and 10" thick with the projections averaging 1'4" in diameter and 5" in height. The broken pad with projections is 4' long and 2'9" wide. A large basalt boulder is located on the northwest edge of the discarded structural elements.

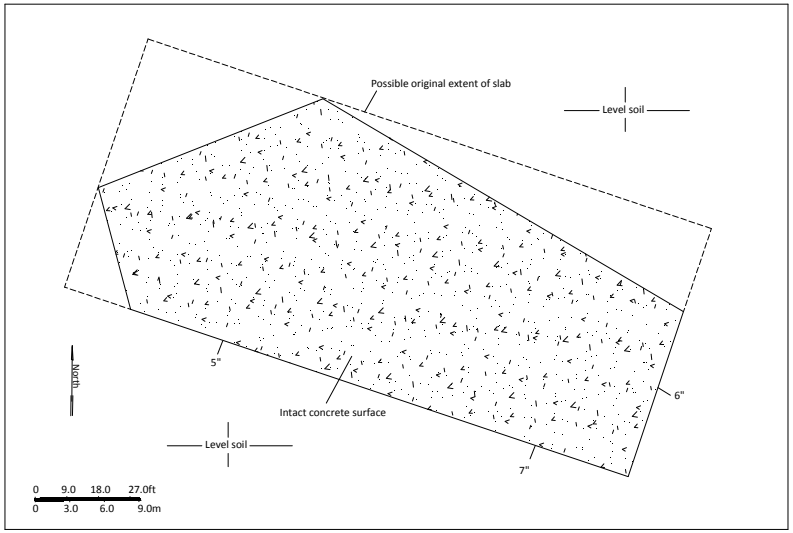


Figure 67. Site 7265 plan map

Figure 68. Site 7283 stone mound, view to north

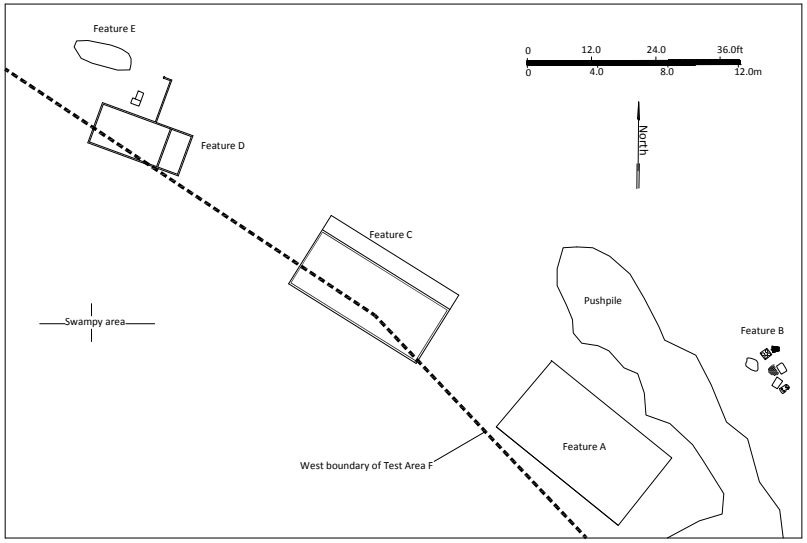


Figure 69. Site 7284 plan map

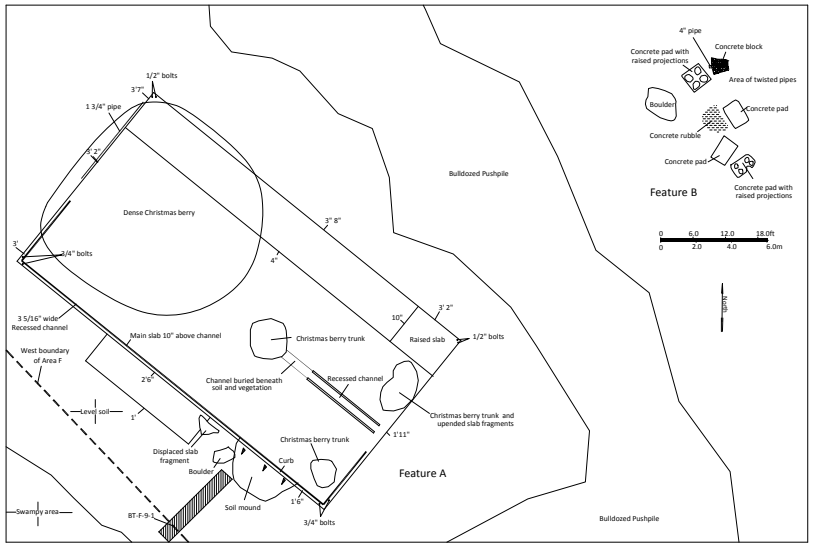


Figure 70. Site 7284, Feature A and B plan map

Figure 71. Site 7284, Feature A channel, view to northeast

Figure 72. Site 7284, Feature B concrete pad with projections, view to northwest

Feature C is a rectangular concrete slab 70'2" long (northwest by southeast) and 37'6" wide, located 15 m northwest of Feature A (*Figure 73*). The slab is 1'10" to 2'6" high and was constructed using 7" wide form boards (*Figure 74*). The northeast side of the slab is raised 4" above the rest of the slab surface. A recessed (10" deep) channel, identical to one at Feature A, frames the lower portion of the slab. A series of ½" threaded metal bolts spaced 4' apart extend from the northeast side of the raised portion of the slab *(Figure 75*). Numerous Anchor Hocking brown and colorless glass bottles are scattered around the slab.

Feature D is a complex concrete structure situated 22 m northwest of Feature C. The structure is densely overgrown with Christmas berry and is composed of three adjoining rooms. The overall structure is 44'2" long (west-northwest by east-southeast) and 19'8" to 40'8" wide (*Figure 76*). The walls are 1' thick and were constructed using 7" wide form boards. Broken edges reveal metal reinforcing rods. The smallest room on the east side is 19'8" long by 10'9" wide with a concrete floor, but no roof or obvious entrance. Half-walls are present on the north and east sides, 2'3" to 2'6" high. A metal ladder is attached to the southwest interior wall of the smallest room (*Figure 77*). The central room is 33' 4" long by 19'10" wide; wall heights vary from 5'4" to 5'7" and the floor is concrete (*Figure 78*). The floor and the lower half of the interior walls are coated with tar. The central room also lacks a roof and obvious entrance. A northern extension of the central room consists of a rectangular concrete slab that adjoins the north side of the central room. The northern extension is 26'11" long by 20'10" wide and is only partially walled, but not roofed. A half-wall, 1' thick and 1'11" to 2' high, extends along the east side and northeast corner. A raised concrete platform in the center of the slab has two levels (*Figure 79*). The lower level is 3'11" long, 2'8" wide and 6" high, with a metal bracket at both ends. The upper level is 4' long, 2'6" wide and 1'5" high. A metal electrical panel is located on the wall near the southeast corner. Modern trash is scattered within and adjacent to the structure.

Feature E is trash dump of historic and modern debris covering an area 8.5 m long (east-west) by 3 m wide, c. 3.5 m northwest of Feature D (see *Figures 69* and *76*). The oldest items are colorless glass containers, Anchor Hocking bottles and jugs, brown glass beer bottles, and rusted metal cans (*Figure 80*). Modern debris includes a lawn mower, plastic bottles, a small refrigerator, an enamel sink and two porcelain toilets.

Site 7284 is part of the World War II Kahuku Army Airfield barracks complex (see *Figure 64*). Features A and C likely functioned as foundations for military structures. The Feature D structure probably was a water storage and distribution facility based on the tar-coated interior main room that lacks a door. The small platform on the northern slab at Feature D potentially supported a pump. The Feature B and E artifact scatters represent trash dumps. The site is in fair condition and retains limited physical integrity.

Site 7285 consists of a pair of metal posts located on opposite sides of a dirt road in the northeast portion of Area F. The posts are 4" in diameter and are set vertically in the ground, spaced 21' apart (*Figure 81*). Each post has two hinges fabricated from 4" by 3" metal plates with 1" rods welded to the sides. The remnants of a gate frame are attached to the hinges on the southeastern post. The posts are set in concrete and are supported by two 2" galvanized pipes welded to the sides. No artifacts were observed in association with the site. Site 7285 is located within the former barracks area of the Kahuku Army Airfield (see *Figure 64*) and could represent the remains of a gate used to control access to the barracks complex. Site 7285 is in poor condition and lacks physical integrity.

Site 7286 is a roughly rectangular section of asphalt pavement located on the east boundary of Area F. The exposed portion of pavement is 134'6" long (east-west) by 67' wide (*Figure 82*). A dirt road borders southwest side of the pavement along; low berms of soil and stone frame the other sides. A second dirt road, which leads to the Site 7285 gateposts, is located on the north side of the berm framing the north end of the pavement. A barbed wire fence is located adjacent to the east side of the pavement and parallels Marconi Road. Modern trash is scattered on an around the pavement. Site 7286 is located within the former Kahuku Army Airfield barracks area, 40 m south of the Site 7285 gateposts. The location of the asphalt pavement at an intersection of two roads potentially indicates that it may be a paved intersection. The site is in poor condition and retains limited physical integrity.

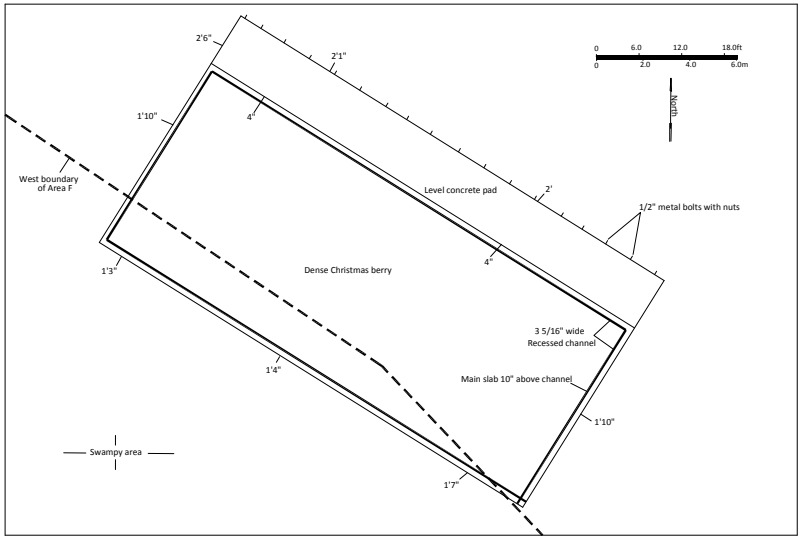


Figure 73. Site 7284, Feature C plan map

Figure 74. Corner of Site 7284, Feature C showing form board marks, view to northeast

Figure 75. Bolts on side of Site 7284, Feature C, view to southwest

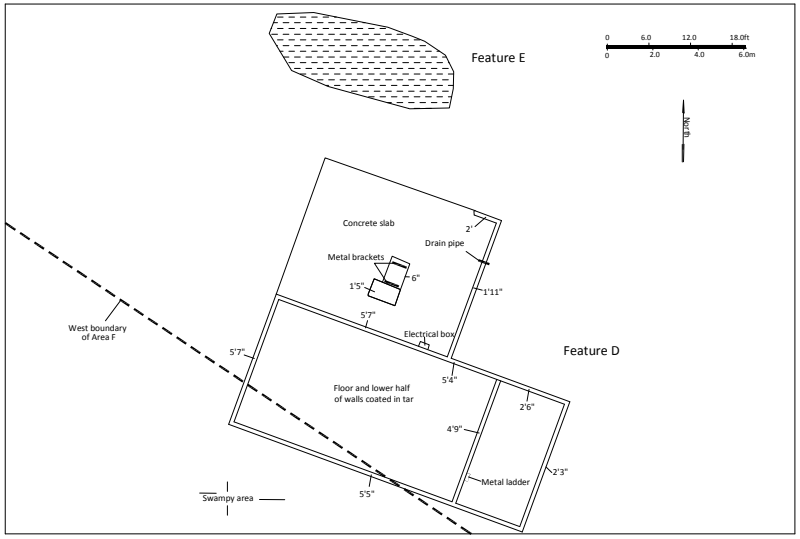


Figure 76. Site 7284, Feature D and E plan map

Figure 77. Metal ladder at Site 7284, Feature D, view to west

Figure 78. Site 7284, Feature D wall, view to northeast

Figure 79. Concrete platform at Site 7284, Feature D, view to west

Figure 80. Site 7284, Feature E artifact scatter, view to north

Figure 81. Site 7285 metal gateposts, view to south

Figure 82. Site 7286 asphalt pavement, view to west

Site 7287 is a displaced U-shaped concrete structure located upside-down and on top of a large bulldozed debris pile near the southeast corner of Area F. The structure is identical in size and shape to the 7278 concrete structure documented in Area E. It is 15'10" long (north-south) by 14'2" wide. The structure walls have the same 2'10" wide overhang sections with two parallel grooves on the underside. The walls are 1' thick, constructed with 6" wide form boards and reinforcing steel bars (*Figure 83*). The corners of this structure are also blown outward in the same pattern as the 7278 structure's corners. Site 7287 is interpreted as a displaced a military gun position, or ordnance storage facility. The site is in poor to fair condition and lacks substantial physical integrity.

Site 7299 is a curvilinear rock wall located on the northwest periphery of Test Area F near Punaho'olapa Marsh, in an area characterized by limestone outcrops and water-filled sinkholes (see *Figure 64*). The location roughly corresponds to that reported for an historic rock wall documented as Site T-5, but few specific details of the T-5 wall are presented in the Bath *et al.* report (1984:19 – Table 1). The Site 7299 wall is 29.2 m long and constructed of roughly stacked and piled limestone cobbles and small boulders. Most of the wall is collapsed and is currently 2.0 m wide and 0.4-0.5 m high. An intact section is 0.9 m wide at the base, 0.7 m wide at the top and 1.1 m high (*Figure 84*). No artifacts were observed in association with the wall. Site 7299 is interpreted as an historic ranch wall used to restrict the movement of cattle, based primarily on the height of the intact wall section. It is in poor to fair condition and retains limited physical integrity.

Test Area G

No surface sites were identified in Area G. This area encompasses 9.9-acres and is located at the southeast corner of the TBR property. It is bordered by golf course to the north and west, by Kamehameha Highway to the south and by Marconi road to the east (*Figure* 85). This area is located south of the boundary of the Kahuku Army Airfield barracks complex (*Figure 86*). The surface of Area G has been extensively disturbed by historic and modern agricultural activity. A bulldozed push pile of soil, stones and concrete rubble, probably created during the construction of the adjacent golf course, is located near the northwest edge of Area G.

Figure 83. Site 7287 displaced concrete structure remnant, view to northeast

Figure 84. Site 7299 wall, view to northwest

Figure 85. Aerial view of Test Area G (from Google Earth)

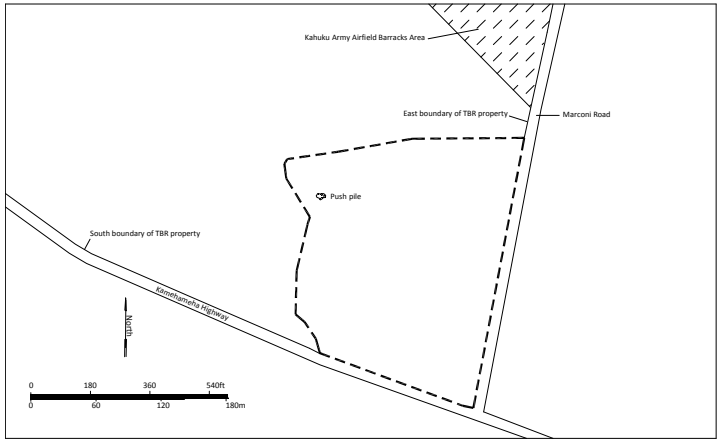


Figure 86. Surface of Test Area G

Subsurface Testing

Subsurface testing was accomplished by mechanically excavating 345 trenches and manual excavation of 10 profile exposures in sand pits. Most trenches were 5-6 m long, but the length was variable and the longest trench was 23 m. A total of 2,040.1 linear meters (1.27-miles) represents the majority of the subsurface testing data. Most trenches (n=322) were systematically placed along a pre-determined grid and the rest (n=23) were excavated to identify the areal extent of buried cultural deposits and to sample areas missed by systematic placement.

Ten subsurface sites were identified during the subsurface testing phase of the project. These consist of seven prehistoric cultural deposits (Sites 7290 and 7291 in Area D; Sites 7292-7296 in Area E), two prehistoric cultural deposits with human burials (Site 7288 in Area B; Site 7289 in Area D) and one isolated human skeletal element (Site 4488; Area C). In addition, widespread evidence of tsunami-related deposits, fill episodes associated with military and resort related land modifications, and evidence of plantation era features were identified. Fill is present in most test areas as a result of prior land modification during World War II in the vicinity of the Kahuku Army Air Field and barracks, and subsequently during the development of Turtle Bay Resort facilities.

In the following test trench excavation descriptions, sediment layers are described in terms of deposit types based on depositional processes. Alluvial deposits are sediments derived from weathered igneous rock on the uplands inland of the project area. These sediments are eroded and transported by water, and deposited on coastal plains and alluvial fans. Humus refers to the uppermost organic-rich layer of the soil and frequently in this report includes the overlying deposit of decaying organic material or duff. Buried A horizons are reported for deposits in several test areas and refer to alluvium that appears to be former ground surfaces denoted by the presence of a humic, or organic-stained zone at the upper boundary of the deposit. In addition, most layers identified as cultural deposits are associated with A horizon deposits.

Marine-deposited sands are typically characterized by coarse to fine-grained calcareous sand mixed with fragments of weathered limestone, coral and shells. These sands are deposited on shorelines by storms and inland by extreme tsunami events. In marine contexts, such sands are deposited in sheltered lagoon settings during higher stands of the sea and during more recent infilling of coastal bays and coves. Aeolian sands are wind-deposited fine-grained sediments of silt and sand that often exhibit horizontal or diagonal bedding planes.

Limestone bedrock underlies most of the project area and is usually the basal deposit in the test trenches unless the water table was encountered first. The upper portion of the limestone bedrock readily decomposes to very coarse calcareous sand mixed with limestone rock fragments when it is subjected to saturation by the water table. The limestone bedrock is a fossil remnant of former coralline and detrital reef structures, often characterized by crevices, fissures and cavities. These voids are occasionally filled with terrigenous silt and clay sediments.

Carbonate zones and layers were identified in a number of trenches. These are usually narrow bands and lenses of calcium carbonate precipitated from a deposit, cementing the matrix, usually sand. The carbonate zones are undoubtedly attributable to episodes of water saturation and subsequent evaporation that precipitated dissolved calcium carbonate.

The research design provided for a sampling strategy of two trenches per acre based on the previously mapped locations of Jaucus Sand and Pearl Harbor Clay deposits and one trench per acre in areas where these deposits do not occur (Areas A and G). Based on the results of the sampling strategy, the areal extent of soil deposits with increased potential to contain significant intact subsurface cultural deposits can be identified. Data collected during subsurface testing will be a valuable tool for future planning and development. Individual trench profiles are summarily illustrated in Appendix B, while specific details of individual trench stratigraphy and sedimentology are tabulated in Appendix C. Cultural material recovered and analyzed during documentation of subsurface cultural deposits are tabulated in the project Accession Record in Appendix D. The raw data presented in the appendices form the scientific basis for the inferences, observation and recommendations made in this report.

Test Area A

Test Area A occupies the coastal lowland immediately inland of Kawela Bay. The terrain is nearly level and was formerly farmed, initially for sugarcane and later, vegetables (Haun *et al.* 2011). The soils series described by Foote *et al.* (1972) for the area consist of a narrow strip of Jaucus Sand paralleling the shoreline (see *Figure 7*). Mokuleia Loam covers the seaward half of the area and Mokuleia Clay Loam covers the inland portion.

Test excavations did not encounter the seaward strip of Jaucus sand, but did confirm the presence of Mokulei series soils throughout the parcel. Foote *et al.* (1972) describe Mokuleia series soils as formed in alluvium from weathered igneous rock deposited over sand on coastal plains. The typical surface layer is a dark grayish brown clay loam approximately 40 cm thick, overlying 86 to 122 cm, or more, of dark brown to light gray single grain sand and loamy sand.

Testing in Area A consisted of mechanically excavating 24 systematically placed trenches (*Figure 87*). The trenches ranged from 5.5 to 8.0 m in length (average 6.6 m) and averaged 1.5 m in width. A total of 159.6 linear meters of trench were excavated in Area A (**Appendix B** *Figures B-1* through *B-24*; **Appendix C**). A photograph depicting the typical stratigraphy in Test Area A is presented in *Figure 88*. Excavations documented three to six layers overlying basal weathered limestone (n=10), or were terminated upon encountering the water table (n=14).

Figure 89 shows the maximum depth excavated in Area A trenches. *Figure 90* illustrates the deposit types by layer. Together these two figures convey vertical (*Figure 89*) and horizontal (*Figure 90*) data. Both figures divide the test area into cells that average just under an acre in area (low density sampling). Each cell represents stratigraphic data obtained from a corresponding trench (see *Figure 87*). Layers and depths are trench-specific (**Appendix C**).

Figure 90 shows the horizontal mosaic of deposit types layer by successive layer, where Layer I is the surface deposit. Cells in the successive layer panels in *Figure 90* are coded based on the deposit type alone, regardless of depth. For visual purposes, coding for the terminal layer in a given cell/trench is repeated in successive layer panels, even if no successive deposits were excavated. For example, in Trench A-10-1, the terminal layer is an alluvial deposit Layer IV, in which excavation was terminated upon encountering the water table. The red color-coding for this deposit is repeated in subsequent panels for Layers V and VI, even though no Layers V or VI were encountered in the trench. In this way, the terminal Layer VI panel illustrates the basal deposit type for each cell across Area A.

No intact cultural deposits or human remains were identified in the Area A trenches. All except one trench exhibited stratigraphic evidence of an agricultural plow zone. The remaining trench (BT-5-1) lacked a plow zone but exhibited four layers of fill. The plow zone was the surface layer in 13 trenches (Layer I) and fill was the surface layer in 11 trenches. The plow zone exhibits evidence of mixing and the introduction of organic material. The plow zone deposits are dark brown to very dark brown loam to loamy sand and vary in thickness from 0.2 to 1.45 m, with an average thickness of 0.37 m.

Cultural material from the Area A trenches was usually confined to the upper two strata, unless recovered from deeper fill deposits. Basalt aggregate was noted in Layer I of BT-A-1-1, A-1-2 and A-2-1. Limestone aggregate was noted in Layer I of BT-A-3-1 and in Layer II of BT-A-5-1. A volcanic glass multidirectional core (Acc. 1.001) was collected from Layer II in BT-A-1-2. A waterworn basalt pebble was noted in Layer I of BT-A-3-2. Plastic trash was associated with Layer I of BT-A-4-3. A chromed handle (Acc. 2.001), asphalt and sparse charcoal were associated with Layer IV in BT-A-5-1. Plastic trash and charcoal flecks were noted in the buried plow zone of Layer III in BT-A-5-3. A *Conus* sp. shell was noted in the buried Layer II plow zone from BT-5-4; Plastic trash was associated with Layer I in BT-A-8-1 and sparse marine shells were noted in Layer II. A waterworn basalt pebble was noted in the Layer III buried plow zone of BT-A-9-1, overlying a large trash pit containing historic domestic debris. The trash pit is 1.9 m wide, 0.9 m thick and 0.5 m below ground surface (bgs; see *Figure B-23*, **Appendix B**). Artifacts in the pit consist of glass condiment, medicine and cosmetic bottles, a Japanese glazed ceramic teacup, butchered pig and goat bones, sanitary cans, metal and plastic screw caps (post-1936).

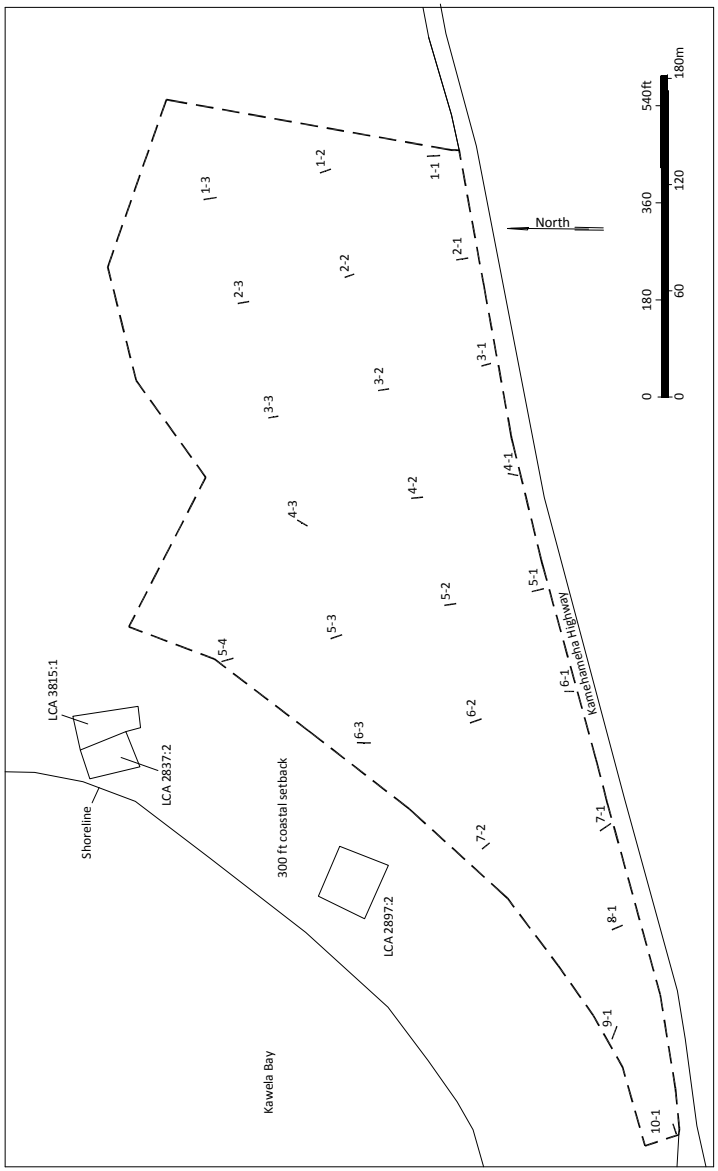


Figure 87. Location of trenches in Test Area A

Figure 88. Photograph of BT-A-1-3 showing typical Test Area A stratigraphy, view to west

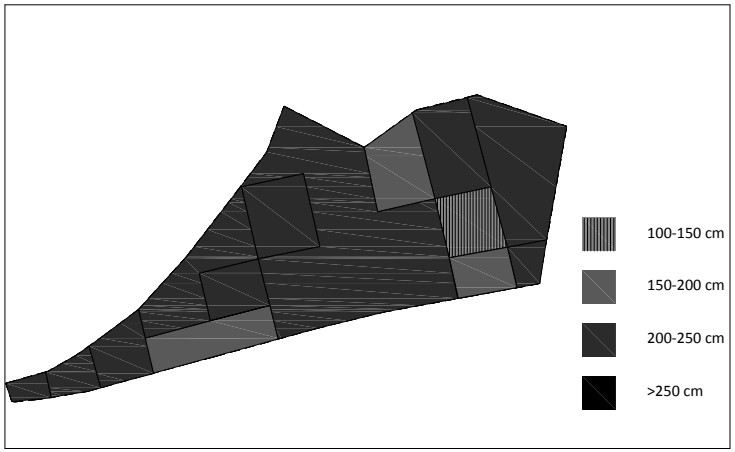


Figure 89. Test Area A trenches – maximum depths

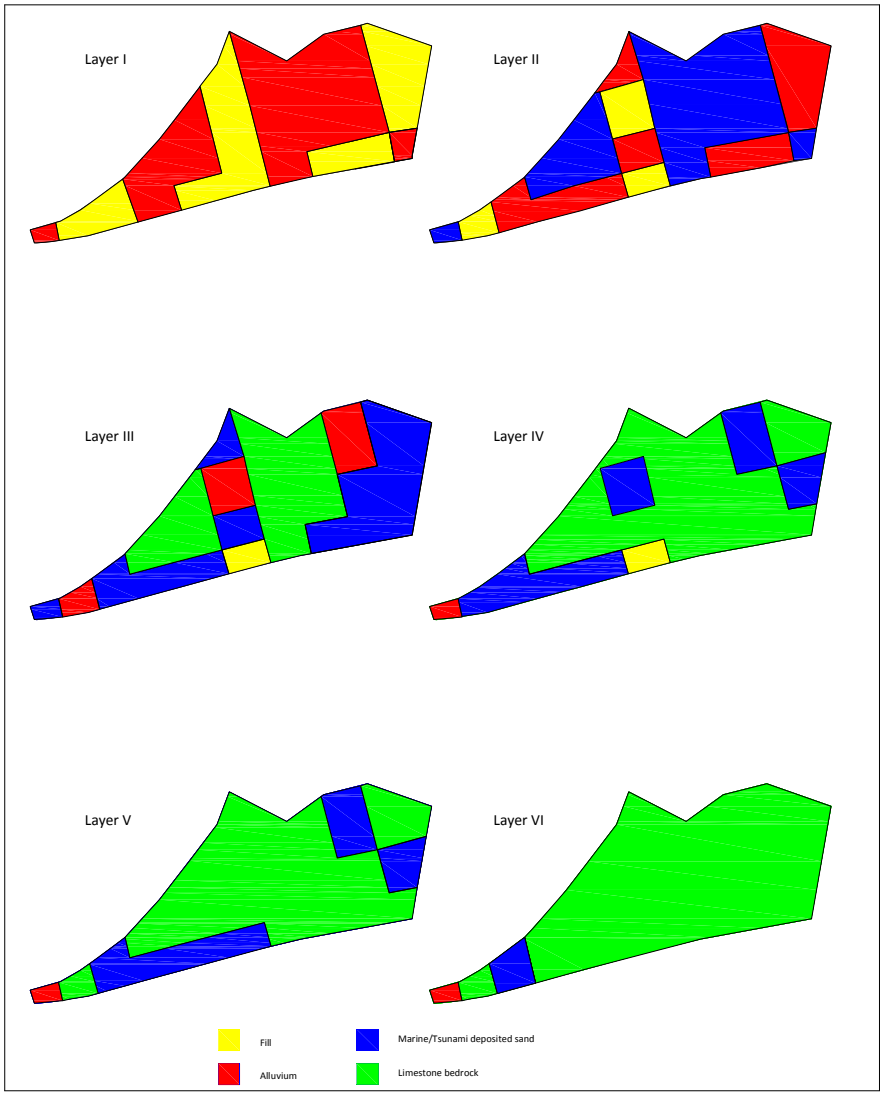


Figure 90 Test Area A deposit types by layer

Layer II in BT-A-7-1 was identified as a buried A horizon, consisting of 0.22 m of very dark gray and black loose single grain silty sand beneath the plow zone (see *Figure B-20* in **Appendix B**). No cultural material was noted in association with this layer, but the deposit represents an older ground surface, subsequently buried.

Many Area A trenches exhibited one to two layers of alluvial sandy clay loam that was extensively plowed for farming, overlying one to three layers of coarse sand. A layer of fill overlies the plow zone in several trenches along trench transect 1 (2 trenches), transect 5 (3 trenches) and along the Kamehameha Highway (5 trenches). Many surface and near-surface fill deposits contained crushed limestone or crushed basalt aggregate in the matrix.

Coarse sand layers probably represent material that was deposited in water indicating that Kawela Bay was formerly much larger and extended across much of Test Area A. These coarse sand deposits vary from very pale brown to yellowish red in color and from 0.04 to 1.95 m in thickness. Waterworn reef rubble, consisting of shell and coral fragments, was present in the coarse sand deposits in 23 of the 24 trenches, a further indication that deposition occurred in a marine environment. The marine-deposited sand layers are thicker in proximity to Kawela Bay and decrease in thickness with distance from the ocean. The elevation of Area A is only c. 2 m amsl and the terrain is essentially featureless with no topographic relief. These facts support the inference that the buried sand deposits probably represent perched beach sands derived from reef truncation and date from the Late Holocene (1500 to 5000 years BP) when sea level was 1-2 meters higher than it is today (Grossman 1998). Alluvial infilling over the Area A lagoon sediments occurred as sea-level fell.

A thin zone of calcium carbonate precipitate is present in the coarse sand deposits in six trenches (BT-A-1-2, 4-1, 4-2, 4-3, 5-2 and 5-3). Most of these trenches are located in the central portion of Area A, with BT-A-1-2 located along at the east end. The precipitate is generally expressed as a 2-4 cm band of calcium carbonate cemented sand. Calcium carbonate is the principal component of marine organisms, which are the constituent parts of limestone. As the underlying limestone substrate dissolves from contact with fresh water from the water table, calcium carbonate becomes suspended in solution as fine particles or precipitate. The precipitate lenses and bands probably denote the high stand of the Late Holocene sea level, resulting in evaporation from increased aridity.

Most of the Test Area A trenches were terminated at a basal deposit of weathered limestone. *Figure 91* is a composite stratigraphic profile for Area A. Most trenches selected for this profile lack surface fill layers and so are especially suited to illustrate the area's natural stratigraphy. The profile shows that the underlying limestone extends throughout Test Area A, although it was not documented in every trench profile obtained from Area A if the water table was encountered first. The profile shows the surface layer of alluvium that was plowed as a result of commercial agriculture after 1890, when land use switched from ranching to sugarcane plantation agriculture.

Figure 92 depicts the extent of the former Kahuku Plantation sugarcane fields in the project area and shows that the plantation covered most of Area A. The area seaward of the sugarcane fields, up to the forested shoreline of Kawela Bay, was also subsequently cultivated, perhaps by later lease-holders, as is evident in a 1970 aerial photograph of the TBR property just prior to development (Haun *et al.* 2011:41, Figure 23). The only possible subsurface evidence of the OR&L railroad grade was encountered in Layer I of BT-A-5-3, where the matrix consists of 80% limestone and 5% basalt fill. It is probable that the railroad grade was used as a farm road after 1946.

There is a low probability of encountering intact subsurface cultural deposits or human remains in Area A during future excavations based on the results of subsurface testing. All cultural deposits in Area A will be confined to the alluvial sediments overlying the marine-deposited sand. The alluvial deposits are no more than 0.66 m thick and most are substantially less, but the average thickness is 0.37 m. The alluvial deposits are surficial in some places and in others are buried by fill. Testing documented that the entire area has been disturbed by historic agricultural activity that would have destroyed the physical integrity of prehistoric cultural deposits. Prehistoric agricultural use of the alluvial land along Kawela Bay is probable, but evidence for agricultural use is negligible.

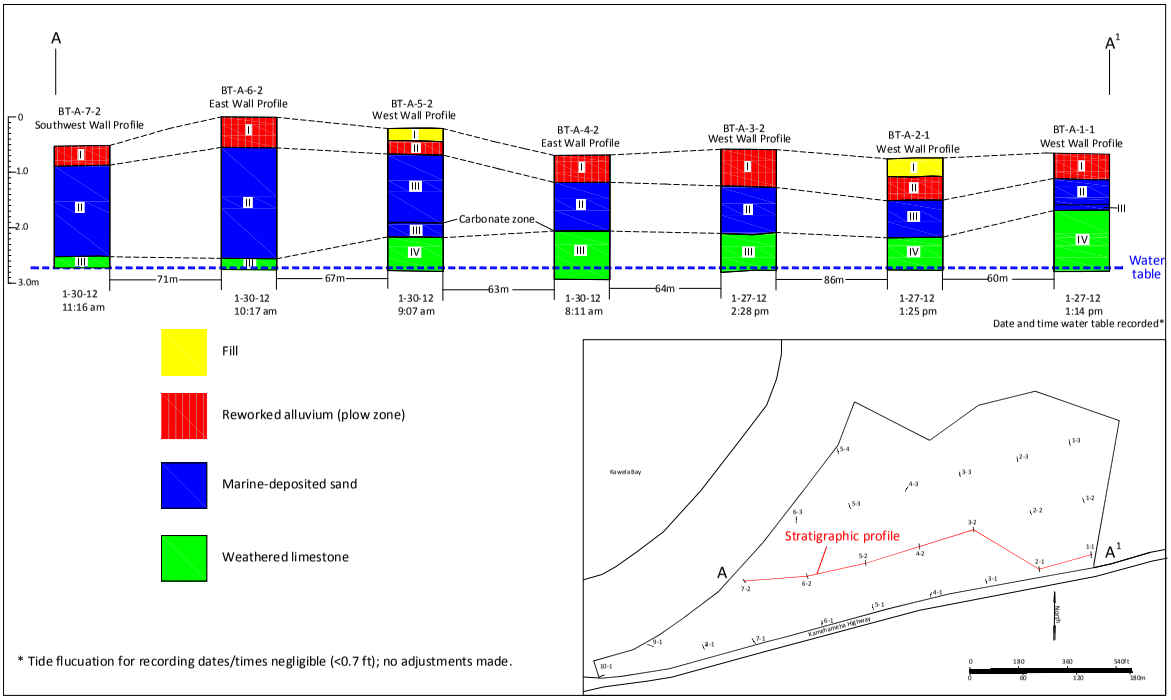


Figure 91. Test Area A stratigraphic profile

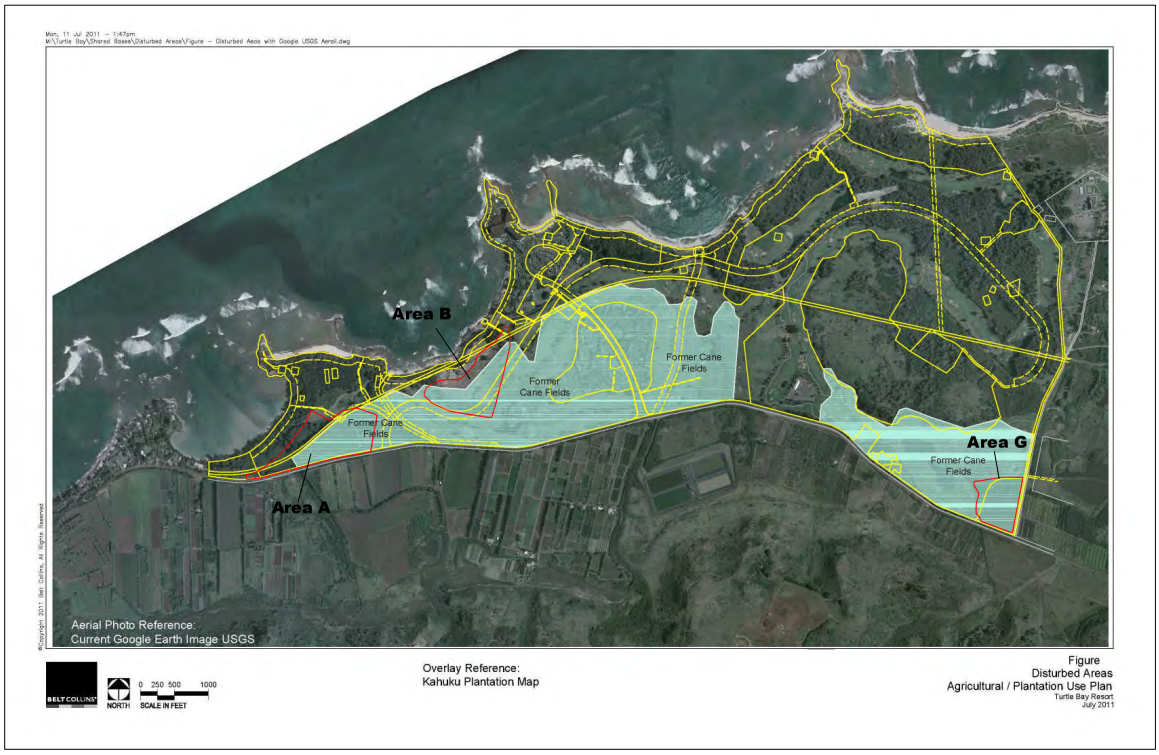


Figure 92. Aerial photograph of TBR property showing former extent of sugarcane fields

Test Area B

Test Area B occupies the coastal lowland between Kawela Bay and the TBR hotel at Kuilima Point. The terrain is fairly level with a low dunal ridge fronting the shoreline. Most of the area is landscaped and was formerly farmed for sugarcane (Haun *et al.* 2011; see *Figure 92*). The west portion of Area B is currently used by TBR for a stable and corrals for horses and ponies.

The soil series described by Foote *et al.* (1972) for Area B consist of Jaucus Sand paralleling the shoreline (see *Figure 7*). Kaloko Clay and Waialua Silty Clay soils are present along the inland side of the area. Waialua series soils develop on alluvial fans and are derived from weathered igneous rock (*ibid*.: 128-129). The surface layer in a representative profile is c. 30 cm of dark reddish brown silty clay overlying c. 66 cm of dark reddish brown silty clay with a sub-angular blocky structure. Kaloko series soils are poorly drained and formed on coastal plains from alluvium that overlie marly lagoon deposits (*ibid*.: 58-59). A typical profile is characterized by 30 cm of dark brown clay overlying 20 cm of dark reddish brown to weak red clay subsoil; these deposits overlie 33 cm of light gray to white mottled platy silty clay over dark greenish gray to dark gray massive silty clay.

Thirty-seven systematically placed trenches were excavated in Test Area B (*Figure 93*). Trenches varied in length from 3.0 to 7.2 m (average 5.4 m) and averaged 1.5 m in width. A total of 201.1 linear meters of trench were excavated. Trenches were excavated either to weathered limestone (n=29) or the water table (7) and the profiles document one to eight layers. Excavation of one trench was terminated when human remains were identified. The trench profiles are illustrated in **Appendix B** (*Figures B-25* through *B-61*). Trench dimensions and detailed stratigraphic data are presented in **Appendix C**. No cultural material was collected from Area B.

Site 7288 consists of an intact primary human burial encountered in BT-B-6-2, located in the north-central portion of Area B. Human skeletal elements were observed in the second bucket of material excavated from the trench and excavation was halted. The crown of the cranium was visible *in situ* in the trench wall. SHPD was notified immediately upon the identification of human remains. As a result of SHPD consultation, all of the excavated soil was screened using ⅛" mesh hardware cloth to recover displaced skeletal elements; the recovered skeletal elements were reburied with the *in situ* skeletal elements. The recovered bones were in very poor, fragmented condition. Recognizable elements recovered from the screen include portions of the cranium, a mandible fragment and long bone fragments. Most of the remaining bone was in very small pieces that could not be readily identified in the field. Although no burial pit was evident, the volume of bone and inventory of identifiable elements indicate that the remains likely represent a primary burial. The estimated age of the individual is 6-8 years of age, based on the mandibular dentition.

Two layers were exposed in the Trench B-6-2 profile before excavation was terminated at a depth of 0.6 m (*Figure 94*). Layer I consists of 0.24 m of brown to pale brown moderately compacted slightly silty sand with sparse limestone gravel and pebble inclusions. Layer II underlies Layer I from 0.2 to 0.6 m and consists of very pale brown loose, single grain aeolian sand with no inclusions. A human cranium was observed in the northeast trench wall at 0.34 m below surface in Layer II. Cultural materials identified as a result of screening the excavated sediments consisted of a volcanic glass flake, marine shells and burned *kukui* nutshells; these were reburied. It is inferred that cultural materials identified from the screened sediments were probably associated with Layer I, because Layer II is a homogenous sand deposit with no inclusions. Alternatively, it is possible that the cultural materials were derived from the burial pit. Site 7288 is in fair condition and retains substantial physical integrity.

Figure 95 shows the maximum depths of the excavated trenches in Test Area B. Soil accumulation in the south-central portion are relatively shallow. The deepest deposits are located along the northwest and northeast sides. *Figure 96* illustrates deposit types by layer. The uplifted limestone reef represents bedrock in this area, but several trenches encountered the water table before reaching the limestone substrate. Alluvium covers the limestone in the east and south sections of Area B. The northwest side is characterized by deposits of wave- and wind-deposited sand interbedded with alluvium in the north-central section. Surface fill deposits overlie the east half and west tip of Area B.

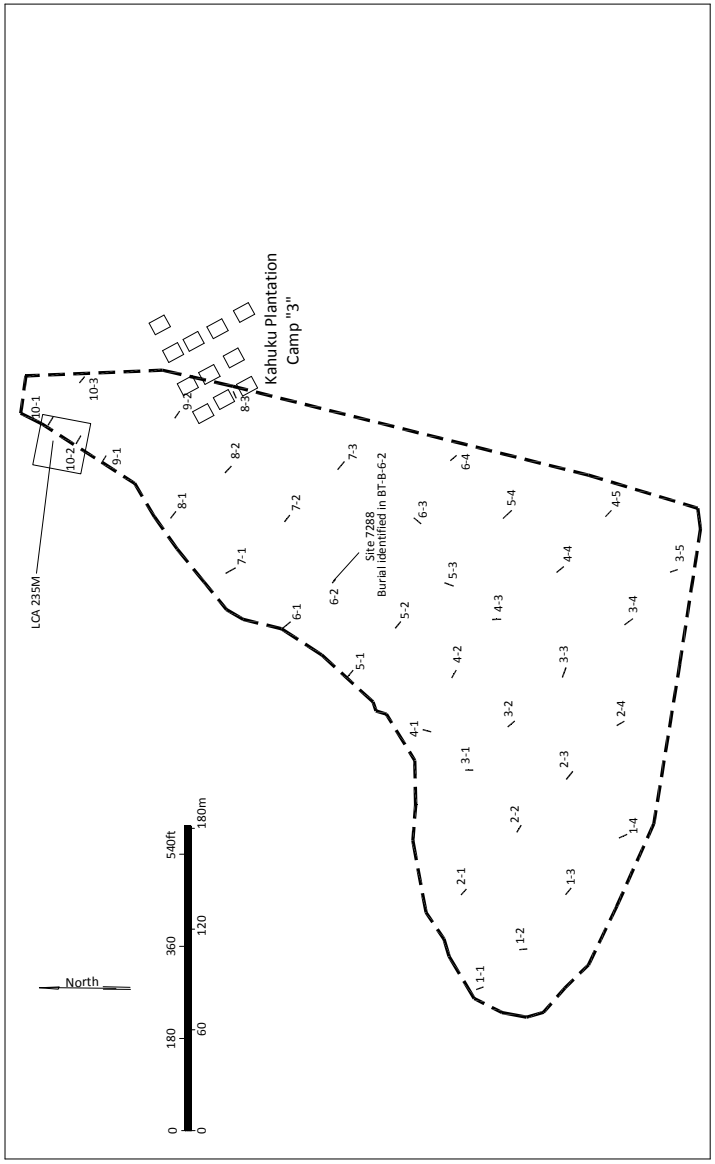


Figure 93. Location of trenches in Test Area B

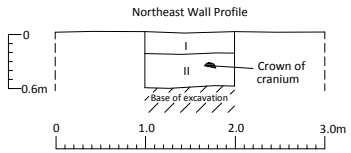


Figure 94. Site 7288 in BT-B-6-2

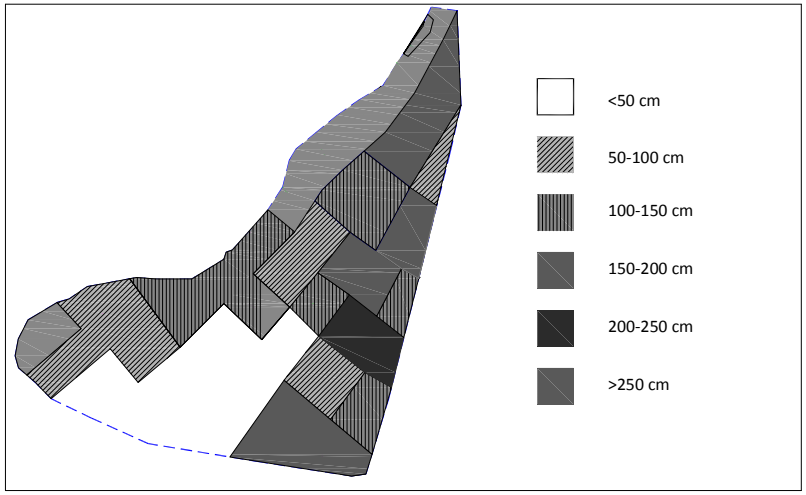


Figure 95. Test Area B trenches - maximum depths

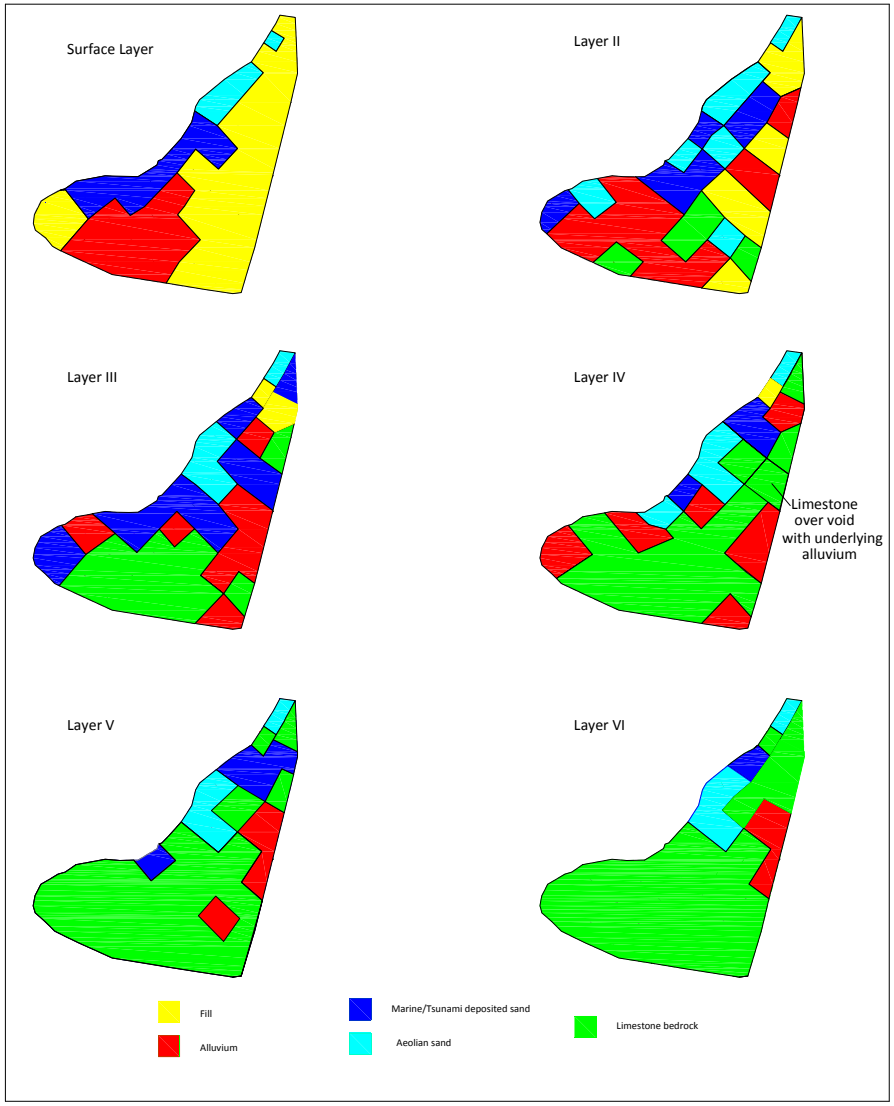


Figure 96. Test Area B deposit types by layer

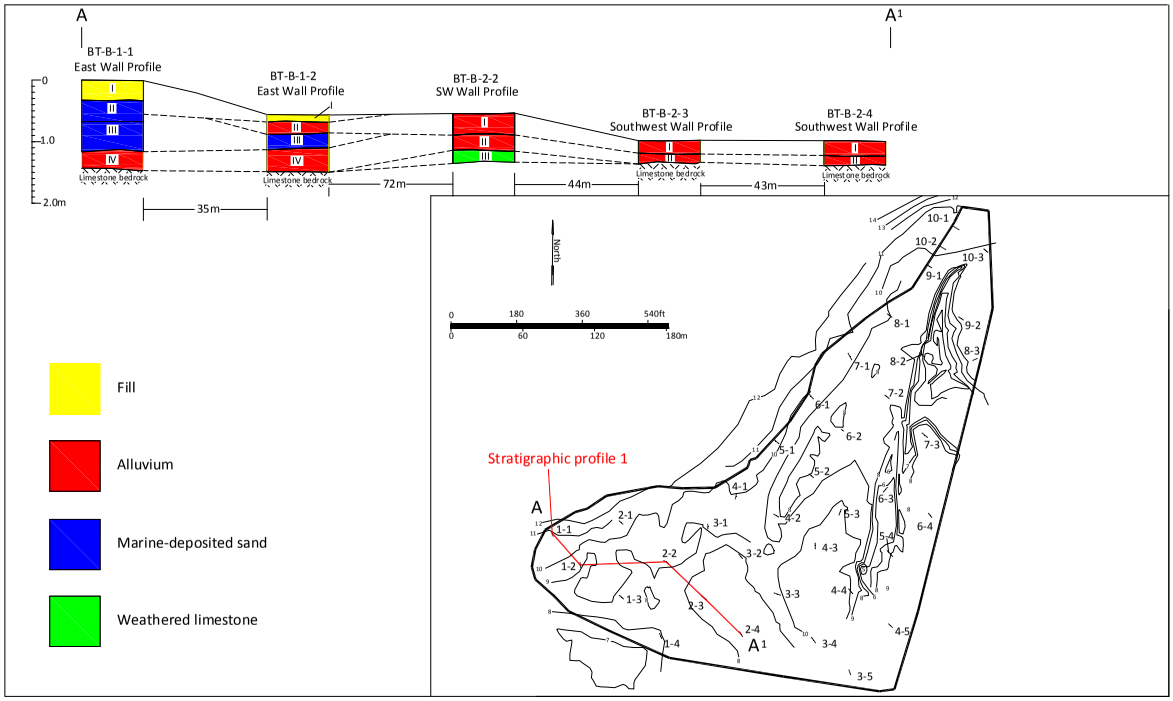


Figure 97. Test Area B stratigraphic profile 1

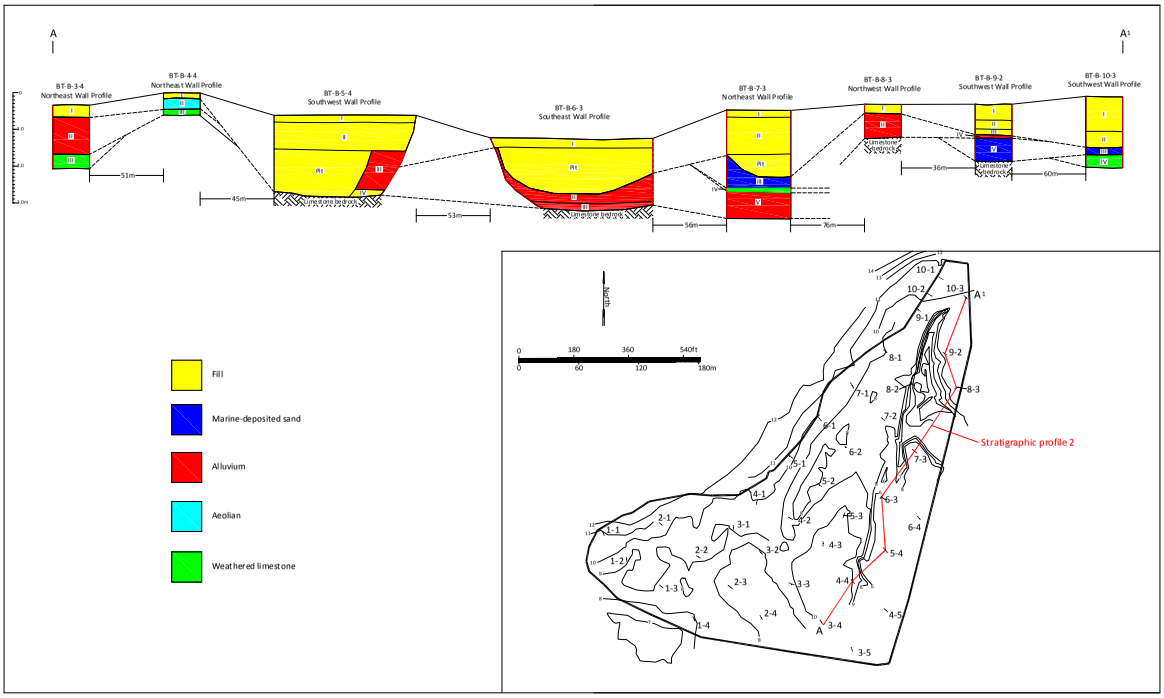


Figure 98. Test Area B stratigraphic profile 2

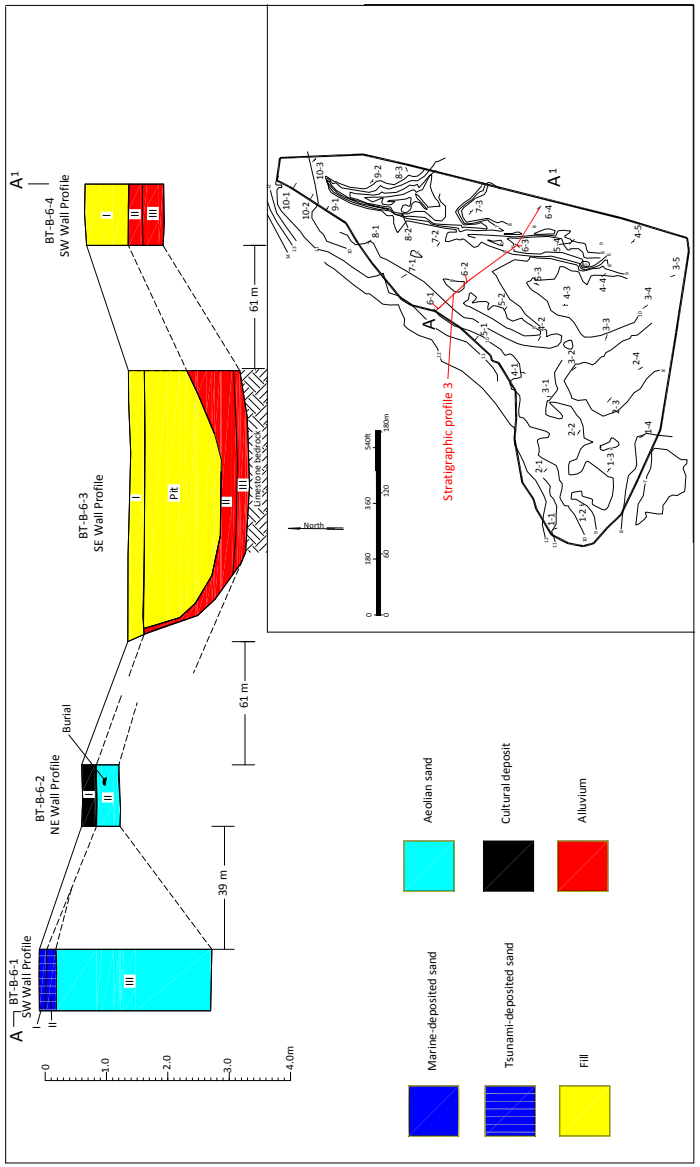


Figure 99 . Test Area B stratigraphic profile 3

Figure 97 is the first of three composite stratigraphic profiles (Profile 1) and illustrates the depositional sequence for the south-central portion of Area B. Profile 1 shows the relatively shallow alluvial deposits overlying limestone bedrock. Alluvial deposits are separated by marine-deposited sand in BT-B-1-2. In the seaward-most trench (B-1-1), where marine-deposited sand overlies alluvium, the corresponding upper alluvial deposit is missing, having been replaced by two layers of fill containing modern trash consisting of a rubber hose fragment and aluminum can.

Figure 98 is the second of three composite stratigraphic profiles (Profile 2) and shows the eastern boundary of Test Area B, illustrating the extensive fill deposits encountered here. Eighteen trenches in the eastern half of Area B documented fill deposits. Nine contained a single fill layer, seven contained two fill layers and two contained three fill deposits. These deposits varied in thickness from 0.1 to 1.8 m, and averaged 0.46 m. The majority of the fill deposits consist of dark brown to dusky red clays, clay loams and silty clay loams; the rest consist of silty to loamy sands. One trench contained limestone gravel fill (BT-B-3-4). Modern debris was noted in the fill layers of six trenches, consisting of asphalt (BT-B-3-5, B-4-5, B-5-3), plastic (B-3-5, B-5-2, B-8-2), ceramic tile (B-3-5) and irrigation pipes (B-5-2, B-8-3 and B-10-1). In the south portion of Profile 2 fill overlies alluvium or limestone bedrock. To the north, marine-deposited sand overlies the limestone substratum.

Figure 99 is the third of three composite stratigraphic profiles (Profile 3) and bisects the central portion of Test Area B. It includes Trench B-6-2 where the Site 7288 burial was identified. The inland two trenches (BT-B-6-3 and B-6-4) in this profile show deep fill deposits overlying alluvium developed on limestone bedrock. Trench B-6-2 shows the aeolian sand deposit where the excavation was terminated when the Site 7288 burial was identified. The seaward-most trench, BT-B-6-1, shows two wave-deposited sand layers overlying an aeolian sand deposit of more than 2.5 m. The water table was encountered 2.8 m below the surface, preventing excavation to bedrock. It is likely that the aeolian sand deposit in Trench B-6-2 is nearly 2 m deep based on the stratigraphic data from the adjacent trenches.

Intrusive pit features are present in six trenches (BT-B-4-1, 5-1, 5-4, 6-3, 7-1 and 7-3). A globular pit, truncated by a probable tsunami deposit was identified in the west wall of BT-B-4-1 (see *Figure B-38*, **Appendix B***)*. The pit intrudes into an aeolian sand deposit (Layer IV). The pit is 0.97 m wide and 0.24 to 0.41 m in thickness. The pit fill is a banded deposit of brown to pale brown silty sand. Pit fill was excavated and screened through 1¼" mesh but no cultural materials were recovered, potentially indicating a natural origin.

A large pit feature with stratified fill was documented in the southwestern wall of BT-B-5-1 (see *Figure B-43*, **Appendix B***)*. This pit is 2.45 m wide at the top with tapering sides. The base of the feature is 0.17 m wide and is 1.2 m in depth below ground surface. The pit intrudes into an aeolian sand deposit (Layer II) that lacks cultural materials. There are three strata in the pit. The upper layer (a) is a 0.4 m thick deposit of dark gray slightly silty sand containing a *Conus* shell. The second pit fill layer (b) is a 0.27 m thick deposit of grayish brown and light gray sand containing compacted ash. The basal fill layer (c) is a 0.28 m thick deposit of grayish brown and white slightly silty sand, containing juvenile pig bones. The side deposit (pit fill Layer Id) represents a draft or dig out deposit. The compacted ash and pig bones indicate the pit was used as an underground cooking feature (*imu*). The pit originated in Layer I, which contained plastic fragments and electrical wire, indicating that the pit is a modern feature.

A large pit feature was documented in the southwestern wall of BT-5-4 (see *Figure B-46,* **Appendix B**). This pit originates in a clay fill deposit (Layer II) 0.95 m below the ground surface. The portion exposed in the trench is 2.6 m long and 1.25 m thick. Pit fill is brown to dark brown friable clay containing recent materials including milled lumber, a garden hose and plastic fragments. The pit was excavated to the limestone substrate through two intact alluvial clay deposits.

Another large pit feature was identified in BT-6-3 (see *Figure B-49,* **Appendix B**). This feature originates at the base of a clay fill deposit (Layer I) 0.24 m bgs and intrudes into an intact alluvial clay deposit (Layer II). The pit is greater than 4.2 m wide, 1.2 m thick. Pit fill is black to very dark grayish brown fine friable clay containing recent garbage.

Two former utility trenches and a possible post mold were documented in BT-B-7-1 (*Figure B-51,* **Appendix B**). The trenches are visible in both walls of the test excavation and are 0.34 to 0.77 m wide and 0.39 to 0.53 m deep. The possible post mold is 0.21 m wide and 0.38 m deep. The features all originate at the interface between Layers I-II, and are intrusive into Layer II, indicating their recent origin. The fill in all three features is very dark grayish brown silty sand and none contain visible cultural material.

A large basin-shaped pit was identified in the northeast wall of BT-B-7-3 (see *Figure B-53*, **Appendix B**) 1.2 m below the ground surface. The northern half was profiled, where it is 1.0 m-wide and 0.65 m thick. The pit originates at the interface of Layers II-III, and intrudes into Layer III, an intact deposit of marine-deposited loamy sand. The pit contains recent trash consisting of plastic bags, a Gatorade bottle and aluminum cans. The pit is capped by Layer II fill.

LCA 235M is located at the north end of Area B (see *Figure 93*). This land claim of 0.41-acres was awarded to Kaili (Waihona ʻAina 2000). A house lot and 5 *kalo* patches are described in the claim testimony. Kaili died in 1849 and left his property to his daughter Nahuli. Two trenches (BT-B-10-1, B-10-2) were excavated in the vicinity of the LCA. In BT-B-10-1, 0.1 m of imported fill overlies an aeolian sand layer and in BT-10-2 two layers of aeolian sand were documented. No cultural materials were recovered from either trench.

A Kahuku Plantation workers' camp (Camp 3) was formerly located adjacent to the OR&L Railroad in the northeast portion of Area B (Haun *et al*. 2011: 25, 27). BT-B-8-3 and B-9-2 were excavated in the vicinity of the camp, but no evidence of it was identified. Trench B-8-3 exposed a surface layer of fill over an alluvial clay deposit. An irrigation pipe is present in the fill layer (see *Figure B-56,* **Appendix B**). Trench 9-2 revealed three layers of fill overlying an alluvial deposit. The alluvium overlies marine-deposited sand on limestone bedrock (see *Figure B-58,* **Appendix B**). It is probable that any deposits once associated with Camp 3 were destroyed during the late 20th Century development of the property as a resort.

There was no surface evidence in Area B of the OR&L Railroad bed in the location plotted on historic maps. Its alignment was generally on the seaward side of Test Area B, but entered Area B in the vicinity of BT-B-9-1 and exited between BT-B-10-2 and B-10-3. The rail bed was constructed on fill of limestone and basalt aggregate. The subsurface deposits in trench B-9-1 did not contain limestone in sufficient quantity to identify as railroad bedding material. BT-B-10-1 contained 50% limestone gravel inclusions in the Layer I fill and BT-B-10-3 contained 50% crushed limestone and basalt aggregate in the Layer I fill, which could be associated with railroad bedding; however, six other trenches (BT-B-3-4, B-3-5, B-5-4, B-7-2, B-8-2 and B-9-2 also contained upper layer fill deposits composed of 40% to 95% basalt and/or limestone inclusions and these trenches do not correspond to the historically mapped location of the railroad. It is possible that the exact location of the former railway right-of-way in this part of TBR property is not accurate and that it formerly was located within Test Area B.

Test Area B is relatively flat with a perceptible but gentle rise toward the shore. The presence of deeply buried sediments was unexpected. The limestone substrate at the south end is shallow and overlain by minimal alluvial deposition. Fill deposits, extending 1.80 m deep in some places, are extensive in the *mauka* half of Test Area B. On the *makai* side, which is the back slope of the coastal dune, aeolian sand deposits exceed 2.5 m and are capped by marine-deposited sand. Alluvial sediments behind the bay front were covered by aeolian sand. Episodically deposited marine sand covered the dune and some alluvial deposits on the *mauka* side of the dune. Marine deposited sand is the result of giant surf and tsunami events but it would require high-resolution techniques to determine specific origin and periodicity (Keating *et al*. 2011).

An intact human burial (Site 7288) was encountered in an aeolian sand deposit 44 cm below the surface, capped by c. 25 cm of marine deposited sand. Cultural material characteristic of habitation deposits was recovered from the screened excavation deposits containing mixed Layer I and II sand while recovering bone fragments. Cultural materials are either associated with the burial or with the marine deposited sand, possibly but not necessarily in secondary context, since the burial is presumably in a pit underlying a cultural surface. Intact marine or aeolian sand deposits in Area B can be expected to contain additional prehistoric cultural deposits.

Test Area C

Test Area C is a forested sand dune situated between the TBR hotel at Kuilima Point and the mouth of ʻŌiʻo Stream, fronting the west side of Kaihalulu Bay (see *Figure 37*). The soils series described by Foote *et al.* (1972) for Area C consist of a small section in the southwest corner of coral limestone outcrop, while Jaucus Sand covers the rest of the area. During resort development TBR used the Jaucus Sand deposits to augment the beach in front of the hotel. Twelve sand pits indicate the areas mined for sand in the central and eastern portions of the dune. These pits are designated Sand Pit 1 (SP-1) through 12 (see *Figure 38*). The pits were excavated with heavy equipment to an average depth of nearly 4.0 m and occupy a combined area of approximately 1,500 sq m (0.37 ac). A dirt road parallels the shoreline on the seaward side of Test Area C and a paved golf cart path cuts through the inland side. The terrain slopes moderately to steeply south, toward a golf course fairway (*Figure 100*). A grove of Norfolk pine trees was planted in the central portion of Area C as part of a nursery, now abandoned.

Aside from historic trash pits, the only archaeological material identified in Test Area C was a secondarily deposited human metatarsal on the surface of SP-7. After consultation with SHPD permission was obtained to temporarily curate the isolated bone in a secure location at the adjacent TBR office trailer. Human remains from Area C were previously discovered in sand mined from an Area C sand pit and spread elsewhere on the resort property in 1992. When identified, the remains were transported to the Kahuku Police Station and eventually to the Medical Examiner's office in Honolulu. Kennedy (1992) examined the mined and secondarily deposited sand, as well as the dune from which the sand was obtained. The secondarily deposited sand was screened and additional skeletal elements were recovered. The sand pit in the dune was examined but no other skeletal elements were found. Analysis of the remains indicated that four individuals were represented: an adult female and three sub-adults of indeterminate sex. The remains were assigned State Inventory of Historic Places (SHIP) number 4488 and were transferred to SHPD for curation. The burials were subsequently designated as Burials 11-14 (Maly and Rosendahl 1992, O'Hare and Hammatt 2006).

In 1996, additional human remains were discovered during sand mining in the Site 4488 area (Carson *et al*. 1996, 1999). The initial finds made by SHPD staff included "a child's left tibial diaphysis…[and] the facial bones and a scapular bone fragment of an adult" (*ibid*. 1996: 4). Subsequent archaeological excavations by Archaeological Consultants of the Pacific, Inc. recovered additional skeletal elements from two adults (Burials A and B), wood fragments and square nails. The wood and nails were inferred to represent historic coffin remnants. Carson *et al*. (*ibid.:* 4-8) conclude that adult Burials A and B are not the same as the remains of an adult and a child initially recovered by SHPD staff. The remains were turned over to SHPD for curation and subsequently designated as Burial 17 by O'Hare and Hammatt (2006).

Burials A and B were found in a "concretized" layer of sand 90 cm below the ground surface (Carson *et al*. 1996:7). Incompleteness of both burials and fragmentation were cited as evidence of earlier disturbance, prior to the sand mining activity that led to their discovery. The initial disturbance also pre-dated the "concretization" process based on the disarticulation of one individual. Carson *et al.* (*ibid.*) describe intrusive "gravelly lenses… suggesting that tidal action may have been responsible for the [initial] disturbance of the burials". The authors note the presence of a "sheet of fully oxidized corrugated metal (probably tin) and a large cement block" within the sand pit vicinity as possible evidence of a subsequent episode of disturbance prior to the sand mining (*ibid*.). The "concretized" layer containing the burials was underlain by a deposit of "loose" sand of undetermined depth, and overlain by two additional "concretized" sand layers separated between three layers of loose sand.

The human metatarsal recovered during the SAIS fieldwork comes from the same vicinity as the previously discovered skeletal remains, according to TBR Senior Planner Ralph Makaiau. It is likely that this bone is from one of the previously identified individuals that were subsequently reburied elsewhere on the property. Skeletal remains from at least eight individuals have been recovered from the Site 4488 area. All individual burials except Burial B are incomplete and missing numerous skeletal elements.

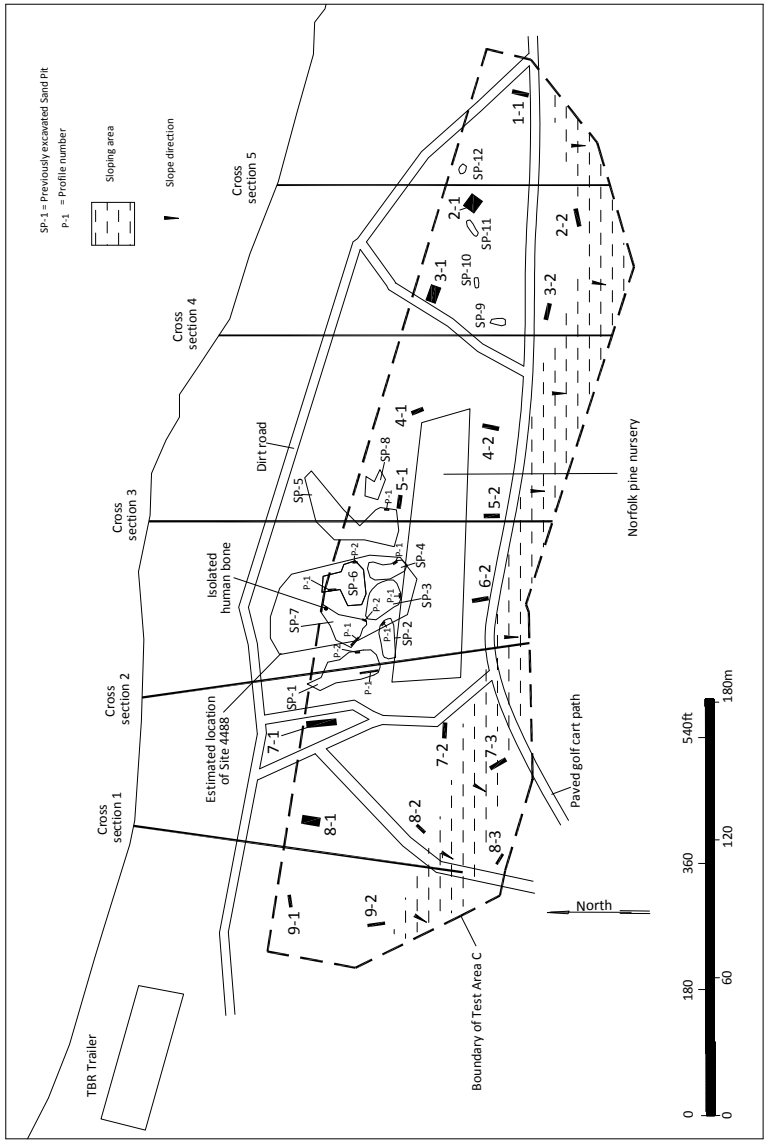


Figure 100. Location of trenches in Test Area C

The SAIS fieldwork in Area C included instrument mapping of five dune surface cross-sections, manual excavation and profiling of ten sand pit walls, mechanical excavation and documentation of 18 systematically-placed trenches, and mechanical excavation of two trenches at the base of two manually-profiled sand pits (SP-1 and SP-7; see *Figure 100*). Dune cross-sections were prepared using a transit and stadia rod and are illustrated in *Figures 101-105*. The cross-sections show that the dune extends 88 m (290 ft) to 136 m (445 ft) inland from the shoreline and rises from 13.5' (4.11 m) to 16.5' (5.03 m) above sea level. Limestone bedrock is exposed at approximately 3 ft (0.91 m) amsl along the shore (see *Figure 101*).

The 18 trenches varied from 5.3 to 13.2 m in length (average 7.12 m) and in width from 1.25 to 6.4 m (average of 2.45 m wide). A total of 125.7 linear meters of trench were excavated. The trenches varied in depth from 1.03 to 4.9 m (average of 2.65 m) and exposed two to seven layers. Only two systematically placed trenches were excavated to the limestone substrate (BT-C-8-2 and C-8-3). Two pits, which were mechanically excavated in conjunction with obtaining manual profiles in Sand Pits 1 and 7, also reached limestone bedrock (see *Figure 39)*.

Mechanical excavation to bedrock was not consistently attempted in most of Area C because the depth and loose, single grain texture of the sand presented logistical and safety issues. Mechanical excavation deeper than c. 2.5 to 3.0 m required digging a hole large enough for the excavator to drive into and dig deeper. Unstable trench walls were especially hazardous, not only from the danger (and undesirability) of wall collapse but also for the potential to destabilize surrounding ironwood trees. These factors also precluded safe access to document the deepest portions of the excavations. It was readily apparent from the initial excavations that at depths below approximately 1-1.5 m the dune deposits consisted of relatively homogenous aeolian sand with faintly visible fine bedding planes and variable degrees of calcium carbonate cementation (*Figure 106*). Complete profiles from the surface to limestone bedrock were obtained in Trenches BT-C-8-2 and C-8-3, which were both located on the lower elevation, inland side of the main dune, and in Sand Pits 1 and 7 where mechanical excavations to reach bedrock were combined with manual profiles of previously excavated pit walls.

The systematically placed, mechanically excavated trench profiles are illustrated in **Appendix B** (*Figures B-62* through *B-79*). The trench dimensions and stratigraphic data are presented in **Appendix C**. *Figure 107* shows the maximum depths reached in the trenches. No excavations reached the water table, which is probably quite deep and likely to be below the surface of the underlying limestone substrate. *Figure 108* illustrates the deposit types by layer. Since no trench was excavated at the Transect 6, number 1 position, data from SP-7 was used for this cell in *Figure 108*

Layer I throughout most of Area C is an organic humic, or duff layer, encountered in 14 of the 18 trenches; fill deposits were encountered on the west and east sides of Test Area C. PVC pipe and electrical wires were observed in association with the humic layer in BT-C-9-1. Five trenches exhibited a surface layer of imported fill (BT-C-4-2, C-8-2, C-8-3, C-9-2). Limestone and basalt aggregate and asphalt fragments are associated with the Layer I fill in BT-C-8-3. Plastic, glass and milled lumber are associated with the Layer I fill in BT-C-9-2.

Layer II across most of Area C consists of aeolian sand deposits. Deeply buried intact aeolian deposits were documented throughout much of Area A in Layers III-VI. BT-C-7-1 is the only trench containing more than six layers, where Layer VII also consists of aeolian sand (not depicted in *Figure 108*). The only trench where aeolian sand deposits were not documented is BT-C-8-3, where fill deposits directly overlie the limestone substrate. Aeolian deposits consist of loose (unstabilized dune), moderately compacted (stabilized dune) to semi-lithified (fossilized dune) single grain sand that varies in color from gray to very pale brown. Bands of calcium carbonate precipitate are evident in the Layer III aeolian sand deposits in BT-C-1-1, at the interface between Layers II and IV in BT-C-2-1, and in Layer IV of BT-C-2-2.

Layer II along the south and east edges of Area C also consists of several fill deposits. Redeposited sediments are present beneath the surface layer in 7 trenches (BT-C-1-1, C-2-2, C-3-2, C-7-2, C-7-3, C-8-1, C-8-3). These deposits were likely imported into the area as road bedding. Fill extended into Layers III and IV in BT-C-7-1 and C-7-3. Collectively, the fill deposits consist of compact to friable clays, sand, or sand and gravel deposits that vary in color from very pale brown to dark reddish brown.

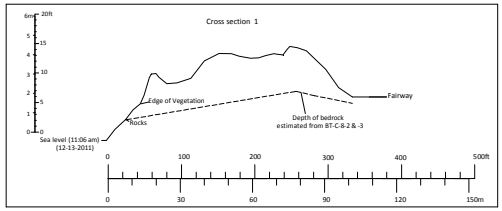


Figure 101. Test Area C cross section 1 (8:1vertical scale – 1:1 horizontal scale)

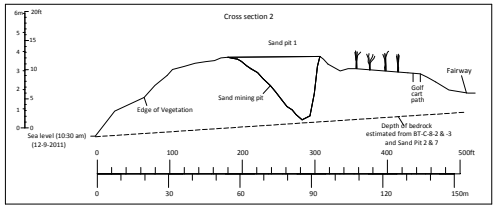


Figure 102. Test Area C cross section 2

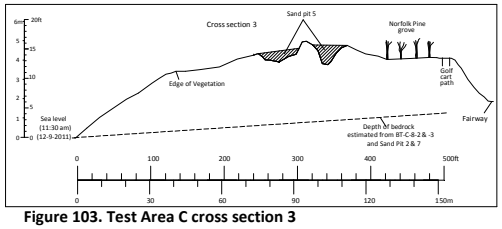


Figure 103. Test Area C cross section 3

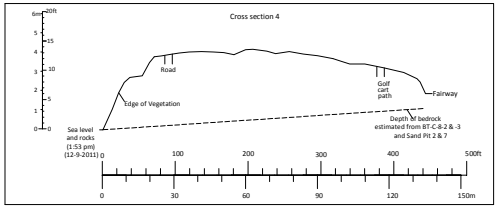


Figure 104. Test Area C cross section 4

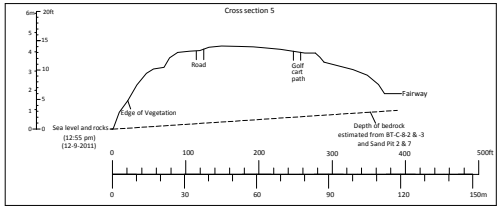


Figure 105. Test Area C cross section 5

Figure 106. Wall of BT-C-2-1 showing bedding planes, view to view to southeast

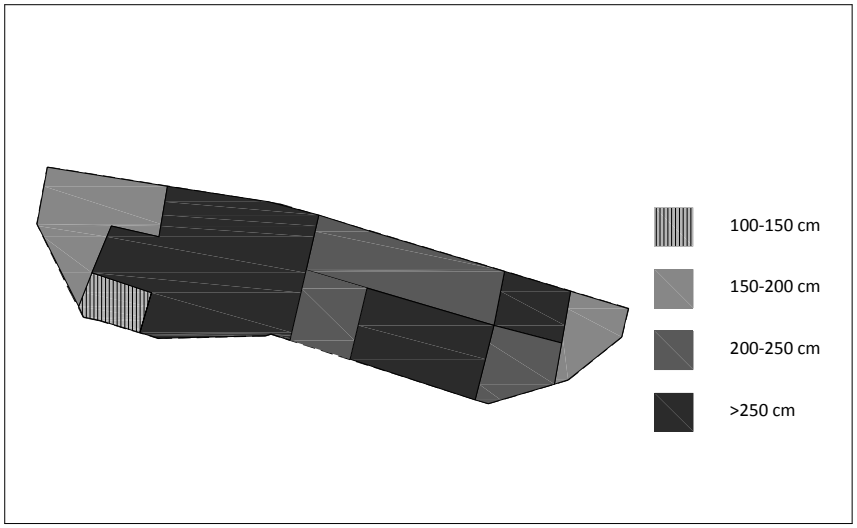


Figure 107. Test Area C trenches – maximum depths

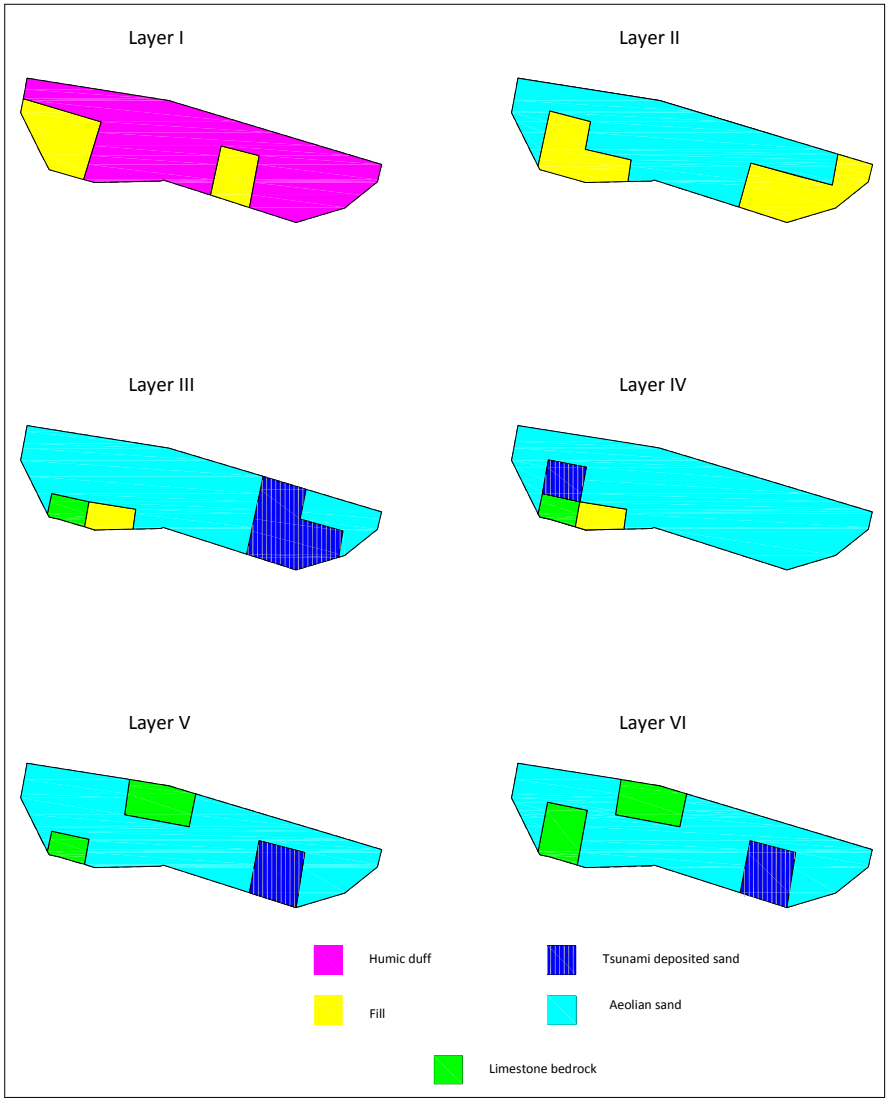


Figure 108. Test Area C deposit types by layer

Beneath Layer II aeolian deposits in two trenches in the west section of Area C (BT-C-7-1 and C-8-1), five to eight layers of aeolian in-fill represent either historic or modern infilling of road cuts or possible old sand mining pits. On *Figure 108* these are coded as aeolian deposits.

Three WW II-era trash pits underlie Layer II and Layer III deposits at the east end of the dune. The trash pit beneath the sand fill Layer II in BT-C-1-1 (see *Figure B-62* in **Appendix B**) is 2.5 m wide by 2.4 m deep and contains a large quantity of glass bottles (1943 date on base), in addition to ceramic tiles, batteries and a railroad rail. Crown cap colorless and brown glass beverage bottles were noted in the WW II pit fill deposit beneath Layer II aeolian sand in BT-C-2-1. A third large WW II-era trash pit, 5.0 m wide and 1.15 to 2.2 m deep, beneath Layer II fill in BT-C-2-2 (see *Figure B-64* in **Appendix B**) contained fragments of United States Quarter Master Corps glazed ceramic tableware stamped "USQMC 1941", cosmetic, beverage, and condiment glass bottles, bricks and a large casing. The presence of the WW II trash pits beneath fill and aeolian sand at the east end of the dune closest to the Kahuku Army Airfield, indicates that parts of the dune were probably mined for Airfield materials and in-filled with trash to stabilize the dune when the Airfield was decommissioned at the end of the war.

Layer III contained evidence of possible tsunami deposits in three trenches at the east end of Test Area C (BT-C-2-2, C-3-1, C-3-2). In Layer III in BT-C-2-2 and C-3-2 the potential tsunami deposits are more than 1.0 m thick and contain broken glass throughout (see *Figures B-64 and B-66*; **Appendix B**). The tsunami deposit in BT-C-2-2 overlies a military trash pit full of glass containers. If the broken glass in Layer III of BT-C-2-2 and C-3-2 is from reworking the World War II-era trash pit material, then the Layer III tsunami deposits in those trenches date to the tsunami events of either 1946 or 1957. In BT-C-3-1 the Layer III possible tsunami deposit consists of light brownish gray and very pale brown-banded loose sand between two aeolian deposits (see *Figure B-65* in **Appendix B**).

Layer IV in BT-C-8-2 at the west end of Area C consists of a probable tsunami deposit (see *Figure B-76* in **Appendix B**). In this trench Layer IV (a/b) consists of gray and dark gray compacted sand and slightly loamy sand deposits, with sparse charcoal flecking and waterworn marine shells associated with Layer IVa. The deposit is identified as a tsunami deposit on the basis of color and the inclusion of sparse charcoal and shells.

Layer V in BT-C-3-2 was identified as a possible pre-1946 tsunami deposit. In that trench a second possible tsunami deposit is separated from the Layer III tsunami deposit by 0.53 m of homogeneous very pale brown aeolian sand (Layer IV). The older Layer V tsunami deposit is represented by more than 1.4 m of very pale brown and light gray compacted sand. Layer V could have been deposited by the 1923 tsunami or during any of the five tsunamis known to have affected the North Shore in the 19th Century (Walker 1994:32).

Manual excavation of eight or more 1.0 by 1.0 m test units to document the stratigraphy in and around Site 4488 was proposed in the SAIS Plan (Haun *et al*. 2011: 88). The depth and large quantity of unstable aeolian sand made this proposal untenable. Instead, stratigraphic profiles were obtained by manually facing large exposures of existing sand pit walls using shovels to obtain relatively vertical surfaces (see *Figure 40*). In an effort to identify deposits reported by Carson *et al. (*1996, 1999) where burials were previously discovered, ten profiles were obtained from previously mined sand pits in Test Area C. Manually-excavated profiles were documented at 6 of the 12 sand pits, with one profile completed in SP-2, -3, -4 and -5 and two profiles in SP-1, -6 and -7 (see *Figure 100*). The profiled faces varied in length from 1.5 to 8.3 m and in depth from 1.3 to 6.5 m below the surface of the sand pits. Layer descriptions for the sand pit profiles are presented in *Table 3*; the profiles are illustrated in *Figures 109-117*.

Wall slump was removed and the sand pit walls were shaved back to produce a clean vertical face for stratigraphic documentation. In the deepest sand pit (SP-1) two steps were excavated for a total vertical exposure of 2.3 m. The profiling work in SP-1 and SP-7 was supplemented by mechanical excavation in the bottom of each pit (see *Figure 39*). In both pits the basal limestone and overlying strata were exposed (see *Figures 109* and *116*) and these strata were correlated with the manual profiles from the upper portions of the pits.

Table 3. Summary of Manual Profiles in Test Area C

Profile	Profile length (m)	Max. Trench Depth (m)	Layer	Depth of layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Disturbance	Cultural remains
Sand Pit 1, Profile 1	8.30	4.75	I	0.0-0.1	0.10	Pale brown	10YR 6/3	Sand	Loose, unconsolidated	90% organic material	Distinct/wavy	Recent duff	Intact	-
			II	0.1-4.1	4.00	Very pale brown	10YR 8/3	Sand	Unconsolidated	Ironwood roots	Distinct/wavy	Aeolian dune	Intact	-
			III	4.1-4.75	0.65	Very pale brown	10YR 8/3	Bedded Sand	Consolidated	Root concretions	Abrupt/wavy	Aeolian dune	Intact	-
			IV	4.75+	-	-	-	Limestone	-	-	-	Bedrock	Intact	-
Sand Pit 1, Profile 2	1.60	2.40	I	0.0-0.15	0.15	Very dark brown	7.5YR 2.5/2	Sand	Unconsolidated	90% organic material (ironwood cones, needles, roots)	Distinct/wavy	Recent duff	Intact	-
			II	0.05-2.4	2.35	Very pale brown	10YR 8/4	Sand	Unconsolidated, single grain	sparse roots, lamination	Unexcavated	Aeolian dune	Intact	*Felis catus* tibia radius, 2 vertebrae, 3 phalanges
Sand Pit 2, Profile 1	1.50	1.50	I	0.0-0.3	0.30	Very pale brown & light gray	10YR 8/2 & 10YR 7/2	Sand	Unconsolidated, single grain	-	Distinct/wavy	Aeolian	Disturbed during sand mining	Fish vertebra
			II	0.3-1.5	1.20	White	10YR 8/1	Sand	Unconsolidated to slightly compacted,	Root concretions increase with depth; up to 7 cm in diameter	Unexcavated	Aeolian dune	Intact	-
Sand Pit 3, Profile 1	1.50	1.30	I	0.0-0.85	0.80	Very pale brown	10YR 7/4	Sand	Unconsolidated, single grain, loose	Rootlets	Diffuse/wavy	Aeolian	Disturbed (slump)	-
			II	0.75-1.3	0.55	Very pale brown	10YR 8/3	Sand	Slightly compacted / consolidated; laminated	Sparse concretions & lithified chunks	Unexcavated	Aeolian dune	Intact	-
Sand Pit 4, Profile 1	1.60	1.40	I	0.0-0.2	0.20	Very pale brown	10YR 8/2	Sand	Unconsolidated, single grain, loose	Root mat	Diffuse/smooth	Aeolian	Disturbed	-
			II	0.2-0.93	0.73	Very pale brown	10YR 8/3	Sand	Unconsolidated, single grain, loose	Sparse concretions & small chunks of lithified sand	Abrupt/wavy	Aeolian dune	Intact	-
			III	0.93-1.4	0.47	Very pale brown	10YR 8/3	Sand	Slightly compacted; laminated	Sparse concretions & small chunks of lithified sand	Unexcavated	Aeolian dune	Intact	-
Sand Pit 5, Profile 1	1.80	1.50	I	0.0-0.1	0.10	Dark brown	7.5YR 3/3	Clay	Compact, very fine friable crumb	-	Abrupt/discontinuous	Imported Fill	Redeposited	-
			II	0.1-0.32	0.22	Light gray to pale brown	Mottled 10YR 7/2 to 10YR 6/3	Sand	Slightly to moderately compacted, fine, single grain	Sparse root concretions	Distinct	Aeolian	Disturbed w/buried pockets of Layer I material	-
			III	0.32-1.5	1.18	Very pale brown	10YR 8/2 & 10YR 8/3	Sand	Loose, fine, single grain & thin continuous lenses of coarser sand	Sparse root concretions suspended in matrix	Unexcavated	Aeolian dune	Intact	-
Sand Pit 6, Profile 1	3.70	1.90	I	0.0-0.68	0.44	Light gray to gray	10YR 7/1 & 10YR 6/1	Sand	Moderately compacted	10% semi-lithified sand chunks	Distinct/wavy	Storm Deposit?	Recently stabilized surface	-
			II	0.36-1.80	0.95	Light gray, gray & light brownish gray	10YR 7/2, 10YR 5/1, & 10YR 6/2	Sand	Moderately compacted; banded	waterworn marine shells throughout	Distinct/wavy	Storm surge or tsunami	Intact	earthenware slipped ceramics, mammal bones (pig, cow or horse), avian bone, charcoal
			III	1.12-1.9	0.43	Very pale brown	10YR 8/3	Sand	Slightly compacted	Root concretions	Unexcavated	Aeolian	Intact	-
			IV	0.44-1.9	1.45	Very pale brown	10YR 8/2 & 10YR 8/3	Sand	Extremely loose, single grain	Sparse coral	Unexcavated	Aeolian & Marine Deposited	Intact	-
Sand Pit 6, Profile 2	2.40	2.00	I	0.0-0.2	0.20	Light gray to grayish brown	10YR 7/2 & 10YR 5/2	Sand	Loose	organic material (ironwood)	Distinct/wavy	Recent duff	Intact	-
			II	0.2-1.6	1.40	Very pale brown	10YR 8/2	Sand	Very loose, very fine	dense small roots	Diffuse/wavy	Aeolian	Intact	-
			III	1.6-2.0	0.40	Very pale brown	10YR 8/2	Sand	Moderately compacted; banded	laminated bedding planes	Unexcavated	Aeolian dune	Intact	-
Sand Pit 7, Profile 1	2.50	6.70	I	0.0-0.1	0.10	Pale brown	10YR 6/3	Sand	Loose	50% organic material (ironwood)	Distinct/wavy	Recent duff	Intact	-
			II	0.1-0.20	0.10	Very pale brown	10YR 8/2	Sand	Moderately compacted	semi-lithified sand chunks & discontinuous carbonate lenses	Diffuse/wavy	Aeolian	Intact?	-
			-	0.2	0.02	-	-	Calcium carbonate	Cemented; laminated, discontinuous	-	Distinct/wavy	Precipitate	Intact	-
			III	0.20-2.8	2.60	White to very pale brown	10YR 8/1 & 10YR 8/2	Sand	Moderately compacted	Sparse root concretions increasing with depth	Diffuse/wavy	Aeolian dune	Intact	-
			IV	2.8-6.7	3.90	White to very pale brown	10YR 8/1 & 10YR 8/2	Sand	Semi-lithified	semi-lithified sand chunks & root concretions	Abrupt	Aeolian dune	Intact	-
			V	6.7+	-	-	-	Limestone	-	-	-	Bedrock	Intact	-
Sand Pit 7, Profile 2	1.90	1.80	I	0.0-1.3	1.30	Very pale brown	10YR 8/2	Sand	Loose, single grain, unconsolidated	Roots	Diffuse/wavy	Aeolian dune	Intact	-
			II	1.3-1.8	0.50	Very pale brown	10YR 8/2	Sand	Moderately compacted, single grain	-	Unexcavated	Aeolian dune	Intact	-

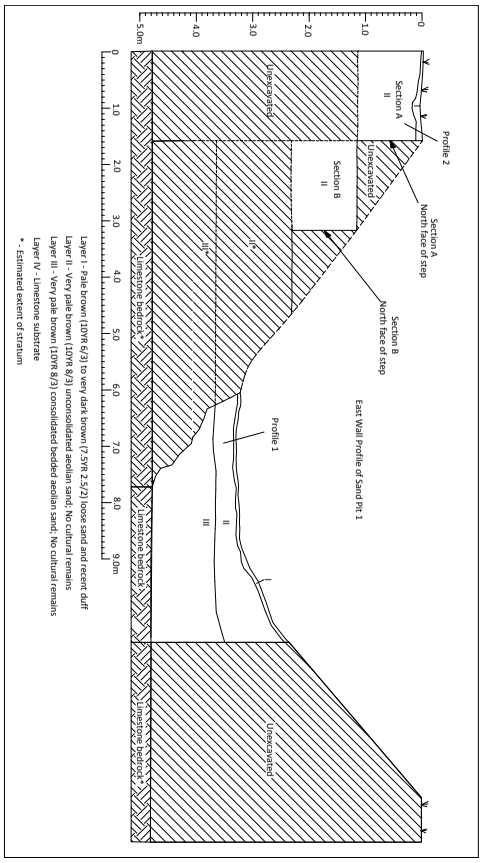
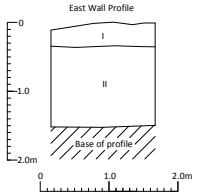


Figure 109. Test Area C – SP 1 profiles 1 and 2

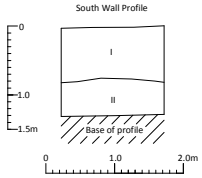
Figure 110. Profile 1 of SP-2



Layer I - Very pale brown (10YR 8/2) to light gray (10YR 7/2) unconsolidated aeolian sand; Fish vertebra

Layer II - White (10YR 8/1) unconsolidated aeolian sand; No cultural remains

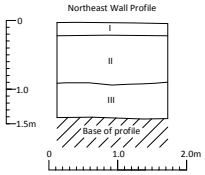
Figure 111. Profile 1 of SP-3



Layer I - Very pale brown (10YR 7/4) unconsolidated aeolian sand; No cultural remains

Layer II - Very pale brown (10YR 8/3) slightly compacted, laminated aeolian sand; No cultural remains

Figure 112. Profile 1 of SP-4

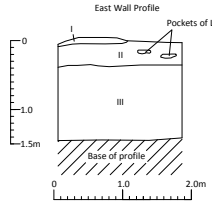


Layer I - Very pale brown (10YR 8/2) unconsolidated aeolian sand; root mat; No cultural remains

Layer II - Very pale brown (10YR 8/3) unconsolidated aeolian sand; No cultural remains

Layer III - Very pale brown (10YR 8/3) slightly compacted, laminated aeolian sand; No cultural remains

Figure 113. Profile 1 of SP-5

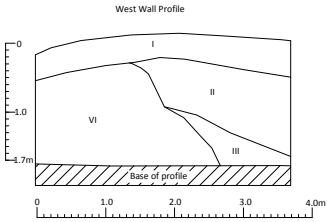


Layer I - Dark brown (7.5YR 3/3) compacted clay fill; No cultural remains

Layer II - Light gray (10YR 7/2) to pale brown (10YR 6/3) slightly to moderately compact, disturbed aeolian sand; No cultural remains

Layer III - Very pale brown (10YR 8/2 to 10YR 8/3) loose aeolian sand; No cultural remains

Figure 114. Profile 1 of SP-6



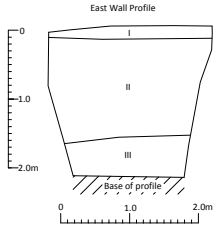
Layer I - Light gray (10YR 7/1) to gray (10YR 6/1) moderately compacted sand storm deposit; No cultural remains

Layer II - Light gray (10YR 7/2) to gray (10YR 5/1) moderately compacted sand tsunami deposit; Bird and cow bones and glazed ceramics

Layer III - Very pale brown (10YR 8/3) slightly compacted aeolian sand; No cultural remains

Layer IV - Very pale brown (10YR 8/2 to 10YR 8/3) loose aeolian and marine deposited sand; sparse coral present

Figure 115. Profile 2 of SP-6

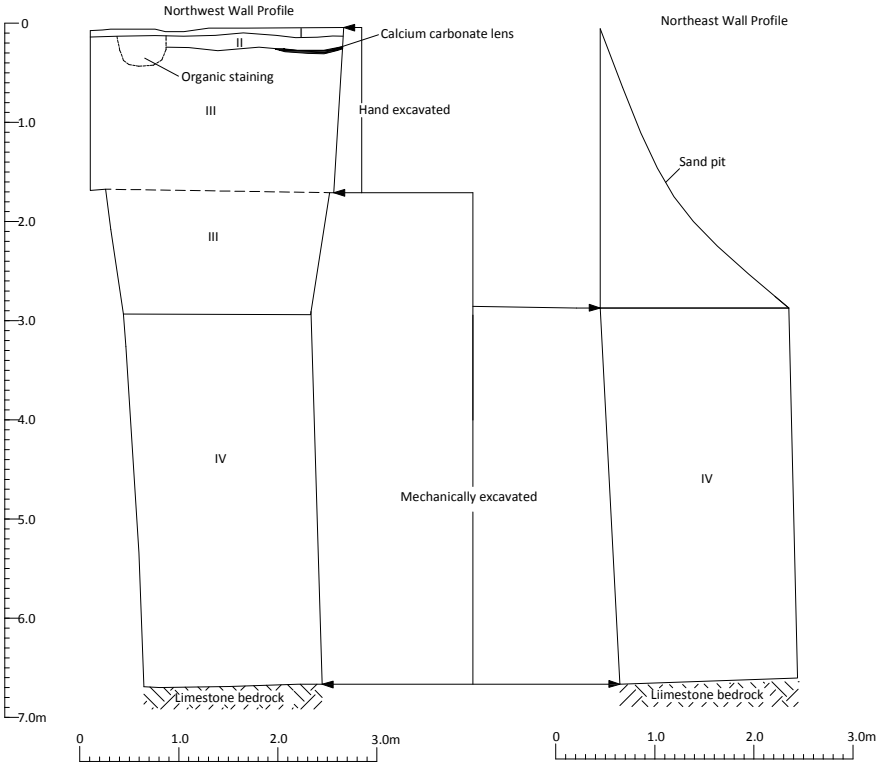


Layer I - Light gray (10YR 7/2) to grayish brown (10YR 5/2) loose sand with organics (recent duff); No cultural remains

Layer II - Very pale brown (10YR 8/2) loose very fine aeolian sand; No cultural remains

Layer II - Very pale brown (10YR 8/2) moderately compacted and banded aeolian sand; No cultural remains

Figures 110-115. Test Area C profiles of Sand Pits 2-6



Layer I - Pale brown (10YR 6/3) loose sand with organics (recent duff); No cultural remains

Layer II - Very pale brown (10YR 8/2) moderately compacted aeolian sand; No cultural remains

Layer III - White (10YR 8/1) to very pale brown (10YR 8/2) moderately compacted aeolian sand; No cultural remains

Layer IV - White (10YR 8/1) to very pale brown (10YR 8/2) semi-lithified aeolian sand; No cultural remains

Figure 116. Test Area C profile 1 of SP- 7

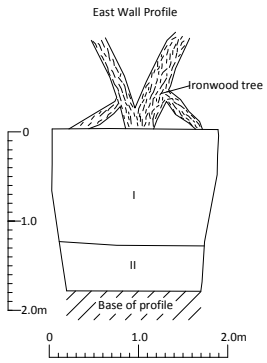


Figure 117. Test Area C profile 2 of SP-7

The sand pit profiles documented a surface layer of recent duff in five sand pits (SP-1-1, 1-2, 4-1, 6-1, 7-1), imported fill in one sand pit (SP-5-1), a storm deposit in one sand pit (SP-6-1) and surface aeolian sand in three profiles (SP-2-1, 2-2, 7-2). A fish bone was noted in the Layer I aeolian deposit of SP-2-1. The fill layer in SP-5-1 is compacted clay devoid of cultural material.

The storm deposit in Layer I of SP-6-1 is moderately compacted sand, containing 10% semi-lithified sand chunks; Layer I is underlain by a second probable tsunami layer of banded light gray, gray and light brownish gray moderately compacted sand containing earthenware slipped ceramic fragments, large mammal bones (pig, cow, or horse), avian bones and charcoal. Layer III aeolian sand overlies Layer IV and marine deposited sand containing sparse coral.

Figure 118 is the first of three stratigraphic profiles (profile 1) and illustrates a composite north-south transect across the west half of Area C. A surface layer of humic duff overlies 4.75 m of aeolian sand (SP-1) and is indicative of the coastal dune's depth on the west side of Kaihalulu Bay. Mixed sand deposits underlie the humic duff and overlie intact aeolian deposition on the seaward (north) side of the composite transect, where in BT-C-7-1 the aeolian infill deposits are interpreted as episodic infilling of an area occupied by a dirt road (see *Figure 38*). On the south end of the composite transect fill underlies the surface duff and truncates the underlying intact aeolian sand deposits in BT-C-7-2 and C-7-3.

Figure 119 is the second of three stratigraphic profiles (profile 2) and illustrates a composite north-south transect across the east half of Area C, where possible storm deposits were documented in BT-C-3-1 on the seaward (north) side and BT-C-3-2 on the inland (south) side. Both profiles show a surface layer of humic duff. On the seaward side in BT-C-3-1, the surface duff caps a shallow deposit of intact aeolian sand (Layer II), which overlies a shallow (0.09 m) deposit of banded sand identified as a storm deposit (Layer III). The shallow tsunami deposit overlies a semi-lithified (calcium carbonate-cemented) aeolian sand deposit (Layer IV), which overlies 2.08+ m of fine, loose single grain aeolian sand. The semi-lithified aeolian Layer IV deposit, at 0.29-0.62 cm below the ground surface, was probably super-saturated with seawater and compressed during the Layer III storm or tsunami event. On the south end of the composite transect in BT-C-3-2, a layer of intact aeolian sand (Layer IV) separates the tsunami deposits (Layers III and V), which are both characterized by undulating bands of multi-hued sand deposits; the upper deposit contains broken glass throughout, but the lower deposit contains no inclusions.

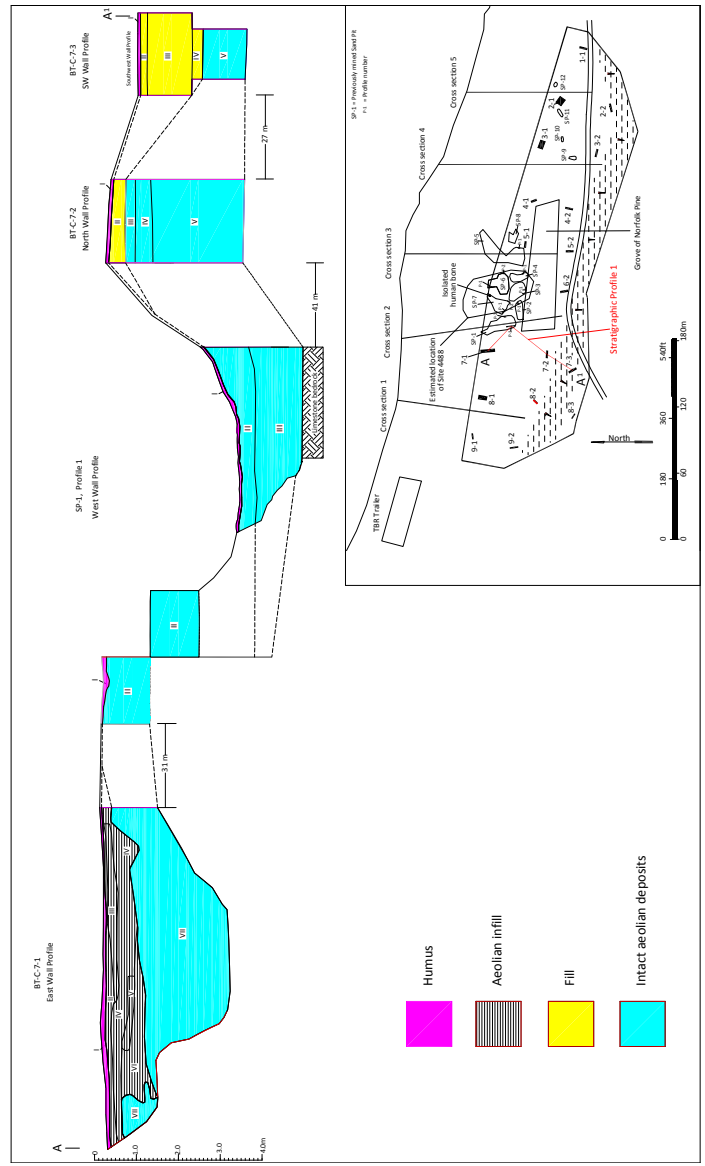


Figure 118. Test Area C stratigraphic profile 1

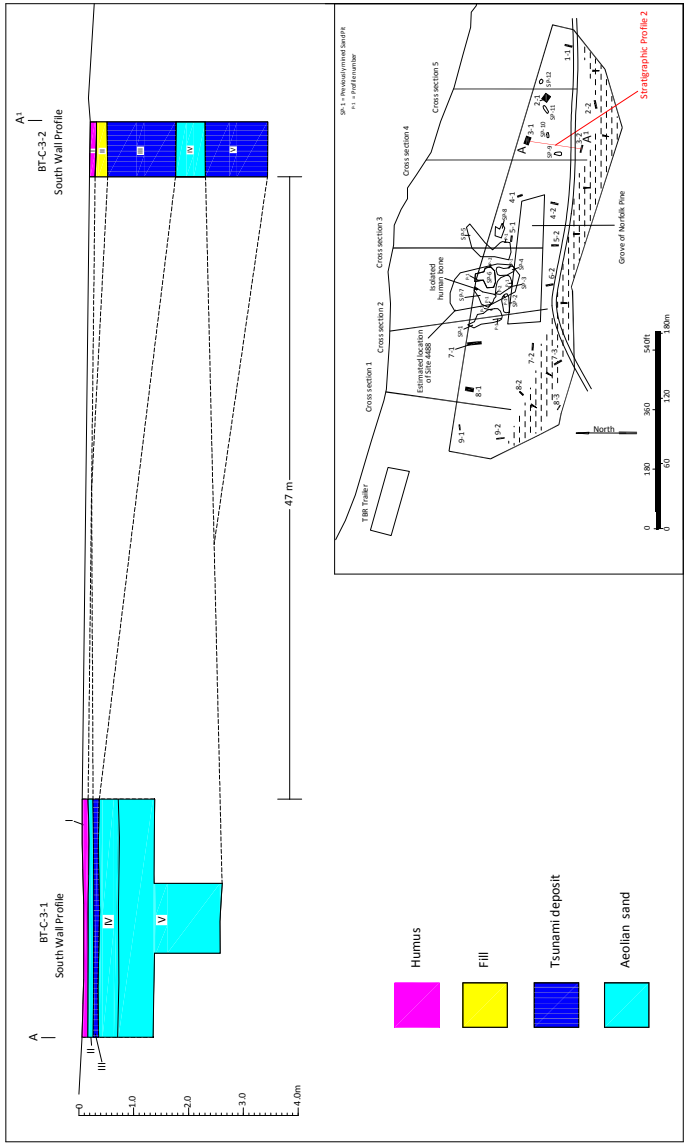


Figure 119. Test Area C stratigraphic profile 2

Together these profiles show the erosional effect of the tsunami in BT-C-3-1, where the volume of Layer IV aeolian sand is reduced by 40%, compared to Layer IV in BT-C-3-2, while the volume of tsunami deposition in Layer III increases by more than a factor of 10 in BT-C-3-2. The Layer III tsunami deposits represent either the 1946 or 1957 tsunami, when shoreline inundation or runup (maximum observed height of the sea surface, measured relative to mean sea level) at Kahuku Point was 8.2 m (27 ft) in 1946, and 7.0 m (23 ft) in 1957 (Walker 1994: 6, 32). Runup was of sufficient height to completely inundate the Area C dune, the maximum height of which is slightly less than 7.0 m (c. 22 ft). At the east end of the dune, the height above sea level is currently only 4.25 m (c. 14 ft). While there is no data on file for runup heights at Kahuku Point during the 1923 tsunami, runup measured at Hale'iwa was 3.7 m (*ibid.*: 32) and by extrapolating from the known Hale'iwa and Kahuku Point runups for 1946 (3.4 m Hale'iwa) and 1957 (5.2 m Hale'iwa), the 1923 tsunami at Kahuku Point might have resulted in a runup of 5.0 m to 7.0 m, or more. The volume of the Layer V tsunami deposit in BT-C-3-2 was probably the result of an event equal to, or possibly greater than the Layer III tsunami episode.

Figure 120 is the last of three stratigraphic profiles (Profile 3) and illustrates a composite north-south transect across the approximate center of Area C, where intact deposits across the dune show the humic duff differentially overlying sequential aeolian deposition. Stratigraphic Profile 3 shows SP-7, at the north end of the composite transect, encountered the limestone substrate at 6.7 m below the ground surface. Layer II in SP-7 consists of aeolian sand containing semi-lithified sand chunks and discontinuous calcium carbonate lenses at the interface with Layer III. The calcium carbonate horizon probably resulted from seawater inundation from either the 1946 or 1957 tsunami, or both; the semi-lithified sand chunks could result from super compaction or, less probably from secondary deposition of fossilized dunal remnants from an exposure closer to the shoreline. The 10-cm thick Layer II aeolian sand in SP-7 could represent a severely eroded and truncated aeolian deposit. In contrast, Layer IV in SP-7 is a 4.0 m deposit of semi-lithified aeolian sand that is the fossilized dune over which the upper dunal deposit (Layer III) coalesced.

Sand Pit-2, in the center of the composite transect, while only faced to a depth of 1.5 m specifically to locate buried cultural deposits, shows continuous unconsolidated to slightly compacted aeolian deposition from the surface to the base of the truncated profile. Layer I in SP-2 was noted to be disturbed as a result of sand mining activity, and a single fish vertebra noted in the deposit could be displaced as a result of recent cultural or tsunami or storm activity. Layer II contained root concretions of calcium carbonate commonly up to 7 cm in diameter, which provides additional evidence of seawater inundation.

The BT-C-6-2 profile shows shallow sandy duff overlying 2.6 m of intact aeolian sand. Layer II consists of semi-lithified banded or bedded aeolian sand deposit that slopes 10-degrees north from horizontal, toward the sea. Similar horizontal bedding was documented in Layer II of SP-6, where it was tentatively interpreted as cyclical storm surge or tsunami depositional sequences. No calcium carbonate lenses, root concretions or differential sand coloration was observed in the Layer II deposit of BT-C-6-2 so it is not specifically identified as a tsunami or storm surge deposit, but the semi-lithification of this deposit could have resulted from inundation because it is unlikely to represent the fossilized dunal core. Layer II overlies Layer III, a homogeneous 0.70+ m deposit of semi-lithified single grain aeolian sand devoid of obvious bedding planes or inclusions. Semi-lithification in Layer III could be the result of pre-20th Century seawater inundation and compaction, or the fossilized dunal core; excavation was not deep enough to make a more specific determination.

3est Area C is a forested coastal sand dune on the west side of Kaihalulu Bay, c. 90-135 m from the shoreline. The central *makai* side of the dune contains 4.75 to 6.7 m of aeolian sand overlying the limestone substrate and is the location of previous TBR sand mining operations, where at least 8 burials were encountered at Site 4488. An isolated human bone was recovered from the ground surface near one of the open sand pits during SAIS fieldwork, presumably displaced from one of the eight burials. The southwest side of the dune contains 1.0 to 2.60 m of aeolian sand and fill overlying limestone. The southeast side of the dune was probably mined for sand during WW II, and the pits subsequently filled with trash of the same era. Testing documented disturbance across the dune, but deep, intact aeolian and marine-deposited sand deposits remain. The upper 1.5 m of the intact portions of the dune exhibit an increased potential for encountering additional cultural deposits.

Figure 120. Test Area C stratigraphic profile 3

Test Area D

Test Area D occupies the inland side of the forested sand dunes situated parallel to the shoreline along the west side of Kaihalulu Bay, between the mouth of ʻŌiʻo Stream on the west and the 17th fairway of the Palmer golf course on the east (see *Figure 41*). The 18th Fairway forms the inland (south) boundary of Test Area D. Previously recorded Site 6411-Feature C (formerly Site 50-OA-2911; Walker *et al*. 1988b, Corbin 2003) and Site 6419 (Corbin 2003) are located on the seaward side of Area D (*Figure 121*). The terrain is fairly level, except for a dunal ridge fronting the shoreline that is mostly seaward of the test area. The Jaucus Sand described by Foote *et al.* (1972) was mapped throughout the entire area. Test Area D varies in elevation from c. 4 ft to 16 ft. The Kahuku Army Airfield runway formerly occupied south-central part of Area D (see *Figures 17* and *42*). Associated taxiways and aircraft storage revetments were formerly located on the north side of the runway, in the northeast half of Area D. Most of Test Area D is currently undeveloped, except for a swath of landscaped lawn that spans the southeast end of the test area, providing an ocean vista from the 18th Green.

Thirty-six systematically placed trenches were excavated in Test Area D. Three discretionary trenches were excavated to define the extent of the subsurface cultural deposit. One trench (BT-D-0-1) was excavated outside the original boundary of Area D in a forested area to the west. Trench length varied from 4.8 to 8.0 m (average 6.5 m) and averaged 1.5 m in width. A total of 259.20 linear meters of trench were excavated. Trenches were excavated either to the water table (N=23) or to the weathered limestone substrate (16) and the profiles document three to nine layers. Excavation of one trench was terminated when human remains were identified. The trench profiles are illustrated in **Appendix B** (*Figures B-80* through *B-118*). Trench dimensions and detailed stratigraphic data are presented in A**ppendix C**.

Testing identified three prehistoric cultural deposits (Sites 7289, 7290 and 7291), one of which contained a human burial (BT-D-2-1b in Site 7289). In addition, buried asphalt pavements were encountered in seven trenches (BT-D-4-1, D-5-1, D-8-3, D-9-1, D-9-2, D-9-3 and D-15-3); these are sections of the Kahuku Army Airfield runway (Site 7275) and ancillary pavements north of the main runway.

Site 7275 is the Kahuku Army Airfield, a large military complex. Construction on the runway began in December 1941 and the airfield was in use until March 1946 (Bennett 2011: 52). The main (NE-SW) runway, located within 300 ft of the shoreline south of Kahuku Point, had a number of building phases, including modification in 1943/1944 to accommodate B-29 aircraft, which included covering the runway in "pierced steel planking (Marston Mat)" and paving both Kahuku Point runways with "asphaltic concrete…with compacted coral shoulders 100 feet on either side of its 200 foot width" (*ibid*.: 54). Regarding the construction of the air base, Bennett (*ibid*.: 53) notes:

> Early attempts at building a single runway on the limestone, lithified dunes, sand dunes and wetlands at Kahuku Point by Hawaiian Constructors were foiled by poor drainage, which necessitated…the runway being relocated three times before a suitable location was found. To mitigate drainage problems at the location, a system of canals, subterranean drain pipes and culverts were built.

In addition to the runways, "32 earthen revetments were constructed between both runways" to protect aircraft and maintenance crews; the revetments were "sprayed with gunite to prevent erosion…[and were] trapezoidal in cross section requiring 5,000 cubic yards of earth for a traverse 14 feet high" (*ibid*.: 54).

Test Area D partially overlaps the area formerly occupied by the Kahuku Army Airfield runway and revetment area north of the runway (see *Figures 17* and *42*). Widespread evidence of modification for the Airfield facilities was encountered throughout much of Test Area D. These are noted in the descriptions of individual Test Area D trenches in **Appendix C**. All of the Airfield modifications in Test Area D consist of intact asphalt pavement and/or limestone aggregate fill deposits. Only a small section of the former location of the Airfield runway coincides with south-central portion of Test Area D. The revetment area north of the Airfield runway coincides with the north half of Area D. The problem with making specific correlations with specific Airfield features stems partially from the lack of a fully annotated Airfield map identifying features and construction phases; identification of specific

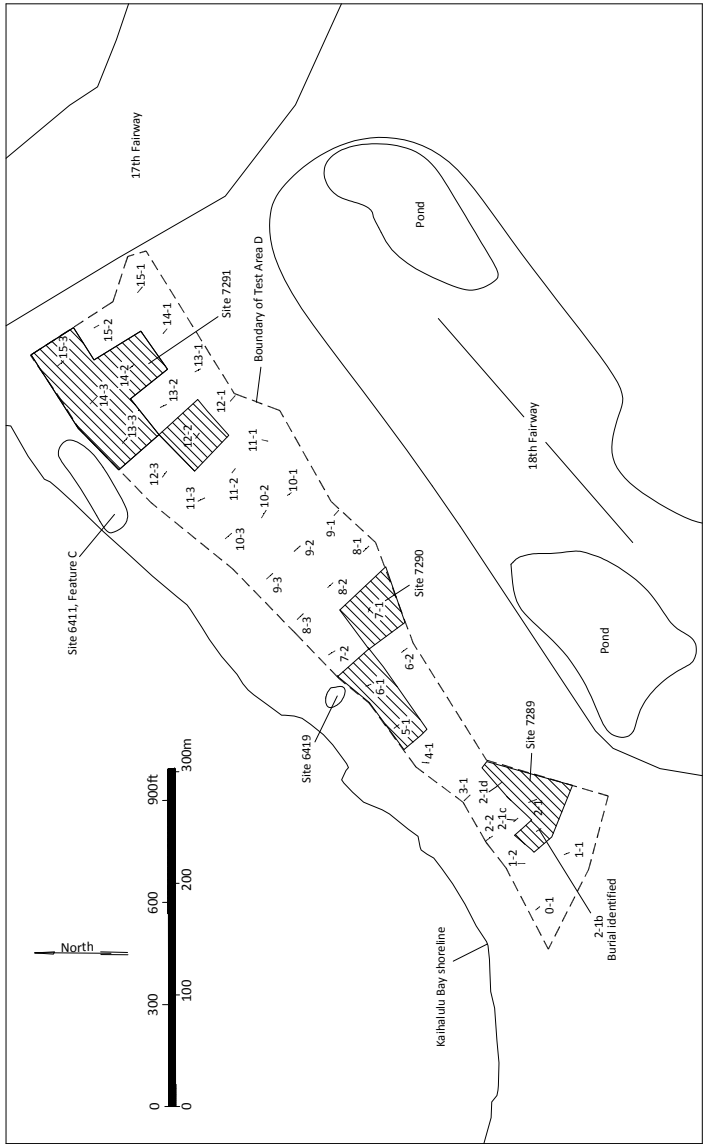


Figure 121. Location of sites and trenches in Test Area D

exposures of asphalt pavement as runway or revetment area features, is based on the inferred location of the runway shown on Figure 17, and in some cases, on the fill deposits underlying a specific section of pavement. As a result of the uncertainty regarding specific identification of Airfield features, none of the Airfield modifications documented in Test Area D were assigned specific feature numbers or separate site numbers, and all were treated as elements of Site 7275.

Pavements north of the runway in the revetment area could represent taxiways, pavement inside revetments or roads leading to revetments. Limestone fill deposits without an overlying asphalt pavement could represent runway shoulders, gravel roads, revetment construction material, or locations where the overlying asphalt was stripped away by the 1946 tsunami. Keating (2008) describes and illustrates the extremely destructive force of the 1946 tsunami on the Kahuku Army Airfield and provides invaluable information for interpreting the deposits encountered in the Test Area D trenches; her geophysical analysis of the depositional and erosional processes on structures and landforms at Kahuku Point were used as the basis of interpretation of the tsunami deposits in Test Area D. In order to properly identify individual features of the Airfield in Test Area D and to be able to specify precisely what elements of the Airfield the deposits represent, horizontal exposure would be more useful than the vertical exposures provided by subsurface trenching.

Site 7289 is a subsurface cultural deposit located at the west end of Test Area D. This deposit was initially encountered in BT-D-2-1, where eight deposits were documented in the trench wall (*Figure 122*). The upper layers consist of humic duff (Layer I) and an aeolian sand layer (Layer II) that contains 80% lithified sand chunks and slight organic staining characteristic of tsunami disturbance. A utility trench containing electrical wires was excavated from Layer I and is intrusive into Layers II-V. More extensive disturbance was noted c. 2.0 m south of the utility trench in Layer II, where an electrical wire was noted at the interface of Layer II and IV. Layer III is a shallow basin-shaped cultural deposit, probably representing a feature on the surface of the Layer IV

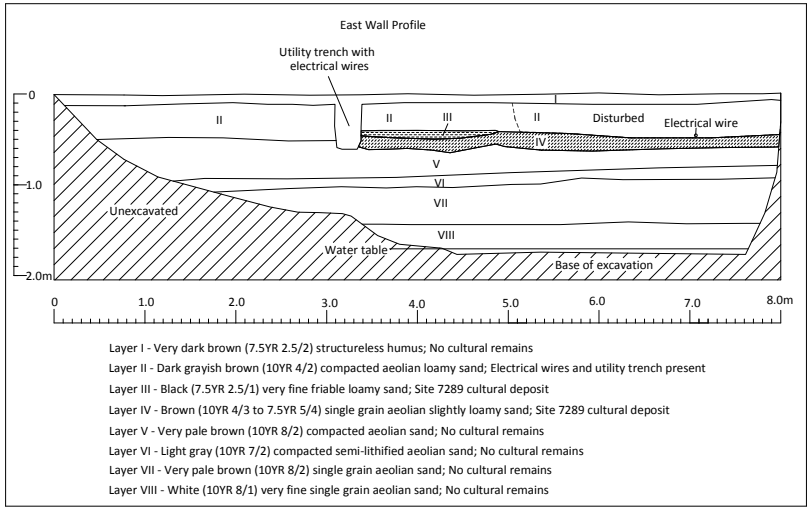


Figure 122. Site 7289 subsurface deposit in BT-D-2-1

cultural deposit. Layer III is characterized by black very fine friable loamy sand and is partially truncated on the north side by the utility trench. Layer III is 0.07 m thick and 1.44 m wide. Four basalt flakes and a *Cellana* shell were recovered from Layer III (Acc. 10.001-10.002, **Appendix D**). The Layer IV cultural deposit underlies Layer III and is also truncated on the north side by the electrical utility trench; additional disturbance in Layer II at the south end of BT-D-2-1 might have also disturbed the upper portion of Layer IV in that area. Layer IV consists of compacted brown slightly loamy charcoal-flecked sand and is visible in both walls of the trench; it varies in thickness from 0.10 to 0.20 m. Layer V underlies Layer II on the north side of the electrical utility trench and underlies Layer IV on the south side of the electrical utility trench. Layers V-VIII are intact aeolian sand deposits that underlie the cultural Layer IV to a depth of 1.7 m below the ground surface (bgs), where the water table was encountered.

Three discretionary trenches (BT-D-2-1b, D-2-1c, D-2-1d) were excavated around BT-D-2-1 to determine extent of the subsurface Site 7289 cultural deposit. BT-D-2-1c, located 15 m northwest of BT-D-2-1 contained no intact subsurface cultural layers (see *Figure B-85* in **Appendix B**). Subsurface evidence of the Site 7289 cultural deposit was also documented in BT-D-2-1b and D-2-1d.

BT-D-2-1b was excavated 25 m west of the subsurface cultural deposit encountered in BT-D-2-1 (*Figure 123*). The trench bisected a subsurface prehistoric house floor, which was visible in both walls of the trench. In addition, the trench exposed a subfloor burial visible only in the southeast wall of the trench. In BT-2-1b the humic duff (Layer I) overlies slightly loamy aeolian sand (Layer II). Layer II overlies Layer III, a house floor exposed in cross-section. The house floor itself is c. 20 cm below the associated prehistoric ground surface (elevated section on left) and the diagonal slope connecting the two represents the location of the former house wall; the sloping wall section indicates that the house was shallowly subterranean, as an adaptation to windy conditions. Layer III is very brown to dark grayish brown loamy sand with charcoal flecks throughout, exposed over a distance of 3.3+ m. The upper and lower boundaries of the deposit are wavy and vary in thickness from 5-16 cm, and average c. 8 cm in thickness. Cultural materials recovered from Layer III consist of marine shells (*Conus* sp., *Nerita polita*, unidentified marine shell fragments and waterworn marine shells), unidentified small mammal bone fragments, urchin and crustacean exoskeleton fragments, a burned *kukui* nutshell fragment and 74 fragments of charred wood (Acc. 11.001-12.007; **Appendix D**).

The subfloor primary burial was exposed 44 cm beneath the north end of the house floor, intrusive through Layer IV to the interface with Layer V. The burial pit sides are indistinct and were not visibly distinguishable from the surrounding Layer IV matrix; pit outlines in the profile are presumed and it is possible that the burial predates and is unrelated to the overlying structure. The distal end of a left humerus, a cervical vertebra and rib were exposed in the southeast wall of BT-D-2-1b, from 0.92-1.10 m bgs. Additional cervical vertebrae and the cranium also remain buried *in situ*. SHPD was notified immediately upon the identification of human remains. After consultation with SHPD, the excavated soil was systematically screened and scanned to recover displaced skeletal elements. The bones were in very good condition. Skeletal elements of a single individual were accounted for except those already mentioned that remain *in situ* and a tarsal cuneiform, 3 intermediate tarsal phalanges, 4 distal tarsal phalanges and a patella. These elements are presumed to also remain *in situ*. Inspection of the innominates indicates the burial is an adult male. All of the recovered remains were carefully returned to the trench and the excavation was backfilled, with appropriate cultural protocols provided by members of the Kahuku Burial Committee. Layers IV-VII are intact aeolian sand deposits, none of which contained associated cultural material, other than the burial.

BT-2-1d was excavated 29 m north-northeast of BT-2-1. Additional evidence of the Site 7289 subsurface cultural deposit was designated as Layer IV (*Figure 124*). The cultural deposit is overlain by humic duff (Layer I), loose sand representing either fill or possibly a storm surge deposit (Layer II), and compacted loamy sand containing 50% crushed basalt aggregate (Layer III). The south terminal end of Layer IV pinches out, which appears to be a natural termination of the deposit, rather than mechanical truncation, based on the depth of the deposit at the north end of the trench; if the deposit was mechanically truncated Layer III would overlie Layer V c. 20 cm deeper. Layer IV is characterized by grayish brown loamy sand with sparse limestone gravel inclusions that varies in thickness from 0.04 m on the south end to 0.24 m on the north end and is 2.80+ m long. Cultural materials recovered Layer IV consist of 15 juvenile *Sus scrofa* (pig) bone fragments and a charred wood fragment (Acc. 13.001- 13.002; Appendix

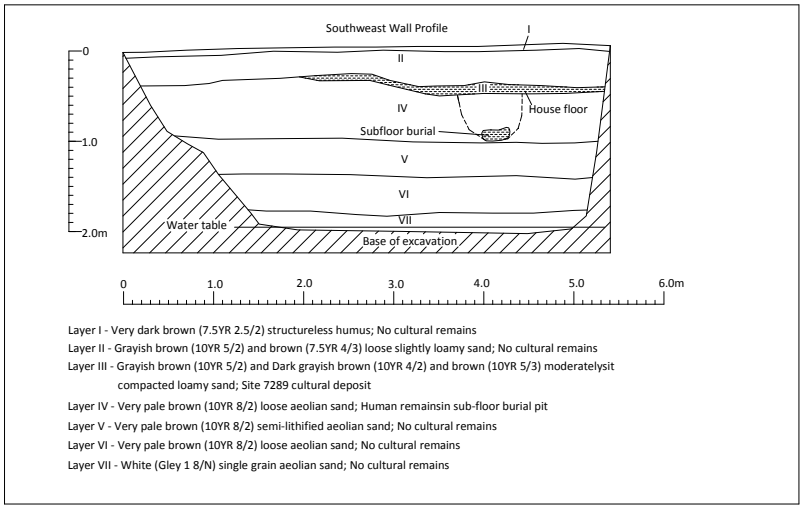


Figure 123. Site 7289 subsurface deposit in BT-D-2-1b

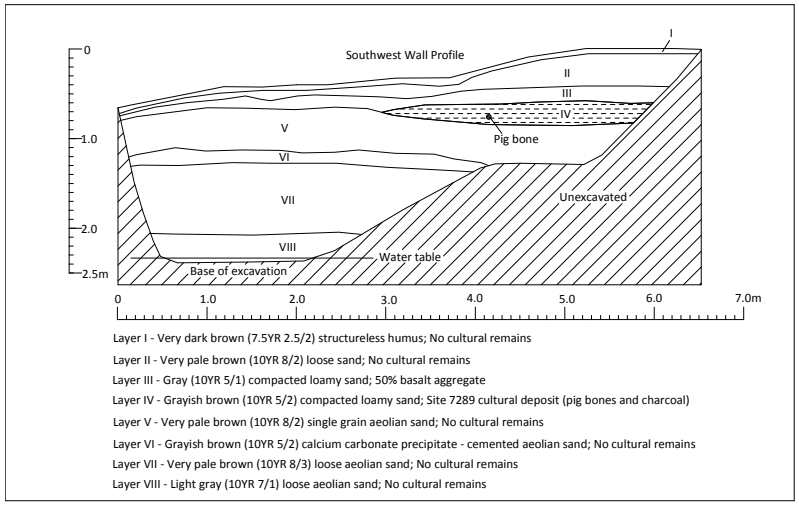


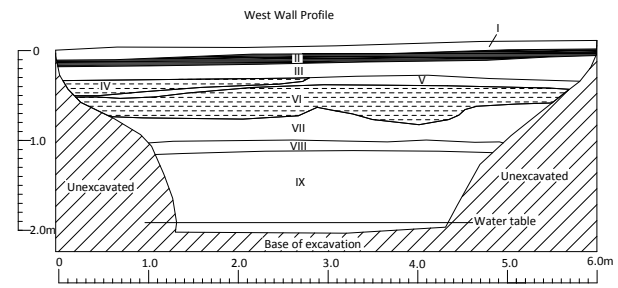
Figure 124. Site 7289 subsurface deposit in BT-D-2-1d

D). Four intact aeolian sand deposits (Layers V-VIII), one with heavy calcium carbonate lensing (Layer VI) underlie the cultural deposit and contain no inclusions or associated cultural material.

No testing was undertaken to the northeast of BT-2-1, where a paved cart path and portion of the golf course are located. Based on the testing, Site 7289 is estimated to encompass an area of at least c. 2,901 sq m. The cultural assemblages indicate the site was used for prehistoric habitation and burial. The site is in excellent condition and retains substantial physical integrity.

Site 7290 contains stratified subsurface prehistoric cultural deposits that were initially observed in BT-D-5-1 on the seaward side of Test Area D, and subsequently also identified in two other trenches (BT-D-6-1, -D-7-1) in the central portion of Test Area D. In BT-D-5-1 two prehistoric cultural layers were identified (*Figures 125-126*). Layer I consists of redeposited loamy sand fill or tsunami-deposited sand (Layer I) overlying an intact asphalt pavement that represents a portion of the Kahuku Army Airfield runway (Layer II) constructed on a secondary deposit of limestone aggregate fill (Layer III). The asphalt pavement is 11 cm thick and is buried 10 cm beneath the Layer I surface deposit. Layer III is 12-28 cm thick and consists of banded very dark grayish brown and yellowish brown, very fine friable crumb, clay loam with 80% limestone gravel inclusions and represents the bedding material for the runway. Layer III overlies Layer IV on the south side of the trench wall and overlies Layer V on the north side, and exhibits an abrupt and smooth boundary at the contact with Layers IV and V, indicating Layer III probably truncated the upper surfaces of both deposits. At its north end Layer IV truncates Layer V and has the appearance of a shallow basin-shaped deposit over a distance of 3.0+ m; the deposit is 16 cm thick at the south end of the trench and gradually pinches out to 2 cm at the north end. Layer IV consists of very dark gray to very dark grayish brown carbon-stained loamy sand with sparse limestone gravel inclusions and waterworn marine shells; cultural material recovered from Layer VI consists of a fragment of charred wood (Acc. 14.001- 14.002; **Appendix D**). Layer V consists of pale brown loose, clean sand containing sparse limestone gravel and deposited in thin wavy bedding planes, interpreted as a storm surge or tsunami deposit. A third cultural deposit (Layer VI) underlies Layer V, except at the very south end of the trench, where it underlies Layer IV. Layer VI varies from 16-40 cm in thickness, characterized by very dark gray to grayish brown mottled carbon-stained slightly loamy sand containing sparse limestone gravel inclusions and waterworn marine shells. Cultural remains recovered from Layer VI consist of a volcanic glass core, marine shells (*Trochus intextus*) and 3 fragments of charred wood (Acc. 15.001- 15.004). Three intact aeolian beach sand deposits (Layers VII-IX) underlie Layer VI to a depth of 2.06+ m bgs; Layer VII contained sparse patches of calcium carbonate lenses, but none of the aeolian deposits contained cultural or other natural inclusions.

In BT-D-6-1, located 42 m northeast of BT-D-5-1, a single subsurface prehistoric cultural deposit associated with Site 7290 was identified (*Figure 127*). Layer I consists of 20-40 cm of compacted brown sandy clay loam containing 80% limestone gravel, pebble and cobble aggregate, and could be runway fill or part of the runway shoulder adjacent to the north side of the runway. Layer II unconformably underlies the Layer I secondary fill deposit and is the subsurface prehistoric cultural deposit. Layer II consists of banded black and very dark brown compacted single grain loamy sand that varies in thickness from 2-18 cm. The abrupt and wavy boundary between Layer I and Layer II indicates that the upper surface of Layer II has been truncated by surface preparation prior to laying down the limestone fill, and at the north end of the trench Layer II is reduced to a 2-cm stain, which could be smeared from the south end of the deposit. Cultural materials collected from Layer II consist of marine shells (*Conus* sp., *Tellina palatam* and indeterminate bivalve shell) and 3 fragments of charred wood (Acc. 16.001- 16.004; **Appendix D**). Layer III underlies Layer II across most of the trench, except at the very north end, where surface preparation prior to laying the fill (Layer I) has completely stripped away Layer II so that Layer I overlies Layer III. Layer III consist of banded dark grayish brown, pale brown and grayish brown single grain sand, representing multiple storm surge deposits. The distinct wavy boundary at the interface between Layers III and IV indicate at least minor truncation of the upper surface of the Layer IV deposit. Layer IV is the third cultural deposit and underlies Layer III, except at the very north end of the trench, where it underlies Layer I. Layer IV is 0.46 to 0.86 m bgs and varies in thickness from 16-32 cm, characterized by very dark grayish brown, very fine friable sandy loam containing sparse limestone gravel inclusions and waterworn marine shells. Cultural material recovered from Layer IV consists of marine shells (*Cypraea caputserpentis*) and charred wood (Acc 17.001- 17.003; **Appendix D**). Layer V underlies cultural Layer IV and consists of 0.82+ m of very fine,



Layer I - Dark grayish brown (10YR 4/2) to light brownish gray (10YR 6/2) single grain loamy sand fill; No cultural remains
Layer II - Black (10YR 2/1) intact asphalt layer; WWII airfield pavement
Layer III - Very dark grayish brown (10YR 3/2) to yellowish brown (10YR 5/4) very fine friable clay loam fill; Aggregate for Airfield pavement bedding
Layer IV - Very dark gray (10YR 3/1) to very dark grayish brown (10YR 3/2) single grain loamy sand; Site 7290 cultural deposit
Layer V - Pale brown (10YR 6/3) single grain sand; No cultural remains
Layer VI - Very dark gray (10YR 3/1) to grayish brown (10YR 5/2) mottled single grain carbon stained slightly loamy sand; Site 7290 cultural deposit
Layer VII - Very pale brown (10YR 8/2) single grain aeolian sand; No cultural remains
Layer VIII - White (10YR 8/1) calcium carbonate precipitate; No cultural remains
Layer IX - Very pale brown (10YR 8/3) single grain aeolian sand; No cultural remains

Figure 125. Site 7290 subsurface deposit in BT-D-5-1

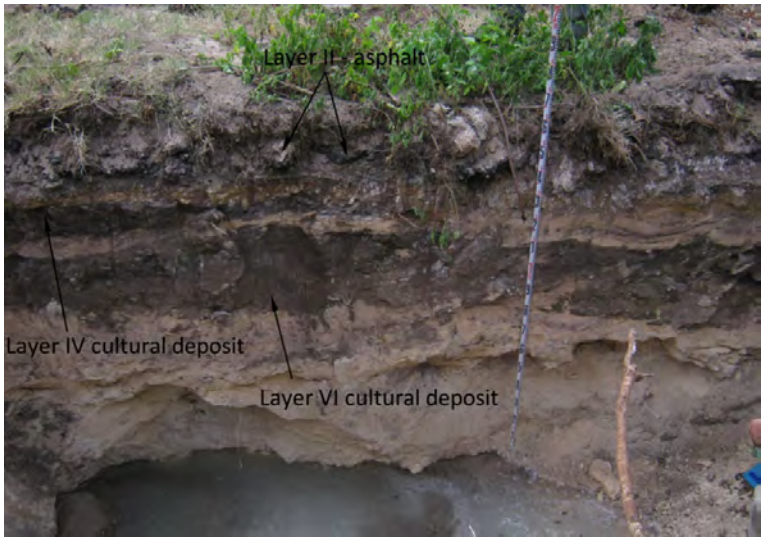
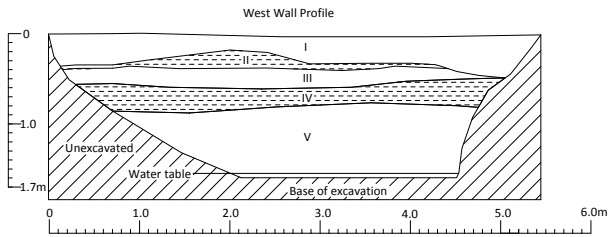


Figure 126. Site 7290 subsurface deposit in BT-D-5-1



Layer I - Brown (10YR 5/3) compacted sandy clay loam; Aggregate for Airfield pavement bedding

Layer II - Black (7.5YR 2.5/1) and very dark brown (10YR 2/2) single grain banded loamy sand; Site 7290 cultural deposit (Marine shells and charcoal)

Layer III - Grayish brown (10YR 5/2) and dark grayish brown (10YR 4/2) and pale brown (10YR 6/3) single grain sand; No cultural remains

Layer IV - Very dark grayish brown (10YR 3/2) very fine friable sandy loam; Site 7290 cultural deposit (Marine shells and charcoal)

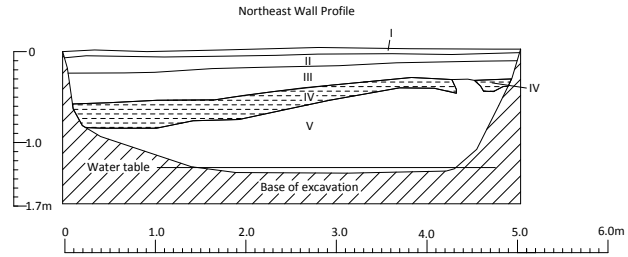
Layer V - Very pale brown (10YR 7/3) very fine single grain aeolian slightly silty sand; No cultural remains

Figure 127. Site 7290 subsurface deposit in BT-D-6-1

single grain slightly silty aeolian sand with weathered coral, sparse carbonates, and 20% limestone gravel and pebble inclusions to a depth of 1.55+ m bgs.

In BT-D-7-1, located 64 m east of BT-D-6-1, another prehistoric subsurface cultural deposit associated with Site 7290 was encountered (*Figure 128*). Layer I consists of 8 cm of humic duff overlying Layer II, composed of 100% crushed limestone gravel aggregate that is probably part of the runway shoulder adjacent to the north side of the runway. The fill varies in thickness from 16 cm at the north end of the trench to 8 cm at the south end and overlies Layer III, which consists of dark grayish brown fine friable crumb compacted sandy clay loam alluvium containing sparse limestone gravel and pebble inclusions. Layer III varies in thickness from 36 cm at the north end of the trench, to 20 cm at the south end, and overlies Layer IV over most of the exposure, except for a small area near the south end of the trench, where it overlies an unconformity in the limestone substrate. Layer IV exhibits a similar, but more pronounced increased thickness at the north end of the trench, noted in Layers II and III, where it is 28 cm thick but is reduced to 10 cm at the south end of the trench, following the topography of the underlying Layer V limestone substrate. Layer IV is the prehistoric cultural deposit characterized by very dark gray, fine friable sandy clay loam with sparse limestone gravel and pebble inclusions and waterworn marine shells. Cultural materials recovered from Layer IV consist of a *Cypraea caputserpentis* shell and probable avian bone fragments (Acc. 18.001-18.003; **Appendix D**).

Site 7290 is estimated to encompass a subsurface areal extent of c. 4,918 sq m. Two intact stratified subsurface prehistoric cultural deposits were identified BT-D-5-1, consisting of two habitation deposits sealed by the WW II-era Kahuku Army Airfield runway. Northeast of BT-D-5-1, in -D-6-1 and -D-7-1 the limestone aggregate shoulder on the north side of the runway seal single prehistoric cultural deposits. In the coastal setback on the seaward side of Site 7290, the adjacent Site 6419 was identified "as a cultural deposit discovered on July 10, 1990 following the mining of sand on the south side of the beach berm within the Hotel-5 area…The shovel test pits and trench indicated the area was highly disturbed, and would yield no useable information, and further testing was abandoned" (Corbin 2003:264). That is essentially the sum total of the information documented for Site 6419; no specific subsurface layer is identified as the cultural deposit, no information is provided regarding what cultural material the deposit contained, and no "highly disturbed" deposits are discussed or documented. Site 6419 also



Layer I - Dark brown (7.5YR 2.5/2) structureless humus; No cultural remains

Layer II - Light gray (10YR 7/2) and light brownish gray (10YR 6/2) compacted crushed limestone fill; Aggregate for Airfield runway shoulder

Layer III - Very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) fine friable sandy clay loam; No cultural remains

Layer IV - Very dark gray (7.5YR 3/1)fine friable carbon flecked sandy clay loam; Site 7290 cultural deposit (Marine shells and probable avian bones)

Layer V - Very pale brown (10YR 8/2) weathered limestone; No cultural remains

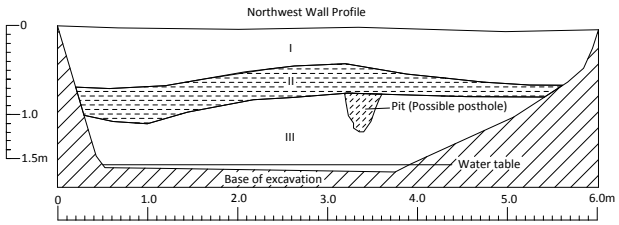
Figure 128. Site 7290 subsurface deposit in BT-D-7-1

encompassed a concrete slab, probably associated with the former Kahuku Army Airfield, which was not identified or discussed. Five stratigraphic layers were documented in the single trench excavated at the north end of Site 6419, but only three layers were described. The documentation for Site 6419 is inadequate for correlation with the subsurface data collected for Site 7290. Subsurface elements of Site 7290 possibly exist seaward in the area defined as Site 6419 and beyond.

Site 7290 is an extensive stratified subsurface site containing intact prehistoric habitation deposits characterized by artifacts and subsistence debris. Intact WW II deposits, representing elements of the Site 7275 Kahuku Army Airfield, overlie and seal the prehistoric deposits, and in limited areas have truncated the cultural deposits. Overall, the prehistoric deposits are in good condition and retain substantial physical integrity.

Site 7291 is a prehistoric subsurface cultural deposit identified in five trenches (BT-D-12-2, -D-13-3, -D-14-2, -D-14-3, -D-15-3) at the north end of Test Area D, in an area north of the Kahuku Army Airfield runway that was formerly occupied by revetments and associated roads. The prehistoric cultural deposit was initially identified in BT-D-12-2.

In BT-D-12-2, 63 cm of Layer I limestone aggregate, representing a secondary deposit of WW II fill, overlies the Layer II cultural deposit to a depth of 63 cm on the north and south ends of the trench and to a depth of 38 cm in the center of the trench (*Figure 129*). Layer II is characterized by 12-40 cm of very dark gray to black, very fine friable silt loam containing sparse limestone gravel inclusions and waterworn marine shells. Cultural material recovered from Layer II consists of marine shells (*Conus abbreviatus*, *Nerita picea*), unburned *kukui* nutshells, a waterworn coral pebble and fragments of charred wood (Acc. 20.001- 20.005; **Appendix D**). The lower boundary of the cultural deposit cultural deposit is not level, but rather descends toward the south end of the trench, where the base of the deposit is 1.05 m bgs and the deposit is 40 cm thick. At the north end of the trench Layer II is only 12 cm thick and the base of the deposit is 72 cm bgs. It is possible, but not certain that the upper surface of Layer II was truncated at the north end of the trench. A conical pit originates in Layer II and is intrusive into the underlying Layer III deposit. The pit is 36 cm wide at the interface with Layer II and 40 cm deep; it potentially represents a



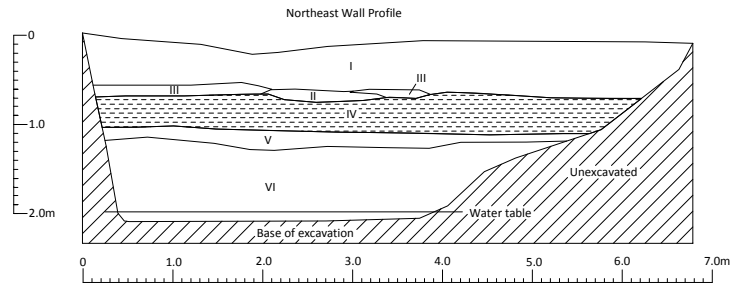
Layer I - Dark yellowish brown (10YR 3/4) loose sandy clay loam fill; 80-90% limestone aggregate
Layer II - Very dark gray (10YR 3/1) to black (10YR 2/1) very fine friable silt loam; Site 7291 cultural deposit (Marine shells, charcoal, kukui nutshells, coral)
Pit (Possible posthole) - Same soil matrix as Layer II (Marine shelsl and charcoal)
Layer III - Very pale brown (10YR 8/2) coarse limestone sand; No cultural remains

Figure 129. Site 7291 subsurface deposit in BT-D-12-2

post mold. Pit fill is the same as the Layer II matrix. Cultural materials recovered from the pit consist of marine shells (*Nerita picea*) and charred wood fragments (Acc. 21.001- 21.003). Layer III underlies Layer II and is characterized by 100% limestone sand representing the decomposing residual bedrock.

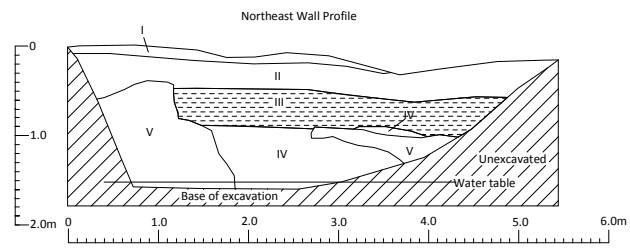
In BT-D-13-3, located 62 m north of BT-D-12-2, the subsurface cultural deposit associated with Site 7291 was identified at c. 65 cm bgs (*Figure 130*). Layer I is a 38-63 cm deposit of dark grayish brown unconsolidated very sandy loam containing 30% limestone gravel and pebble inclusions and pieces of Marston matting from the runway. It probably represents the 1946 tsunami out-flow deposit, since the runway is located c. 150 m south. The lower boundary of Layer I is distinct and wavy. Layer II is a pocket of light gray unconsolidated clean beach sand, and likely represents a tsunami in-flow deposit from a different phase of the tsunami event that deposited the Layer I material. In the center of the trench, Layer II underlies Layer I and cuts Layer III. Layer III also underlies Layer I and consists of a truncated and discontinuous 12 cm deposit of 100% limestone aggregate, representing secondarily deposited fill associated with the WW II revetment area. Layers I, II and III overlie Layer IV in different parts of the trench. All three of the upper layers sealed, but probably also truncated the upper surface of Layer IV. Layer IV consists of 30-42 cm of very dark grayish brown very fine friable sandy clay loam containing 60% limestone gravel, pebble and cobble inclusions and waterworn marine shells. Cultural materials recovered from Layer IV consist of marine shells (*Cypraea*, *Nerita picea*, Mytilidae), urchin and crustacean exoskeleton fragments, a probable *Canis* bone fragment, a burned *kukui* nutshell fragment and charred wood fragments (Acc. 22.001-22.010; **Appendix D**). Layer IV overlies Layer V, an intact alluvial deposit consisting of 17 cm of pinkish gray very compacted silty clay overlying weathering residual limestone.

In BT-D-14-2 the subsurface cultural deposit associated with Site 7291 underlies 60 cm of upper deposits (*Figure 131*). Layer I consists of 10 cm of loose sandy clay loam and duff and overlies Layer II, which consists of 50 cm of compacted clay fill containing 30% limestone gravel, pebbles and cobbles. The fill deposit either represents tsunami-displaced sediments containing limestone aggregate from the revetment area north of the Kahuku Army Airfield runway, or intact WW II deposited fill; the uncertainty results from the percentage of aggregate, which in



Layer I - Dark grayish brown (10YR 4/2) loose very sandy loam; Marston matting from runway
Layer II - Light gray (10YR 7/2) unconsolidated clean beach sand; No cultural remains
Layer III - Very pale brown (10YR 7/3) to pale brown (10YR 6/3) compact crushed limestone fill; 100% aggregate
Layer IV - Very dark grayish brown (10YR 3/2) very fine friable sandy clay loam; Site 7291 cultural deposit (Marine shells, urchin, crab, Canis bone, kukui nutshell, charcoal)
Layer V - Pinkish gray (7.5YR 6/2) very compacted alluvial silty clay; No cultural remains
Layer VI - White (10YR 8/1) weathered limestone; No cultural remains

Figure 130. Site 7291 subsurface deposit in BT-D-13-3



Layer I - Brown (10YR 5/3) loose sandy clay loam with humus; No cultural remains
Layer II - Strong brown (7.5YR 4/6) compacted clay fill; Limestone aggregate
Layer III - Black (7.5YR 2.5/1)very fine friable clay loam; Site 7291 cultural deposit (Marine shells, fishbone and charcoal)
Layer IV - Light brown (7.5YR 6/3) and grayish brown (10YR 5/2) massive clay; No cultural remains
Layer V - White (10YR 8/1) weathered limestone; No cultural remains

Figure 131. Site 7291 subsurface deposit in BT-D-14-2

Layer II is significantly less compared to other intact WW II fill secondary deposits. Layer II overlies the limestone substrate at the south end of the trench and overlies Layer III across the rest of the trench. Layer III is an intact cultural deposit, possibly truncated at the interface with Layer II, characterized by 28-50 cm of black carbon-stained very fine friable clay loam containing 30% limestone gravel and pebble inclusions. Cultural materials recovered from Layer III consist of marine shells (*Conus pennaceus, Cypraea caputserpentis*, unidentified shell fragments), a fish cranial bone and fragments of charred wood (Acc. 23.001 -23.005; **Appendix D**). Layer III overlies the limestone substrate and Layer IV, a 60+ cm alluvial deposit of massive clay that fills a void in the limestone.

In BT-D-14-3 the subsurface cultural deposit associated with Site 7291 underlies 3.53 m of tsunami-deposited sediments (*Figure 132*). Layer I is a 1.14 m deposit of pale brown and dark grayish brown coarse, compacted loamy sand containing 50% limestone gravel, pebble and cobble inclusions; its lower boundary is indistinct due to stepping the trench to permit access for documentation, and it is uncertain whether this deposit represents redeposited fill, an intact storm surge deposit, or an intact tsunami draw back deposit. Layer II consists of 66 cm of banded pale brown and dark grayish brown coarse, compacted loamy sand containing 50% limestone gravel, pebble and cobble inclusions; it is essentially similar to the overlying Layer I deposit, excepted that it is banded, representing episodic deposition and is probably an intact storm surge or tsunami deposit. Layer III is characterized by 1.23 m of grayish brown and dark grayish brown very fine friable sandy clay loam with 50-60% limestone gravel, pebble, cobble and boulder inclusions; this is unmistakably an intact tsunami deposit and probably represents material deposited during the drain back phase of the event. Layer III overlies Layer IV, which consists of 50 cm of very pale brown unconsolidated beach sand with pockets of dark grayish brown massive clay containing 40% limestone gravel and pebble inclusions; this probably represents the intact tsunami inundation phase of the event. Layer IV overlies Layer V, which is the prehistoric cultural deposit and Layer IV probably truncates the upper surface of Layer V, which is exposed at 3.53 m bgs. Layer V is characterized by 13 cm of an intact deposit of black carbon-stained loam containing sparse limestone gravel. Cultural materials recovered from Layer V consist of marine shells (*Conus* sp., *Nerita picea*, Mytilidae, *Tellina palatam*), urchin spines, urchin and crustacean exoskeleton fragments, a waterworn coral pebble and a fragment of charred wood (Acc. 23.006- 23.015; **Appendix D**). Layer V overlies Layer VI, characterized by a 14 cm intact alluvial deposit of dark grayish brown very fine friable sandy clay loam that overlies the limestone substrate.

In BT-D-15-3 the subsurface cultural deposit associated with Site 7291 underlies 50-60 cm of upper layer deposits (*Figure 133*). Layer I is redeposited fill from golf course construction characterized by 10-12 cm of dark reddish brown compacted clay containing sparse limestone gravel. Layer II consists of an intact asphalt pavement preserved in the revetment area north of the Kahuku Army Airfield runway. Layer III is a secondary deposit of fill used as bedding material for the pavement and consists of 24-40 cm of 100% crushed limestone aggregate. Layer III overlies Layer IV at the south end of the trench and overlies Layer V at the north end of the trench. Layer IV is a 4-20 cm aeolian deposit of compacted brown silty sand containing 10% limestone gravel and pebble inclusions and charcoal flecks; the deposit represents the intact leading edge of the leeward side of the back beach dunal deposit. Layer IV overlies the cultural deposit Layer V across much of the trench. The upper surface of Layer V possibly was truncated by deposition of the Layer III pavement bedding, depending on whether the surface was graded prior to fill deposition. Layer V is an intact alluvial deposit characterized by 12-20 cm of compacted black carbon-stained sandy clay loam. Cultural remains recovered from Layer V consist of marine shells (*Conus* sp. and *Nerita picea*; Acc. 24.001- 24.002; **Appendix D**) and pencil urchin spine (not collected). Layer V overlies 54-92 cm of Layer VI residual decomposing limestone substrate.

Intact subsurface prehistoric cultural deposits associated with Site 7291 were identified in 5 trenches (BT-D-12-2, D-13-3, -D-14-2, -D-14-3, -D-15-3) and the areal extent of the subsurface is estimated to encompass c. 10,151 sq m. Intact subsurface cultural deposits also are potentially preserved on the seaward side of Test Area D where the poorly documented subsurface cultural deposits in Site 6411, Feature C were noted (Corbin 2003). A single cultural deposit was encountered in all five trenches, varying in depth generally from 50-75 cm bgs. The exception is the cultural deposit encountered in BT-D-14-3, where 3.53 m of tsunami deposited layers overlie the cultural deposit, and potentially indicate the former location of a pit or channel that was filled during the 1946 tsunami. Only one trench (BT-D-15-3) contained a shallow deposit of Jaucus Sand, which overlies the cultural deposit. All of the subsurface cultural deposits in Site 7291 are intact, but most show at least minor truncation of the upper

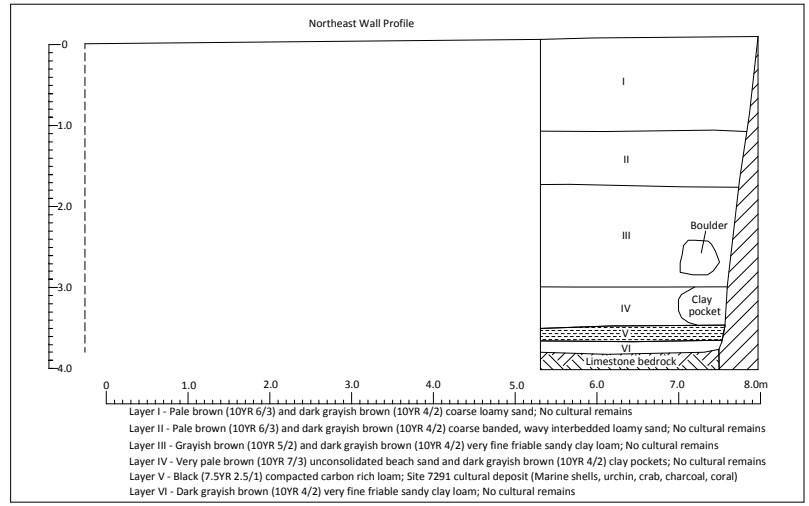


Figure 132. Site 7291 subsurface deposit in BT-D-14-3

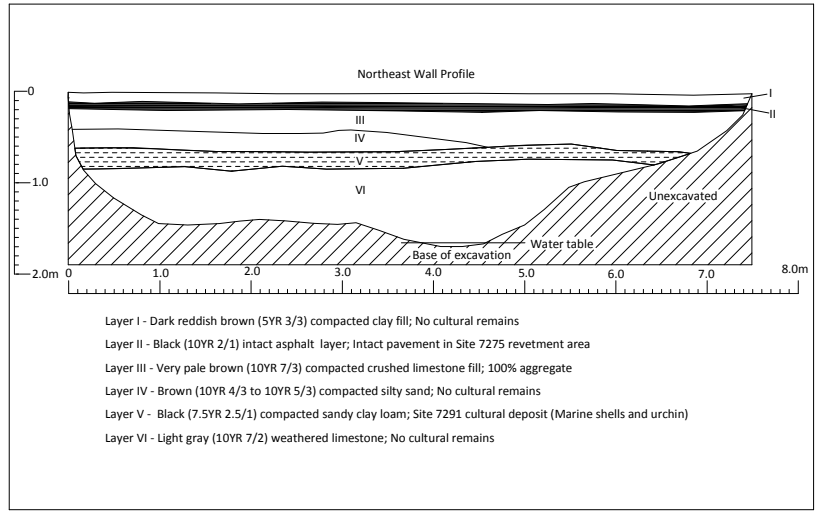


Figure 133. Site 7291 subsurface deposit in BT-D-15-3

boundary. Cultural material was recovered from the deposits during trench facing for documentation and no excavation was undertaken; other than coral manuports, cultural materials consist of subsistence debris. Site 7291 is interpreted as a prehistoric habitation site. The site is in good condition, with most cultural layers having been sealed by tsunami or Kahuku Army Airfield deposits, and retains substantial physical integrity.

Figure 134 shows the maximum excavated depths attained in the Test Area D trenches. Trenches located along the transects from D-0 through D-6 at the southwest end of Test Area D encountered the water table before exposing the underlying limestone substrate. North of transect D-6, the limestone substrate was encountered more consistently before encountering the water table. Sediment accumulation overlying the limestone substrate or water table is differentially deepest on the seaward side and differentially shallowest at the north end. The very deep deposits in BT-D-14-3, located at the north end of Test Area D, potentially result from a WW II-excavated channel or pit, inferred from the unusual depth of the deposits there, where 3.8 m of deposition, the majority of it tsunami-related, overlies the limestone substrate.

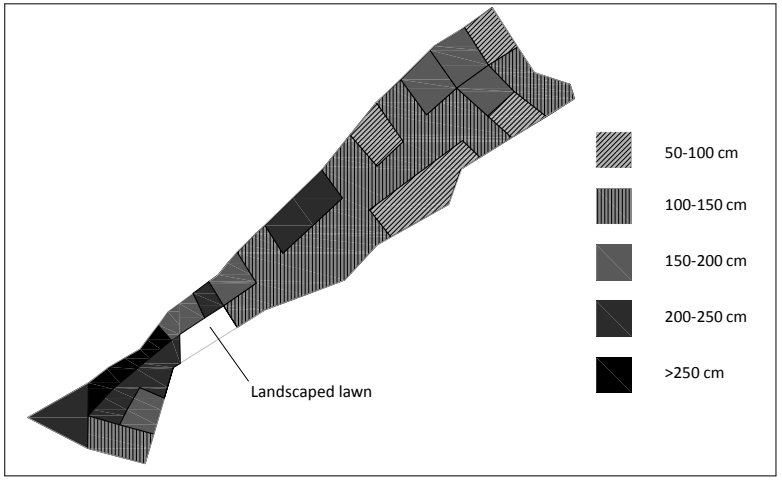


Figure 134. Test Area D trenches – maximum depths

Figure 135 illustrates deposit types by layer. The uplifted limestone reef substrate is bedrock throughout this area, but nearly half of the trenches encountered the water table before reaching the limestone substrate. Deep deposits of aeolian sand were encountered across the south end of Test Area D (BT-D-0-1 through D-4-1). Cultural deposits are associated with the aeolian sand deposits in the south half of Test Area D. Alluvium probably covered most of the limestone substrate in the central and northern sections of Test Area D; however, reconstructing the stratigraphic development of this area is complicated by extensive modification resulting from construction of the Kahuku Army Airfield facilities. Alluvium once formed a stable surface north of the dunal deposits, as indicated by buried A horizons and cultural alluvial deposits in the central and northernmost portions of the area. Marine-deposited sand from seasonal storms and tsunami deposits, are evident along seaward side of Test Area D, in some cases pre-dating, but in most cases postdating airfield fill and asphalt pavement deposits.

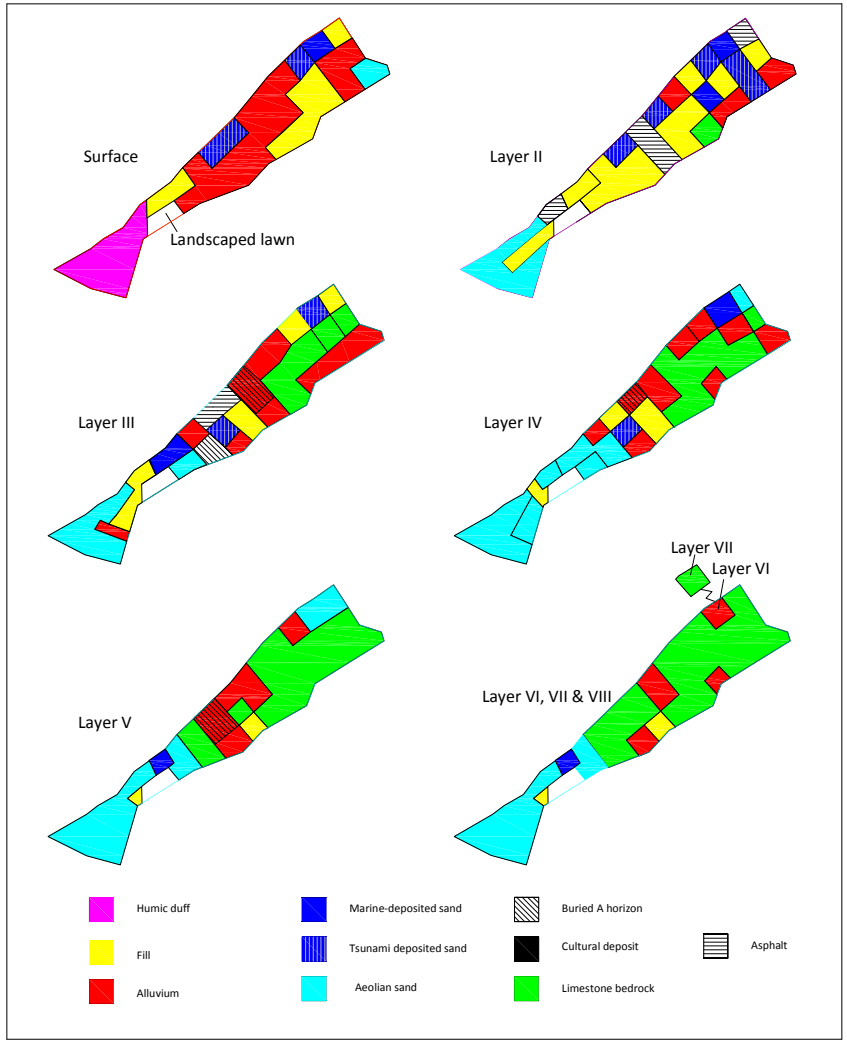


Figure 135. Test Area D deposit types by layer

Figure 136 is the first of three stratigraphic profiles (profile 1) and illustrates a composite *mauka-makai* transect through the south portion of Test Area D. The *mauka* end of Profile 1 shows a partially truncated portion of the Site 7289 cultural deposit at the interface of intact aeolian sand deposits; aeolian deposition continues to below the water table in BT-D-2-1. The *makai* profiles showing BT-D-2-1c and D-2-2 show the inland slope of the dunal ridge that parallels the shoreline. The profile also illustrates the distance between the Site 7289 subsurface cultural deposit and the back beach dune. Calcium carbonate precipitate layers in the dune crest deposit (BT-D-2-2) and the leeward dunal deposit (BT-D-2-1c) indicate episodic seawater inundation events, whether from seasonal storms or tsunami episodes. Corresponding calcium carbonate lenses were observed in Layer IV in BT-D-2-1.

Figure 137 is the second of three stratigraphic profiles (profile 2) and illustrates a composite *mauka-makai* transect across the central portion of Test Area D. Profile 2 shows the extensive, World War II-era asphalt pavement and fill deposits for pavement bedding associated with the Kahuku Army Airfield (Site 7275) runway and revetment area north of the runway. On the inland side of the composite transect, BT-D-9-1 is probably located on the runway; the asphalt runway pavement overlies three layers of fill that are increasingly coarse with depth and that extend below the water table; the basal course of fill in this profile is composed largely of limestone boulders. The central trench (BT-D-9-2) is located in the revetment area north of the runway and shows the asphalt pavement constructed over two layers of fill that are increasingly coarse with depth; these deposits overlie alluvial clay that extends below the water table. The seaward trench (BT-D-9-3) is also located in the revetment area north of the runway, but here a tsunami drain back deposit (Layer I) dumped its sediment load on top of the asphalt pavement, losing sediment at a significant rate with proximity to the sea. "Drain back" is the term Keating (2008:160) uses to describe the tsunami out flow(s) and which is the depositional mechanism in tsunami events; the inundation phase is a largely erosional mechanism. A single fill bedding deposit underlies the asphalt pavement depicted in the seaward trench, which overlies a buried alluvium A horizon (Layer IV) formed over alluvial clay (Layer V). The buried A horizon represents soil of the former ground surface that was covered by fill, in contrast to the alluvial clay deposit (Layer V) in BT-D-9-2 that probably was graded prior to filling as implied by the absence of an A horizon and the presence of additional fill.

Figure 138 is the third of three stratigraphic profiles (profile 3) and illustrates a composite *mauka-makai* transect across the north end of Test Area D, in the revetment area north of the Airfield runway. It includes BT-D-14-2 and D-14-3 where the Site 7291 subsurface cultural deposits were identified. The inland trench (BT-D-14-1) shows Layer II as a probable tsunami deposit (less possible as an Airfield fill deposit) overlying intact alluvium on the limestone substrate. BT-D-14-2 shows a probable tsunami deposit (less possible as an Airfield fill deposit) overlying an intact cultural deposit overlying alluvial clay formed on the limestone substrate. The seaward trench, BT-D-14-3, shows a 3.53 m deposit of episodic tsunami deposits in a channel, trench or pit, overlying an intact cultural deposit; the Layer V cultural deposit overlies 15 cm of alluvium formed on the limestone substrate.

Test Area D is located on the east side of Kaihalulu Bay inland of the shoreline sand dunes. The terrain varies in elevation from c. 4 ft to 16 ft. The southwest end of Test Area D contains aeolian sand deposits to depths exceeding 2.8 m above the water table. The northeastern two-thirds of Test Area D contain c. 0.1 to 3.8 m of tsunami deposits overlying alluvial deposition, formed on tropical peat or the limestone substrate. The absence of surface sites in Test Area D can be attributed to widespread land modification associated with the Kahuku Army Airfield and the destructive effects of the 1946 and 1957 tsunami. Subsurface cultural deposits were identified between 1988-1992 on the north side of Area D at Site 6411-Feature C and Site 6419. SAIS fieldwork identified stratified subsurface prehistoric habitation deposits, including an adult burial, in association with the aeolian deposition at the south end of Test Area D. These deposits are exposed from 0.30 to 0.80 m bgs at Site 7289. Intact stratified subsurface prehistoric habitation deposits were also documented in alluvial deposits in the center of Test Area D at Site 7290 from 0.17 to 0.85 m bgs; Kahuku Army Airfield deposits (Site 7275) seal the underlying prehistoric deposits. Similarly, widespread subsurface prehistoric habitation deposits were documented at the north end of Test Area D, where Site 7291 is preserved from 0.38 to 3.53 m bgs in association with alluvial deposition and sealed by Airfield deposits or tsunami deposits. Buried alluvial A horizons that could contain subsurface cultural deposits were identified between Sites 7290 and 7291. The intact cultural deposits and buried A horizons indicate that significant subsurface cultural deposits can be anticipated across much of Test Area D.

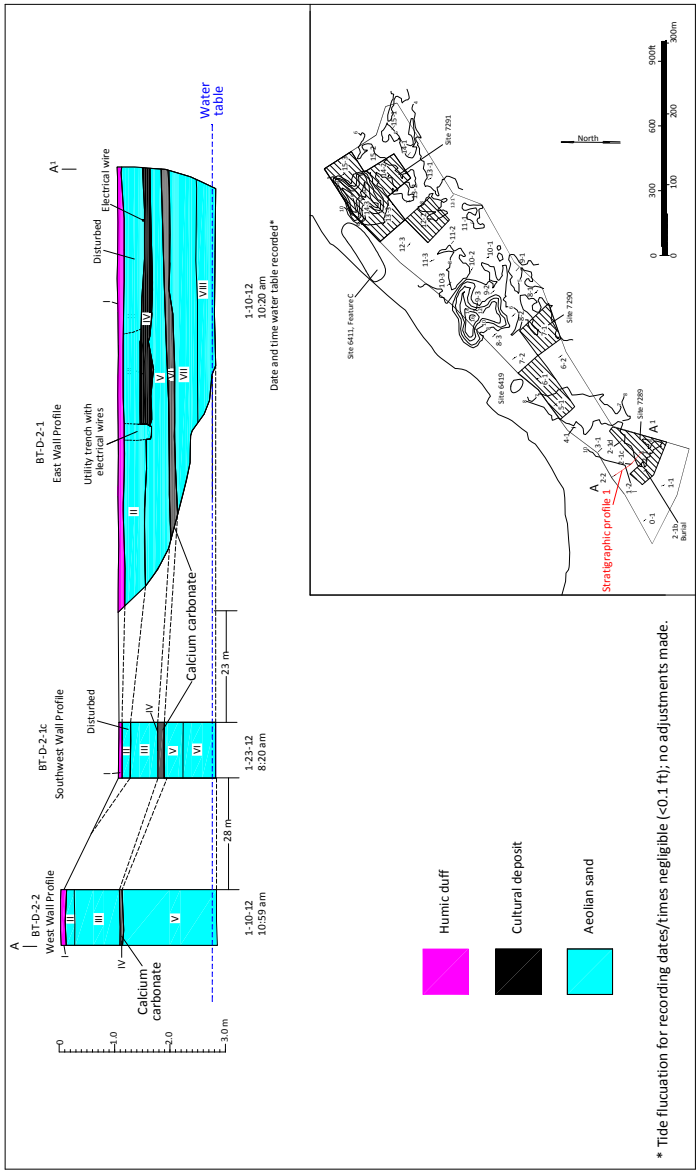


Figure 136. Test Area D stratigraphic profile 1

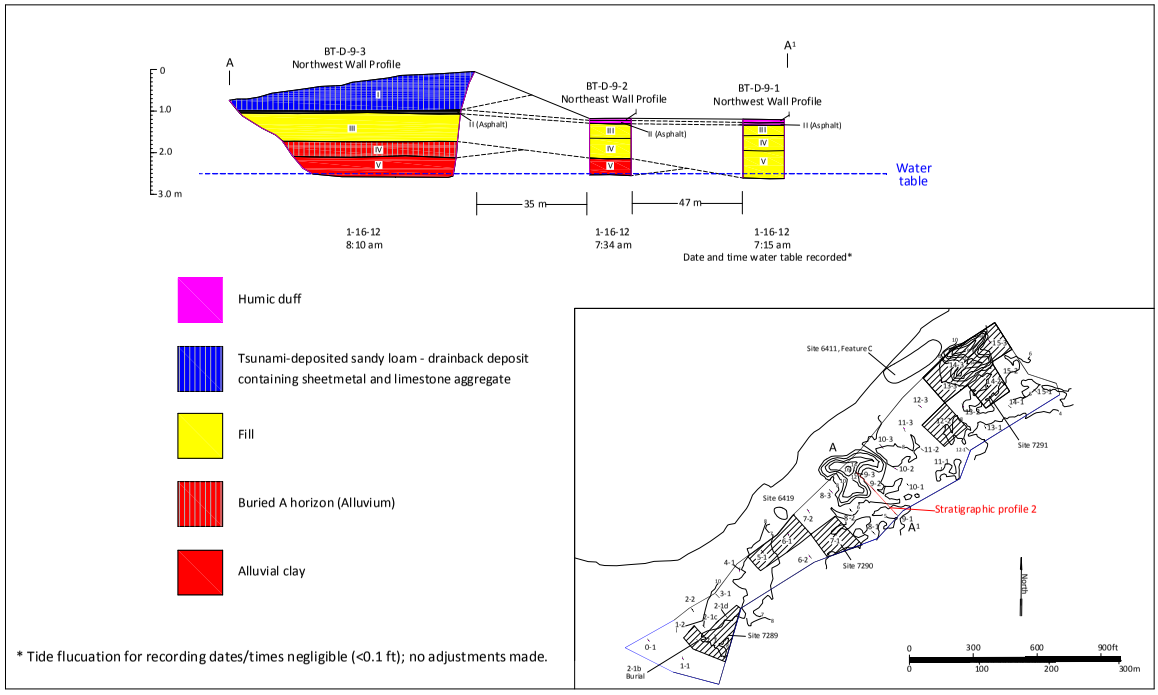


Figure 137. Test Area D stratigraphic profile 2

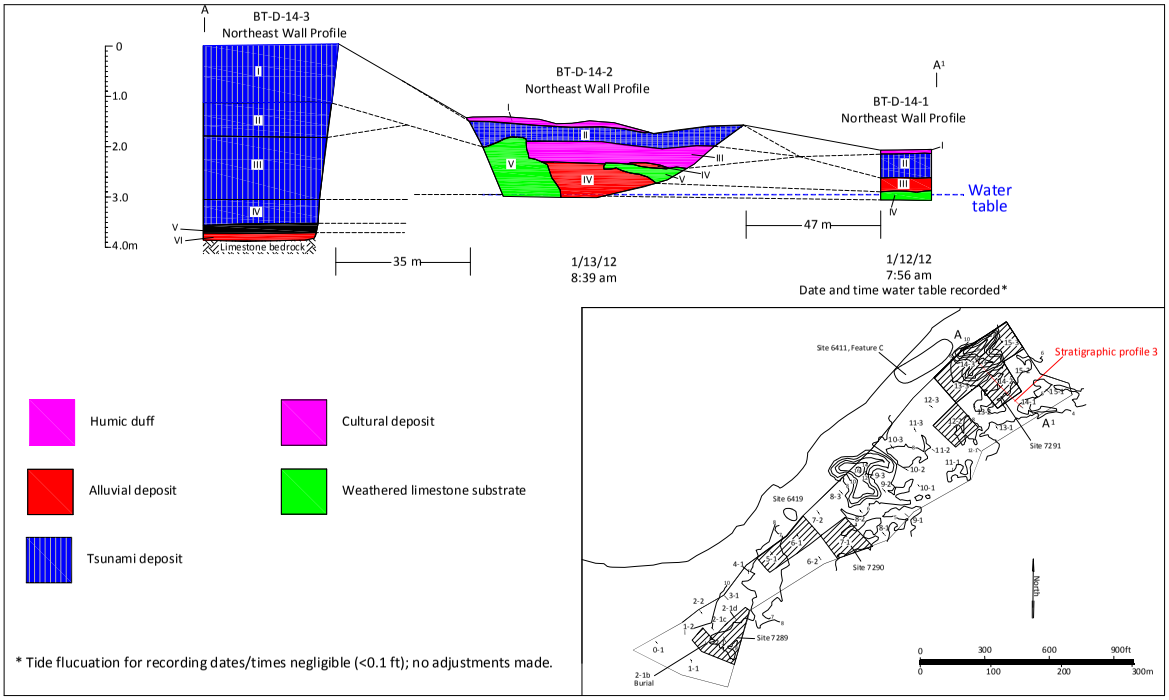


Figure 138. Test Area D stratigraphic profile 3

Test Area E

Test Area E is a relatively level, low lying ironwood and *haole koa* forest surrounded on all sides by fairways of the back nine holes of the Palmer Golf course (see *Figures 43-44*). The tree cover consists of invasive and intentionally planted species that are less than 50 years old. Punaho'olapa Marsh is located on the west of Test Area E, on the west side of the 11th and 12th Fairways. The northwest end of Test Area E is contiguous with the southeast corner of Test Area D, which was mapped as Jaucus Sand, and the spatial distribution of soils described for Test Area E consists of Jaucus Sand covering the northwest half of the area and Pearl Harbor Clay in the southeast half (see Figure 7; Foote *et al.* 1972). The terrain is now level, having undergone extensive modification in the past when the north half was occupied by the main NW-SE runway of the Kahuku Army Airfield (Site 7275) and peripheral revetments on the south side of the runway. Barracks were formerly located at the south end and east side of Test Area E. In addition, a sod farm occupied the south end of Test Area E in the recent past. Test Area E encompasses 68.9 acres and was sampled with two trenches per acre, based on the soil map.

Testing in Area E consisted of excavating 157 trenches, of which 137 were systematically placed and 20 of which were discretionary trenches (*Figure 139*). Trenches varied in length from 3.0 to 23.0 m (average 5.8 m) and averaged 0.8 m wide. A total of 917 linear meters of trench were excavated. These excavations revealed from two to eight layers. Of the 157 trenches, 134 were excavated to a basal weathered limestone deposit, 22 were terminated at the water table, and one was terminated in an unstable layer of boulder fill. The trench profiles are illustrated in **Appendix B** (*Figures B-119* through *B-275*). The trench dimensions and detailed stratigraphic data are presented in **Appendix C**. Testing in Area E identified six subsurface prehistoric cultural deposits (Sites 7275 and 7292-7296). These sites are described below.

Site 7275 is the Kahuku Army Airfield, a large WW II-era military complex, components of which include surface features and subsurface deposits dating to 1942-1946 (see *Figure 43*). The northwest half of Test Area E was extensively modified for construction of the main NE-SW runway, which evolved over its four-year life span to include a number of poorly documented building phases. Revetments were located on the north and south sides of the runway, at the northwest end and central section of Test Area E. Barracks were formerly located at the south end of Test Area E. Widespread evidence of mass grading, followed by deposition of fill characterized by limestone aggregate, often laid down in two courses, was documented in numerous trenches across Test Area E. The WW II-era fill deposits are identified in the stratigraphic descriptions for Test Area E trenches in **Appendix C**.

Fifty-five trenches were excavated within the area encompassed by the main NE-SW runway. Intact asphalt pavement for the main NE-SW runway was located in only 18 trenches (33%), from Transect 2 through Transect 12. Runway pavement was underlain by two fill deposits composed predominantly of limestone aggregate in half of the trenches, while 8 pavement deposits were underlain by a single course of fill. In BT-E-9-4 the paved runway was constructed directly on the underlying limestone substrate. Evidence for multiple runway construction phases was encountered in BT-E-4-2b, where the surface pavement overlies a single base course of limestone aggregate fill, which overlies a truncated section of intact pavement also constructed on a single course of limestone aggregate fill.

In addition, 25 trenches from Transect 4 through Transect 13 contained runway base course fill deposits, but lacked the capping pavement. Twelve trenches documented two runway fill deposits with no overlying pavement, while 13 contained a single runway fill deposit with no associated pavement. Limestone aggregate fill deposits associated with the runway shoulders and in the areas of revetments north and south of the runway were encountered in 17 trenches along Transects 2-3 and 13-16; these generally consist of a single course of fill where the limestone aggregate component is a large part but not always the dominant constituent of the matrix. In three trenches two courses of fill were documented. In BT-E-13-8 asphalt pavement overlies the pulverized limestone substrate in the revetment area south of the runway, and might represent a section of paved road. Along Transects 16-17 in the area between the revetments and the barracks, 5 trenches documented single fill deposits associated with airfield infrastructure. At the very south end of Test Area E two trenches in Transect 21 encountered fill deposits in the barracks area both consisting of two courses of limestone aggregate fill.

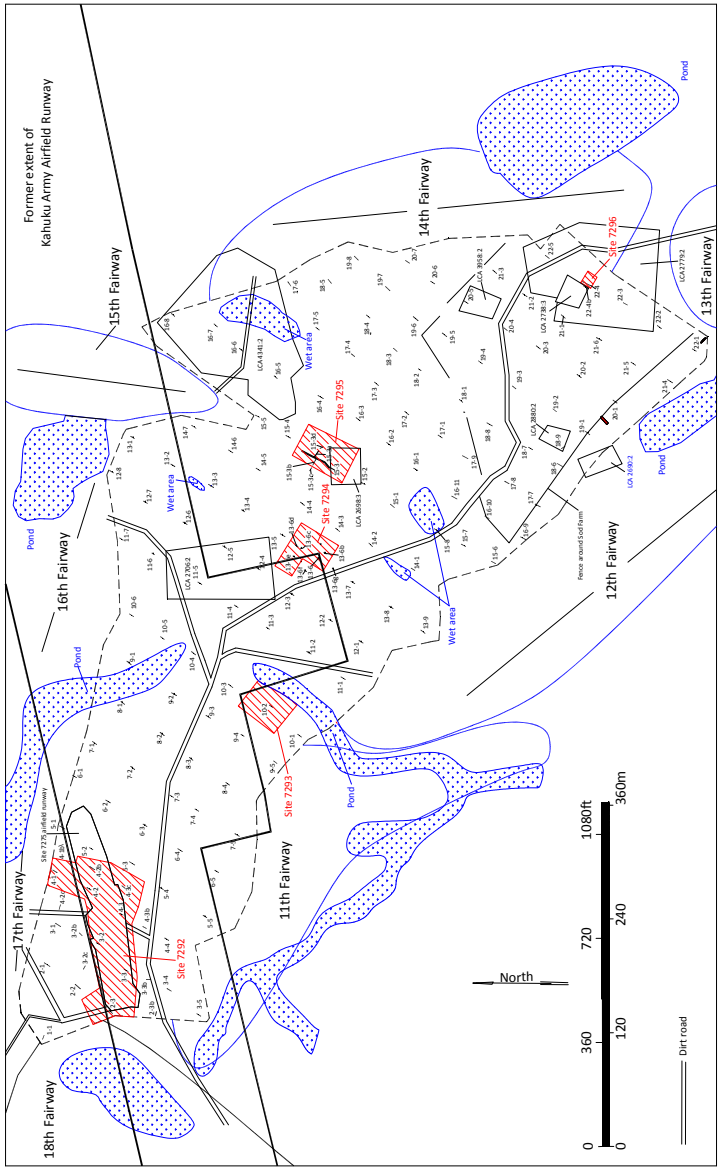


Figure 139. Location of sites and trenches in Test Area E

It is unknown whether the 1946 tsunami stripped the pavement surface from the runway or whether it was removed in the course of periodic vegetation clearing associated with post-military use. A portion of the north side of the runway was used for civilian aviation after the war and the runway was also used for automobile racing. Push piles of debris were noted on and peripheral to the runway and along roads, indicating use of heavy earth-moving equipment. Mass grading associated with subsequent golf course development occurred along the edges of Test Area E and in the area encompassed by the sod farm. There is extensive evidence of fill deposits associated with golf course, road and sod farm construction but little to no evidence of intact tsunami deposits in Test Area E. Concrete blocks dated 1933 and associated with the Marconi Station are preserved in place at Site 7282 and 7279 on the east side of Area E, between the revetments and the barracks. Likewise, the concrete structure at Site 7278 is intact at the entrance to the sod farm, and the concrete slab at Site 7277 is also intact and flush with the ground surface between the 14th and 15th Fairways, indicating that at least some portions of Test Area E are relatively undisturbed and not covered by tsunami debris.

A large historic trash pit was encountered in BT-E-18-1 at the entrance to the former sod farm in the area between the revetments on the south side of the runway and the barracks at the south end of Test Area E. The trash pit underlies two surface deposits of fill (Layers I and II) and is 3.4 m wide and 1.0 m deep, composed of three layers of historic debris (see *Figure B-240* in **Appendix B**). WW II-era debris in the upper layer consists of beverage bottle glass and charred wood. The basal deposit contains porcelain, nails, and burned milled lumber that potentially represent Plantation-era debris. The trash pit containing WW II-era debris could be evidence of post-1946 clean up of this area.

A large section of the former location of the Airfield runway coincides with the northwest half of Test Area E. Specific identification of Airfield features, such as the runway, were made whenever possible, but none of the Airfield modifications documented in Test Area E were assigned specific feature numbers or separate site numbers, and all were treated as elements of Site 7275. Pavements even in the area formerly occupied by the runway could represent taxiways or other specific subfeatures of the runway. Limestone fill deposits were identified as runway base courses when located within the area encompassed by the runway, but other aggregate deposits could represent runway shoulders, gravel roads, revetment construction material, or locations where the overlying asphalt was stripped away by the 1946 tsunami. Aerial photos of the 1946 tsunami aftermath clearly show the effects to the Airfield would have included Test Area E, but little evidence of identifiable intact tsunami deposits were encountered.

Land Commission Awards in Test Area E, previously discussed under the Surface Survey section of this report identified eight historic period parcels. Trenches were excavated in seven of the eight LCAs during subsurface testing of Area E. LCA 2690:2, awarded to Luiki (Luihi), is located on the west periphery of Area E and was not tested. The locations of three LCAs coincide with subsurface prehistoric cultural deposits identified during trenching. LCA 2698:3, awarded to Waanui and listed in the Waihona ʻAina database (2000) as "open flat lands", partially overlies Site 7295, documented in four trenches. No subsurface cultural deposits were encountered in the vicinity of LCA 2706:2, a 0.25-acre parcel awarded to Holoaia for a house lot, but the Site 7294 subsurface prehistoric cultural deposits located 15 m to the south, could indicate the actual former location of LCA 2706:2. LCA 2738:3 is a house lot of 0.25-acres awarded to Paiu; the Site 7296 subsurface prehistoric cultural deposit was documented near the southeast corner of this LCA.

Site 7292 is a subsurface prehistoric cultural deposit identified in the northwest corner of Test Area E. The cultural deposit is located primarily beneath an extant surface portion of the Kahuku Army Airfield (Site 7275) main runway, documented during the pedestrian surface survey of Test Area E. The prehistoric subsurface cultural deposit was identified in six systematically placed trenches (BT-E-2-3, E-3-2, E-3-3, E-4-1, E-4-2 and E-4-3) and in two (BT-E-4-2b, E-4-3c) discretionary trenches. Nine discretionary trenches (BT-E-2-3b, E-3-2b, E-3-2c, E-3-3b, E-4-1b, E-4-2b, E-4-2c, E-4-3, E-4-3c) were excavated adjacent to the systematically placed trenches to determine the horizontal extent of the subsurface deposit.

In BT-E-2-3 (see *Figure B-122*) the prehistoric cultural deposit underlies 86 cm of pavement and fill for the Kahuku Army Airfield runway (Layers I-III, Site 7275). Layer IV is a 5 cm cultural deposit of very dark gray and black massive

alluvial clay containing sparse limestone gravel and pebble inclusions that overlies 27 cm of Layers V and VI alluvial clays formed on the limestone substrate.

In BT-E-3-2 (see *Figure B-125*) the prehistoric cultural deposit underlies 56 cm of pavement and fill for the Kahuku Army Airfield runway (Layers I-III, Site 7275). Layer IV is a 8 cm cultural deposit of black very fine friable alluvial sandy clay loam containing 30% limestone gravel and pebble inclusions that overlies 28 cm of Layer V aeolian silty sand formed on the limestone substrate. Cultural materials recovered from Layer IV consist of a *Cypraea* shell (Acc. 25.001; **Appendix D**); basalt debitage was noted in the deposit but not collected.

In BT-E-3-3 (see *Figure B-128*) the prehistoric cultural deposit underlies 43 cm of pavement and fill for the Kahuku Army Airfield runway (Layers I-III, Site 7275). Layer IVa is a 16 cm cultural deposit of very dark gray and dark gray moderately compacted alluvial clay loam containing 20% limestone gravel and pebble inclusions that overlies 8 cm of Layer IVb, which is differentiated from Layer IVa by color, texture and inclusion content. Layer IVb is a cultural deposit of black very compacted carbon-stained alluvial clay containing sparse limestone gravel and pebble inclusions. The Layer IV cultural deposits overlie 18 cm of alluvial clay formed on the limestone substrate.

In BT-E-4-1 the prehistoric cultural deposit underlies 29 cm of Layer I humic duff and Layer II intact alluvial sandy clay loam (*Figure 140*). Layer III is a 10 cm cultural deposit of mottled very dark grayish brown and dark brown compacted alluvial charcoal-flecked clay loam containing 10% limestone gravel and pebble inclusions that overlies the limestone substrate.

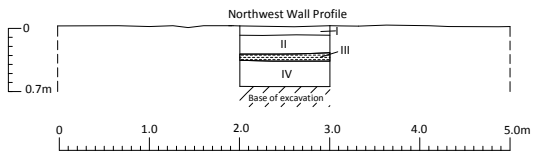
In BT-E-4-2 (see *Figure B-134*) the prehistoric cultural deposit underlies 49 cm of pavement and fill for the Kahuku Army Airfield runway (Layers I-III, Site 7275). Layer IV is a 14 cm cultural deposit of very dark gray very fine friable alluvial sandy clay loam containing 10% limestone gravel inclusions and waterworn marine shells that overlies 8 cm of Layer V alluvial sandy clay loam formed on the limestone substrate and terrigenous clay that fills a void in the substrate. Cultural materials recovered from Layer IV consist of marine shell (*Nerita picea*) and fragments of charred wood (Acc. 26.001- 26.003; **Appendix D**).

In BT-E-4-2b the prehistoric cultural deposit underlies 50 cm of pavement and fill for two construction phases of the Kahuku Army Airfield runway (Layers I-IV, Site 7275; *Figure 141*). Layer V is a 15 cm cultural deposit of very dark gray and black fine friable alluvial clay loam containing 20% limestone gravel and pebble inclusions that overlies the limestone substrate and the underlying terrigenous clay that fills a void in the substrate. Cultural material associated with Layer V consists of fragments of charred wood, which were not collected.

In BT-E-4-3 (see *Figure B-138*) the prehistoric cultural deposit underlies 29 cm of pavement and fill for the Kahuku Army Airfield runway (Layers I-III, Site 7275). Layer IV is a 5 cm cultural deposit of dark grayish brown very fine friable alluvial sandy clay loam containing 10% limestone gravel and pebble inclusions that overlies the fissured and weathered limestone substrate. Charred wood fragments noted in Layer IV but were not collected. Cultural material recovered from Layer IV consists of a *Cypraea caputserpentis* shell (Acc. 27.001; **Appendix D**).

In BT-E-4-3c (see *Figure B-139*) the prehistoric cultural deposit underlies 50 cm of recent duff and 100% limestone fill for the Kahuku Army Airfield runway (Layers I-II; Layer II is Site 7275). Layer III is a 44 cm cultural deposit of very dark gray and dark gray fine friable crumb alluvial clay loam containing 20% limestone gravel and pebble inclusions that overlies 35+ cm of Layer IV massive alluvial clay. Charred wood fragments were noted in association with Layer III, but were not collected.

The subsurface prehistoric cultural deposits associated with Site 7292 cover an estimated area of approximately 8,193 sq m. Only BT-E-4-1 encountered intact alluvial deposits not sealed or truncated by overlying WW II runway deposits. The deposits are preserved beneath 29-86 cm of overlying deposition, indicating a much more varied topography than is characteristic of the extensively modified surface of today. Most of the prehistoric cultural deposits vary in thickness from 5 to 20 cm. One trench (BT-E-3-3) encountered a 24 cm thick cultural deposit, the



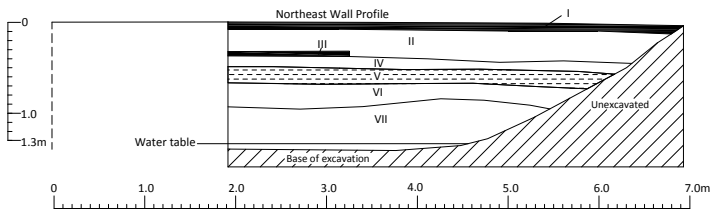
Layer I - Black (10YR 2/1) structureless humus; No cultural remains

Layer II - Very dark grayish brown (10YR 3/2) loose sandy clay loam; No cultural remains

Layer III - Very dark grayish brown (10YR 3/2) and dark brown (7.5YR 3/4) compacted clay loam; Site 7292 cultural layer (charcoal flecks)

Layer IV - Very pale brown (10YR 8/2) weathered limestone; No cultural remains

Figure 140. Site 7292 subsurface deposit in BT-E-4-1



Layer I - Black (10YR 2/1) intact asphalt layer (Site 7275 runway pavement)

Layer II - Dark yellowish brown (10YR 4/4) fine friable clay; 90% limestone aggregate

Layer III - Black (10YR 2/1) intact asphalt layer (Site 7275 runway)

Layer IV - White (10YR 8/1) compacted limestone fill; 100% limestone aggregate

Layer V - Very dark gray (10YR 3/1) and black (10YR 2/1) fine friable clay loam; Site 7292 cultural deposit (charcoal)

Layer VI - White (10YR 8/1) weathered limestone; No cultural remains

Layer VII - Brown (10YR 4/3) massive clay; No cultural remains

Figure 141. Site 7292 subsurface deposit in BT-E-4-2b

upper and lower portions (Layer IVa and IVb) of which are different enough to suggest that two different episodes could be preserved. Site 7292 is interpreted as a prehistoric habitation site based on the cultural assemblage, which consists of artifacts and subsistence debris. The site is in fair to good condition, with minor truncation of the upper surface of some deposits noted. Site 7292 retains substantial physical integrity.

Site 7293 is a subsurface prehistoric cultural deposit identified in BT-E-10-2 situated in the northwestern portion of Area E, 225 m southeast of Site 7292 (*Figure 142* and *Figure B-166*). No discretionary trenching was conducted because the deposit was not encountered in other systematically placed trenches, and appears to be restricted in areal extent. A large artificial pond borders BT-E-10-2 on the southeast and it is located on the southwest edge of former location of the Kahuku Army Airfield runway (Site 7275). The subsurface cultural deposit (Layer II) underlies 40-45 cm of redeposited fill (Layer I) associated with construction of the east extension of the pond in Fairway 11. During pond construction the overlying Kahuku Army Airfield deposits associated with Site 7275 and the upper surface of the prehistoric deposit were removed during mass grading to recontour the ground surface around the pond. In BT-E-10-2 only a remnant of the prehistoric cultural deposit remains, where it overlies a depression in the limestone substrate. The basin-shaped deposit is 1.50 m long and a maximum of 14 cm thick, and consists of black to brown very fine friable clay loam and clayey sand, containing urchin, charcoal and heat-altered rock, none of which was collected. The limited horizontal extent of the deposit suggests that the associated site has largely been obliterated during construction of the golf course. Subsurface evidence of Site 7293 was encountered in only one trench. The site is estimated to encompass a maximum area of approximately 1,768 sq m; however, it is likely that its actual extent is much smaller. Site 7293 is interpreted as a prehistoric habitation site, based on the associated subsistence debris. The subsurface deposit has been truncated during late 20th Century development activities and retains limited physical integrity.

Site 7294 is a subsurface prehistoric cultural deposit located in the central portion of Area E, 115 m southeast of Site 7293, and overlaps a southern extension of the Kahuku Army Airfield runway and the revetment area south of the runway. The deposit was first identified during excavation of BT-E-13-6. Six discretionary trenches were excavated around BT-E-13-6 to determine the horizontal extent of the cultural deposit, which was encountered in four of the six trenches (BT-E-13-6b, E-13-6c, E-13-6d, E-13-6e).

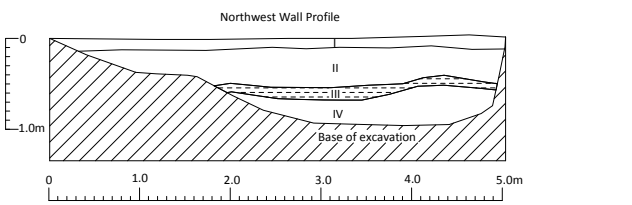
In BT-E-13-6 (*Figure 143*) the prehistoric cultural deposit underlies 50-70 cm of recent duff (Layers I) and redeposited fill associated with road construction (Layer II). Layer III is an 8-15 cm cultural deposit of black fine friable crumb alluvial loam containing 10% limestone gravel inclusions that overlies the decomposing limestone substrate and terrigenous clay that fills pockets in the substrate. Cultural materials associated with Layer III consist of fire-altered rock and flecks of charcoal that were not collected; a basalt flake, crustacean exoskeleton, and fragment of charred wood were recovered for analysis (Acc. 29.001- 29.003; **Appendix D**). The upper surface of the cultural deposit is likely to be truncated as a result of surface grading associated with road construction because the WW II-era deposits that should overlie the prehistoric cultural deposit have been completely destroyed and displaced.

In BT-E-13-6b (*Figure 144*) the prehistoric cultural deposit underlies 30-52 cm of recent duff (Layer I) and two deposits of fill for the Kahuku Army Airfield revetment area south of the main runway (Layers II-III; Site 7275). Layer IV is a 40-60 cm cultural deposit of brown very fine friable crumb alluvial clay loam containing 50% limestone gravel, pebble and cobble inclusions that overlies 17+ cm of Layer V alluvial clay and the decomposing limestone substrate. A *Theodoxus neglectus* shell was recovered from Layer IV (Acc. 30.001; **Appendix D**); charred wood fragments were noted in association with Layer IV, but were not collected.

In BT-E-13-6c (see *Figure B-193*) the prehistoric cultural deposit underlies 40 cm of Layer I humic duff and Layer II intact alluvial clay loam. Layer III is a 45 cm cultural deposit of dark grayish brown very fine friable crumb alluvial clay loam containing 20% limestone gravel, pebble and cobble inclusions that overlies the limestone substrate. Charcoal fragments were noted in Layer III but were not collected.

In BT-E-13-6d (see *Figure B-194*) the prehistoric cultural deposit underlies 40-50 cm of Layer I humic duff and Layer II intact alluvial clay loam. Layer III is an 18-20 cm cultural deposit of dark grayish brown very fine friable crumb

Figure 142. Site 7293 subsurface deposit in BT-E-10-2



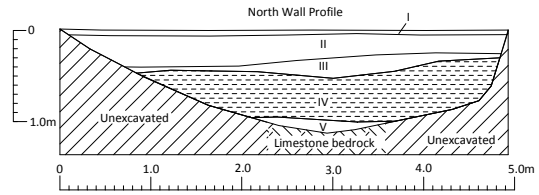
Layer I - Very dark brown (7.5YR 2.5/2) structureless clay loam with humic duff; No cultural remains

Layer II - Brown (10YR 4/3) fine friable sandy clay loam; No cultural remains

Layer III - Black (10YR 2/1) fine friable loam; 7294 cultural deposit (Basalt flake, crustacean, charcoal, fire-altered rock)

Layer IV - Dark gray (10YR 4/1) to light gray (10YR 7/2) weathered limestone with clay pockets; No cultural remains

Figure 143. Site 7294 subsurface deposit in BT-E-13-6



Layer I - Very dark brown (7.5YR 2.5/2) structureless humic duff; No cultural remains

Layer II - Brown (10YR 4/3) very fine friable clay loam; 50% limestone aggregate fill for Site 7275

Layer III - Yellowish brown (10YR 5/4) very fine friable clay loam; 60% limestone aggregate fill for Site 7275

Layer IV - Brown (10YR 4/3)very fine friable clay loam; Site 7294 cultural deposit (Marine shell and charcoal)

Layer V - Dark gray (10YR 4/1) to dark grayish brown (10YR 4/2) very fine friable clay; No cultural remains

Figure 144. Site 7294 subsurface deposit in BT-E-13-6b

alluvial clay loam containing 40% weathered limestone gravel, pebble and cobble inclusions that overlies the limestone substrate. A *Cypraea caputserpentis* shell was recovered from Layer III (Acc. 31.001; **Appendix D**); charred wood fragments were noted in association with Layer III, but were not collected.

In BT-E-13-6e (see *Figure B-195*) the prehistoric cultural deposit underlies 36-44 cm of Layer I humic duff and Layer II intact alluvial clay loam. Layer III is a 10 cm cultural deposit of very dark grayish brown and dark grayish brown very fine friable crumb alluvial clay loam containing 10% limestone gravel and pebble inclusions that overlies 15-25 cm of alluvial clay formed on the limestone substrate. Very sparse charcoal flecking was noted in Layer III.

Site 7294 is estimated to encompass a subsurface areal extent of c. 1,903 sq m. The site is interpreted as a prehistoric habitation deposit, based on the limited artifact and subsistence assemblage recovered during testing. Intact deposits were identified in 5 trenches. Even though the site underlies the south edge of the Kahuku Army Airfield runway and revetment area, WW II-era fill deposits associated with Site 7275 were only encountered in BT-E-6b. The prehistoric subsurface deposits associated with Site 7294 are preserved 30-70 cm bgs and all but two deposits directly overlie the limestone substrate; two overlie alluvial clay deposits formed on the limestone substrate. The subsurface deposits are in excellent condition, with the possible exception of the deposit exposed in BT-E-13-6, the upper surface of which is probably truncated as a result of grading associated with construction of the Fairway 11 pond. The site retains substantial physical integrity.

Site 7295 is a subsurface prehistoric cultural deposit located in the central portion of Area E, 60 m southeast of Site 7294, on the northeast side of LCA 2698:3 and in the southeast quadrant of the Kahuku Army Airfield (Site 7275) area of revetments on the south side of the main runway. The subsurface cultural deposit was initially identified during excavation of BT-E-15-3, which was expanded from 5.3 m to 23 m in length to more fully expose the deposit in an east-west direction. Four discretionary trenches were excavated to determine the north-south extent of the deposit. Additional cultural deposits were encountered in three of the four trenches (BT-E-15-3a, E-5-3b, E-15-3d).

In BT-E-15-3c fill for the Kahuku Army Airfield revetment area (Layer III) overlies the limestone substrate and destroyed any prehistoric cultural deposit that might have extended northwest of the other trenches.

In BT-E-15-3 (*Figure 145*) the prehistoric cultural deposit underlies 48-84 cm of recent duff (Layer I) and two deposits of fill for the Kahuku Army Airfield revetment area south of the main runway (Layers II-III; Site 7275). Layer IV is an 8-28 cm cultural deposit of very dark grayish brown fine friable crumb alluvial slightly sandy clay loam containing 10% limestone gravel and pebble inclusions and waterworn marine shells that overlies 10-45 cm of Layer V alluvial clay and Layer VI gley at the north end of the trench and overlies the decomposing limestone substrate at the south end of the trench. A volcanic glass core, *Nerita picea* shell and fragments of charred wood were recovered from Layer IV (Acc. 32.001- 32.003; **Appendix D**).

In BT-E-15-3a (see *Figure B-211*) the prehistoric cultural deposit underlies 44-52 cm of recent duff (Layer I) and two deposits of fill for the Kahuku Army Airfield revetment area south of the main runway (Layers II-III; Site 7275). Layer IV is an 8-25 cm cultural deposit of dark gray and very dark gray very fine friable alluvial clay loam containing 40% weathered limestone gravel and pebble inclusions overlying 68+ cm of Layer V alluvial clay. The water table was encountered in this trench before the limestone substrate was exposed.

In BT-E-15-3b (see *Figure B-212*) the prehistoric cultural deposit underlies 44-60 cm of recent duff (Layer I) and two deposits of fill for the Kahuku Army Airfield revetment area south of the main runway (Layers II-III; Site 7275). Layer IV is an 8-28 cm cultural deposit of dark gray and very dark gray fine friable alluvial clay loam containing very sparse charcoal flecks and 40% weathered limestone gravel and pebble inclusions overlying 60+ cm of Layer V alluvial clay on the limestone substrate.

In BT-E-15-3d (see *Figure B-214*) the prehistoric cultural deposit underlies 44-52 cm of recent duff (Layer I) and two deposits of fill for the Kahuku Army Airfield revetment area south of the main runway (Layers II-III; Site 7275). Layer IV is an 8-12 cm cultural deposit of dark gray and very dark gray very fine friable alluvial clay loam containing 40% weathered limestone gravel and pebble inclusions overlying alluvial clay at the extreme north end of the trench and the limestone substrate across most of the exposure. The upper surface and south end of the deposit was truncated by the Layer III WW II fill deposit.

Site 7295 is estimated to encompass a subsurface areal extent of c. 2,296 sq m. Site 7295 is interpreted as a prehistoric habitation deposit, based on the limited artifact and subsistence assemblage recovered during testing. Intact deposits were identified in 4 trenches. The site underlies the revetment area south of the Kahuku Army Airfield runway and WW II-era fill deposits associated with Site 7275 were encountered beneath the duff in every trench. The prehistoric subsurface deposits associated with Site 7295 are preserved 44-48 cm bgs and the deposits overlie alluvial clay or the limestone substrate. The subsurface deposits are generally in good condition, having been sealed by the overlying WW II deposits. The exception is the deposit exposed in BT-E-15-3d, where the deposit is truncated as a result of grading associated with filling the WW II revetment area. The site retains substantial physical integrity.

Site 7296 is a subsurface prehistoric cultural deposit identified in BT-E-22-4, located at the southeast end of Area E within a former sod farm (*Figures 146* and *147*). The prehistoric cultural deposit underlies 104-130 cm of recent duff (Layer I), redeposited fill associated with the sod farm (Layer II) and two deposits of fill for the Kahuku Army Airfield barracks area south of the main runway (Layers IIIa and IIIb; Site 7275). Layer IV is a 28-44 cm cultural deposit of black fine friable crumb alluvial clay loam containing 15% weathered limestone gravel and pebble inclusions and waterworn marine shells, overlying a burned and oxidized alluvial clay loam deposit formed on fissured limestone containing voids filled with terrigenous clay. A shallow basin-shaped hearth originates at the upper surface of the Layer IV cultural deposit and slightly intrudes into the upper surface of the underlying Layer V deposit. The hearth is 60 cm long and 16 cm deep. Disturbance within the overlying Layer IIIa deposit, consisting of redeposited asphalt within the matrix and concrete intruding into the upper surface of Layer IV, could be responsible for truncation of the south end of the Layer IV deposit. Cultural materials recovered from Layer IV consist of 2 basalt flakes, marine shells (*Nerita picea*, *Trochus intextus*, Mytilidae, indeterminate bivalve), urchin

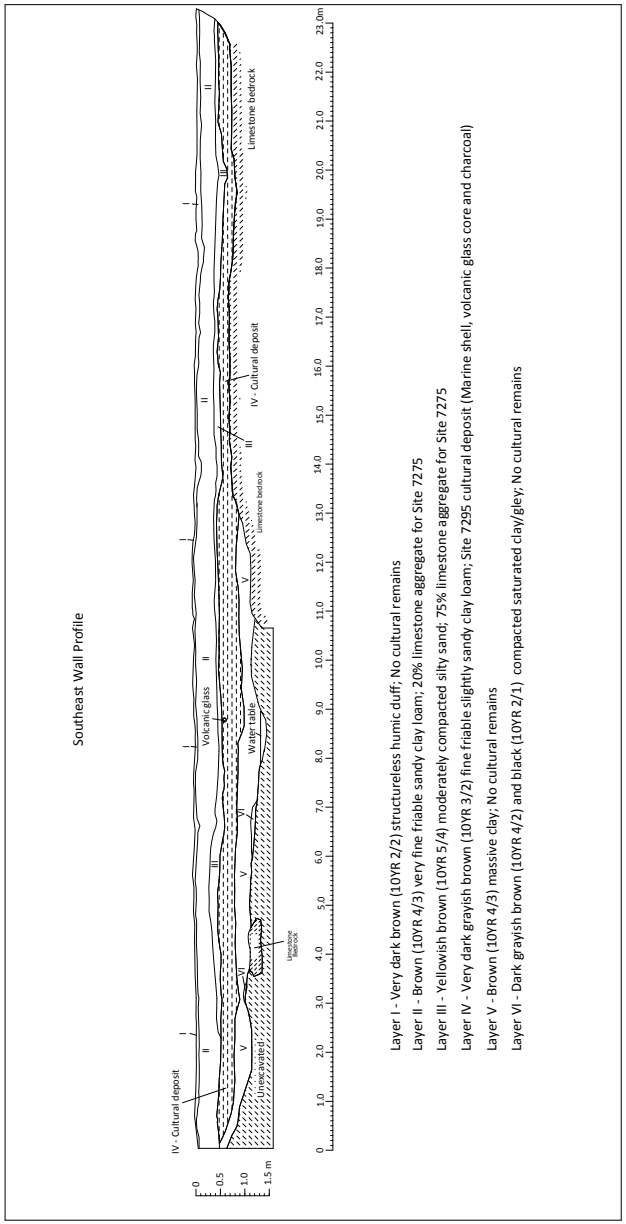


Figure 145. Site 7295 subsurface deposit in BT-E-15-3

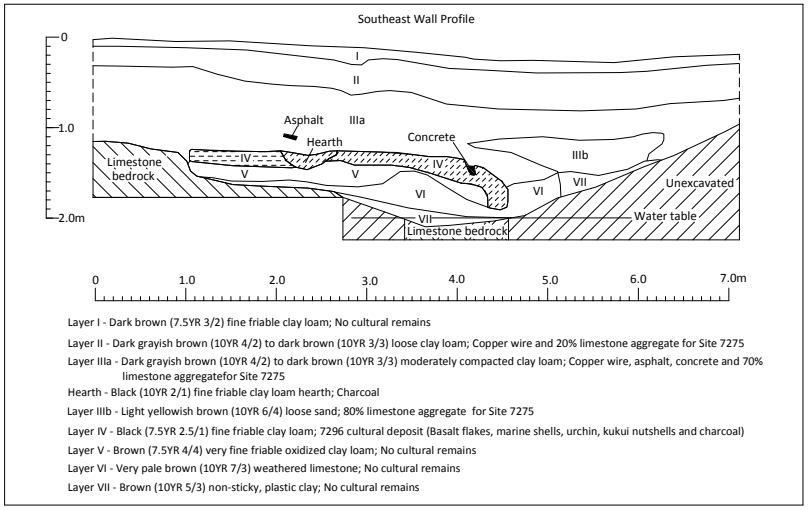


Figure 146. Site 7296 subsurface deposit in BT-E-22-4

Figure 147. Site 7296 subsurface deposit in BT-E-22-4

exoskeleton, a burned *kukui* nutshell fragment and abundant charred wood fragments (Acc. 33.001- 33.008; **Appendix D**).

The total excavated length of BT-E-22-4 was 10.4 m, so no discretionary trenches were located to the northeast or southwest. An attempt was made to excavate a discretionary trench to the southeast, but buried utility lines were encountered and the excavation was abandoned. A discretionary trench (BT-E-22-4b) was excavated 3.8 m to the northwest, and encountered extensive disturbance but no evidence of the Site 7296 cultural deposit. The subsurface prehistoric cultural deposit associated with Site 7296 was encountered in one trench. The subsurface areal extent of the site is estimated to encompass c. 165 sq m. Site 7296 is interpreted as a prehistoric habitation site, based on the associated hearth, associated artifacts and subsistence assemblage. The subsurface deposits are in good to fair condition, and the site retains moderate physical integrity.

Sediment stratigraphy in Test Are E differed from the pre-trenching expectations. Although Foote *et al.* (1972) indicate that Test Area E is almost evenly divided between Pearl Harbor Clay and Jaucus Sand soil series, stratigraphic data from test trench excavations indicate that Pearl Harbor Clay characterizes most of the intact sediments. The reason for the Foote *et al.* soil mapping unit discrepancy is unclear, but could be attributable to two factors. The first is that the Kahuku Army Airfield runway formerly occupied the northwest half of Test Area E, and required extensive land modifications for its construction and sand for concrete building material. The second factor could be attributed to a mapping error by Foote *et al.*, if the sediment map for the area was based on aerial photographs taken after WW II, which show massive sheets of sand covering the runway in the aftermath of the 1946 tsunami.

According to Foote *et al.* (1972:112-113) Pearl Harbor Clay series soils are found on low coastal plains adjacent to the ocean. The soil series consists of poorly drained soils developed in alluvium overlying organic material. The surface layer in a representative profile is very dark gray mottled clay c. 30 cm thick. The underlying sediment is a c. 48 cm-thick layer of very dark gray and very dark grayish brown mottled clay with an angular to sub-angular blocky structure. The substratum is muck or peat at approximately the same depth as the water table. The water table is very shallow in much of Area E, especially in the central portion of the area where muddy areas and standing water are observable on the surface.

Figure 148 is the first of three stratigraphic profiles (Profile 1) and illustrates the northeast-southwest Transect 6, excavated across the northwest end of Test Area E. Profile 1 shows relatively shallow alluvial clay deposits overlying limestone bedrock in BT-E-6-2. In BT-E-6-5, the excavation was terminated at the water table in alluvial clay. Fill layers are present in all trenches. The double fill deposits in BT-E-6-1 and E-6-5 represent intact base course layers for the Kahuku Army Airfield main runway; the upper fill base course has been stripped away in BT-E-6-4, where an intact duff deposit is buried by redeposited fill unrelated to the Airfield runway. In BT-E-6-2 and E-6-3 these runway fill deposits are missing and instead are replaced with redeposited fill in which the limestone aggregate composition is significantly lower (10-20%) than the runway base courses. Two trench profiles (BT-E-6-2 and E-6-5) show fill deposits overlying intact alluvial clay deposits formed on the limestone substrate, but mass grading for runway construction mostly obliterated the underlying alluvial deposits elsewhere.

Figure 149 is the second of three stratigraphic profiles (Profile 2) and illustrates the northeast-southwest Transect 13, excavated across the center of Test Area E, including the subsurface cultural deposits of Site 7294. At the northwest end of Profile 2 in BT-3-1, fill redeposited during golf course construction overlies the limestone substrate. In BT-E-13-2 fill associated with the Airfield revetment area overlies the limestone substrate and caps a small intact deposit of alluvium, preserved in a depression in the substrate, and indicating that the surface was graded prior to deposition of the overlying WW II-era fill; terrigenous alluvial clay fills a void in the limestone substrate at the base of BT-E-13-2. In BT-E-13-3, E-13-4 and E-13-5, the percentage of limestone inclusions is so low (10-20%) that the deposits appear to represent intact alluvial deposition unmodified, except for probable truncation of the upper surfaces. In BT-E-13-6c and E-13-6d intact cultural deposits of Site 7294 are preserved beneath intact alluvial clay loam deposits, containing low percentages (10-15%) of limestone inclusions. In BT-13-6 redeposited fill from road construction overlies the cultural deposit of Site 7294, and grading prior to filling has undoubtedly truncated the upper surface of the cultural deposit; the cultural deposit, composed of alluvial loam,

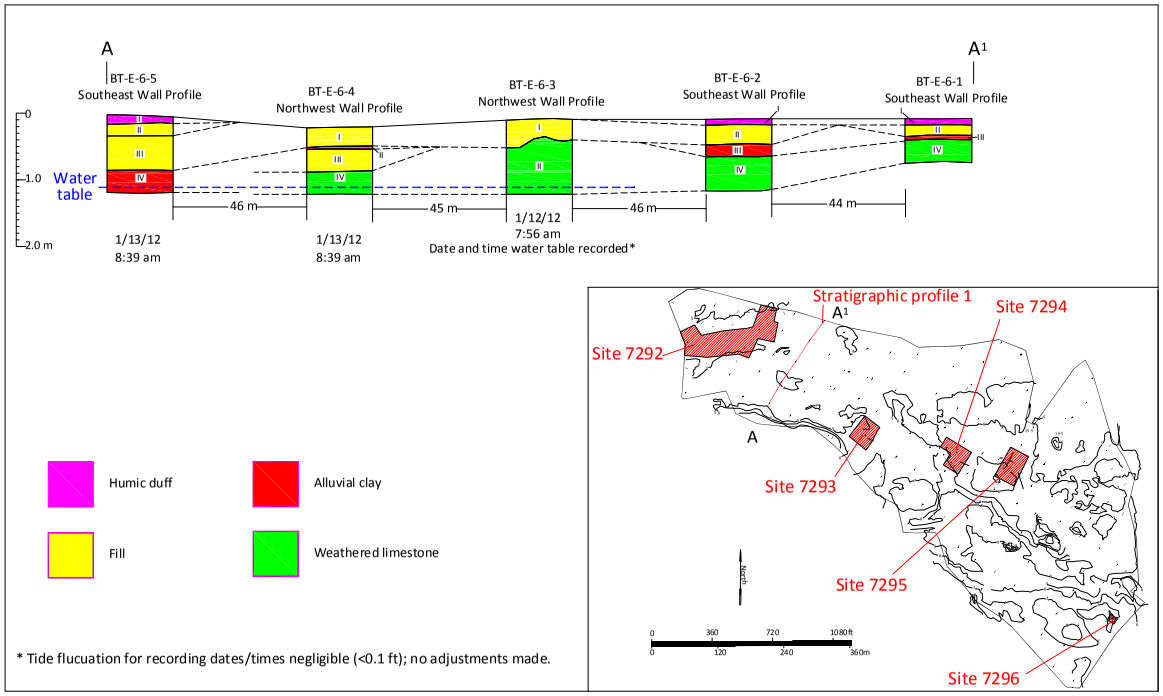


Figure 148. Test Area E stratigraphic profile 1

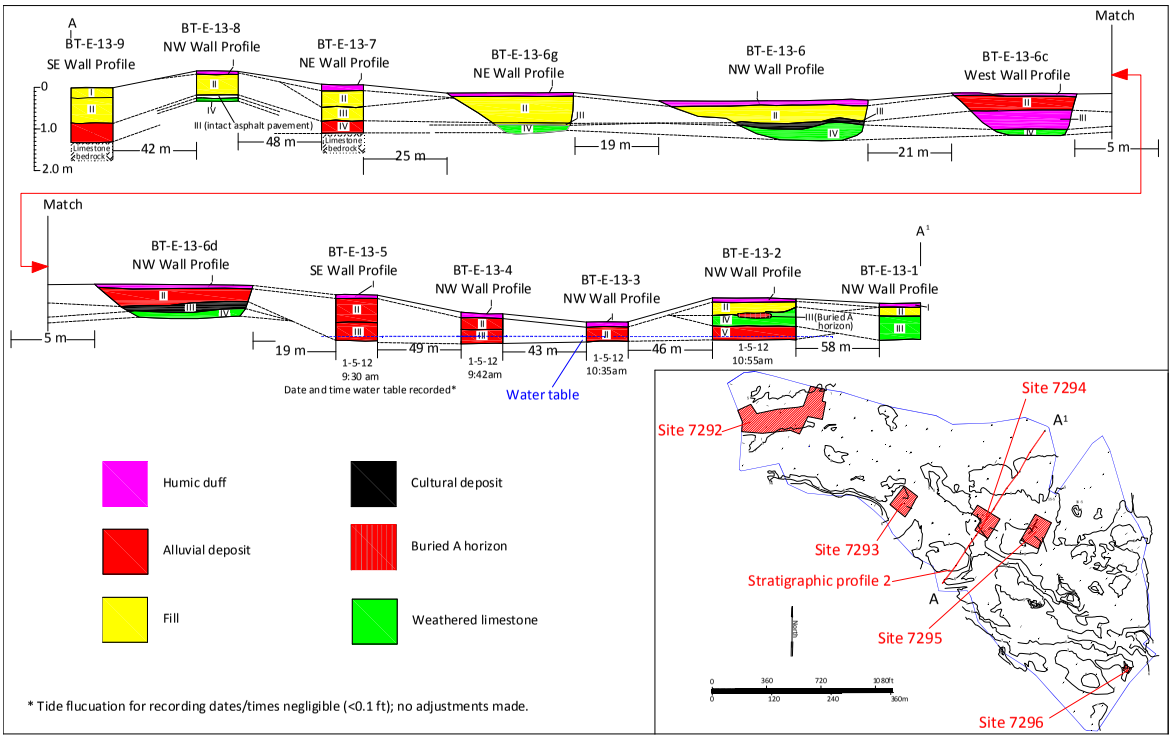


Figure 149. Test Area E stratigraphic profile 2

overlies the limestone substrate. In BT-E-13-6g two layers of WW II-era fill in the revetment area south of the runway overlie the limestone substrate. In BT-E-13-7 two layers of WW II-era fill in the revetment area south of the runway overlie intact alluvial sandy clay formed on the limestone substrate. In BT-E-13-8, redeposited fill containing asphalt fragments and plastic bags overlie an intact section of asphalt pavement constructed directly over the limestone substrate. In BT-E-13-9 at the southwest end of the sample transect, two layers of redeposited fill associated with golf course construction overlie intact alluvial clay formed on the underlying limestone substrate.

Figure 150 is the third of three stratigraphic profiles (Profile 3) and illustrates the northeast-southwest Transect 20, excavated across the southeast end of Test Area E, which crosses the former sod farm and the Kahuku Army Airfield barracks area. All but one trench in this transect were excavated to limestone bedrock; the other, BT-E-20-4, encountered the water table before the limestone substrate was reached. Gley deposits were encountered in BT-E-20-4, E-20-6 and E-20-7; the last two trenches the gley deposits overlie the limestone substrate. In all of the Transect 20 trenches, except BT-E-20-5, the fill deposits consist of redeposited material associated with golf course construction (E-20-6 and E-20-7) or the sod farm. The fill deposit in BT-E-20-5 consists of 95% basalt aggregate and probably represents a stockpile of crushed material for resort hardscaping or landscaping aggregate. The fill deposits overlie intact alluvial sandy loam, sandy clay loam, clay loam or clay; only the fill deposit in BT-E-20-6 overlies the limestone substrate and it is presumed the original alluvial deposits in this area were removed during golf course construction.

Test Area E is a relatively level, low-lying flat east of Punahoʻolapa Marsh. The ground surface was extensively modified during construction of the main NW-SE runway of the Kahuku Army Airfield (Site 7275) and peripheral support facilities. Fieldwork for the SAIS documented widespread fill deposits associated with the Airfield overlying alluvial deposits and gley developed on the limestone substrate. WW II-era fill deposits vary in depth from 0.25 to 1.38 m bgs. Where preserved, alluvial deposition was encountered 0.16 to 0.82 m bgs, overlying gley or limestone. Many fill deposits directly overlie bedrock, but where no fill deposits were encountered, alluvial deposits overlying gley or limestone were at least 0.45 to 0.82 m deep. In addition, five subsurface prehistoric habitation sites were identified as a result of testing (Sites 7292-7296). The prehistoric cultural deposits are associated with buried alluvial deposition. Overlying fill seals many of the cultural deposits. Prehistoric subsurface cultural deposits cover approximately 14,325 sq m (3.5-acres) or 5% of Test Area E.

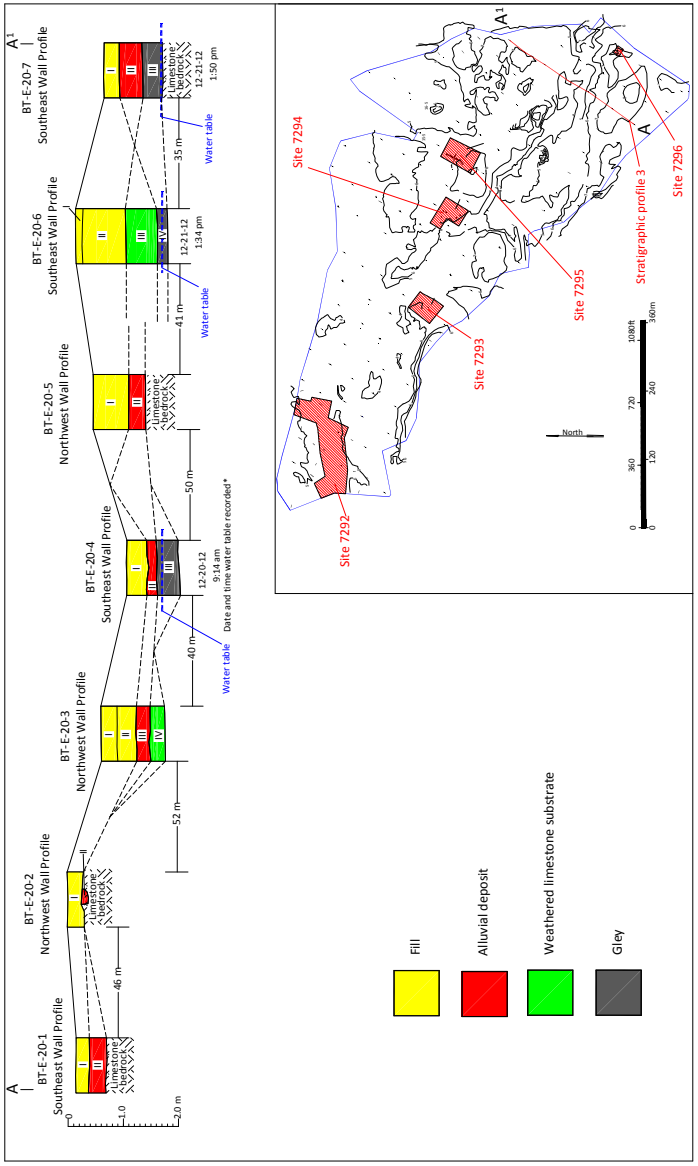


Figure 150. Test Area E stratigraphic profile 3

Test Area F

Test Area F is a level, low lying flat now covered by an invasive *haole koa* forest. Punahoʻolapa Marsh borders Test Area F on the west, while the 12th and 13th Fairways of the Palmer Golf Course border it on the north (see *Figure 63*). Marconi Road borders the east side along the TBR property line, and the 5th and 6th holes of the Palmer course border the south side. The ground surface of Test Area F has undergone extensive disturbance. Numerous push piles of boulders, earth, and other debris were deposited by heavy earth-moving equipment. The soils series for Area F is Pearl Harbor Clay (Foote *et al.* 1972; see Figure 7).

Subsurface testing in Area F consisted of excavating 58 systematically placed trenches that varied from 4.5 to 9.0 m in length (average 5.48 m) and averaged 0.8 m wide (*Figure 151*). A total of 318.25 linear meters of trench were excavated. One to seven deposits were encountered in the trenches. Forty-four trenches were excavated to the limestone substrate, 13 were excavated to the water table, and one trench excavation was terminated when immovable boulder fill was encountered. Trench depths varied from 10 cm to 2.54 m, and averaged 95 cm deep. Trench profiles are illustrated in **Appendix B** (*Figures B-276* through *B-333*). Trench dimensions and stratigraphic data are presented in **Appendix C.**

Site 5791 is the OR&L Railroad grade, which is no longer extant on the surface in Test Area F. The rail bed bisected the north end of Test Area F and crossed the south ends of the 12th and 13th Fairways of the Palmer golf course. Subsurface deposits in BT-F-3-9, F-4-7 and F-12-1 encountered subsurface deposits associated with the rail bed (see *Figures B-294, B-301, B-326*). Where the bedding fill was encountered, it was overlain by asphalt pavement. In BT-F-3-9 the section corresponds with a railroad crossing for a road no longer extant. Redeposited fill overlies the pavement in BT-F-3-9 and F-4-7, but the asphalt pavement is exposed on the ground surface in F-12-1.

Site 7265 is a WW II-era surface feature consisting of a concrete slab, associated with the barracks area of the Kahuku Army Airfield (see *Figure 67*). Excavation of BT-F-5-6 encountered 24 cm of crushed limestone aggregate fill beneath the concrete slab. The fill was laid directly on the limestone substrate.

Site 7284 is a WW II-era surface site consisting of 5 features. Excavation of BT-F-9-1 encountered a surface deposit of 20 cm of limestone fill associated with the foundation for the Feature A concrete slab and underlying pipeline trench. Excavation of BT-F-10-1 encountered 45 cm of limestone fill associated with the foundation of the Feature C slab.

No intact traditional Hawaiian cultural deposits or human remains were identified in any Test Area F trenches. The absence of subsurface prehistoric cultural deposits is probably attributable to extensive disturbance and the relatively shallow soil depth. Widespread disturbance occurred during World War II in conjunction with construction of the Kahuku Army Airfield barracks facilities located throughout Test Area F, and during the subsequent construction of the Palmer Golf Course in 1990-1991. The area indicated as a house enclosure on the 1890 map was tested with two trenches, but no intact subsurface cultural deposits were encountered.

Figure 152 is the first of two stratigraphic profiles (Profile 1) and illustrates the northeast-southwest Transect 4, across the center of the east half of Test Area F. In all except BT-F-4-2 and F-4-4, one or more layers of fill overlie intact alluvial deposits formed on the limestone substrate. In BT-F-4-2 there is no fill deposit and in F-4-4 fill overlies the limestone substrate. In BT-F-4-7 fill overlies asphalt pavement that overlies the OR&L railroad bedding fill deposits, and shows a potential railroad crossing.

Figure 153 is the second of two stratigraphic profiles (Profile 2) and illustrates a northwest-southeast transect across the east half of Area F. Ten of the eleven trenches in this profile show one to three layers of fill overlying intact alluvial deposits or the limestone substrate. The exception is BT-F-5-3, where no fill deposits were encountered. Fill deposits contained a variety of recent and historic trash, including barbed wire, black plastic, a plastic switch cover, bottle glass, a metal pipe, glazed ceramics, bottle glass, copper wire, concrete fragments, a steel cable, plastic hose, a tire, fiberglass and fabric. Crushed limestone and basalt aggregate was frequently encountered in fill deposits. A utility trench feature was noted in BT-F-15-1. Gley deposits were commonly

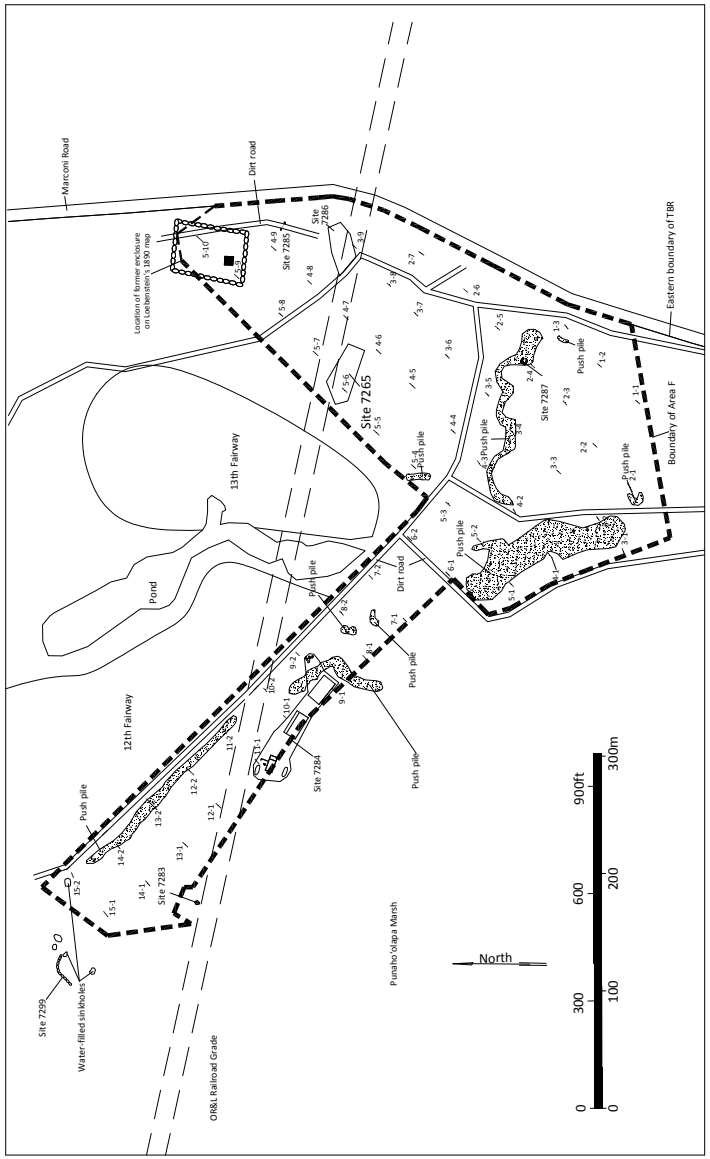


Figure 151. Location of Sites and trenches in Test Area F

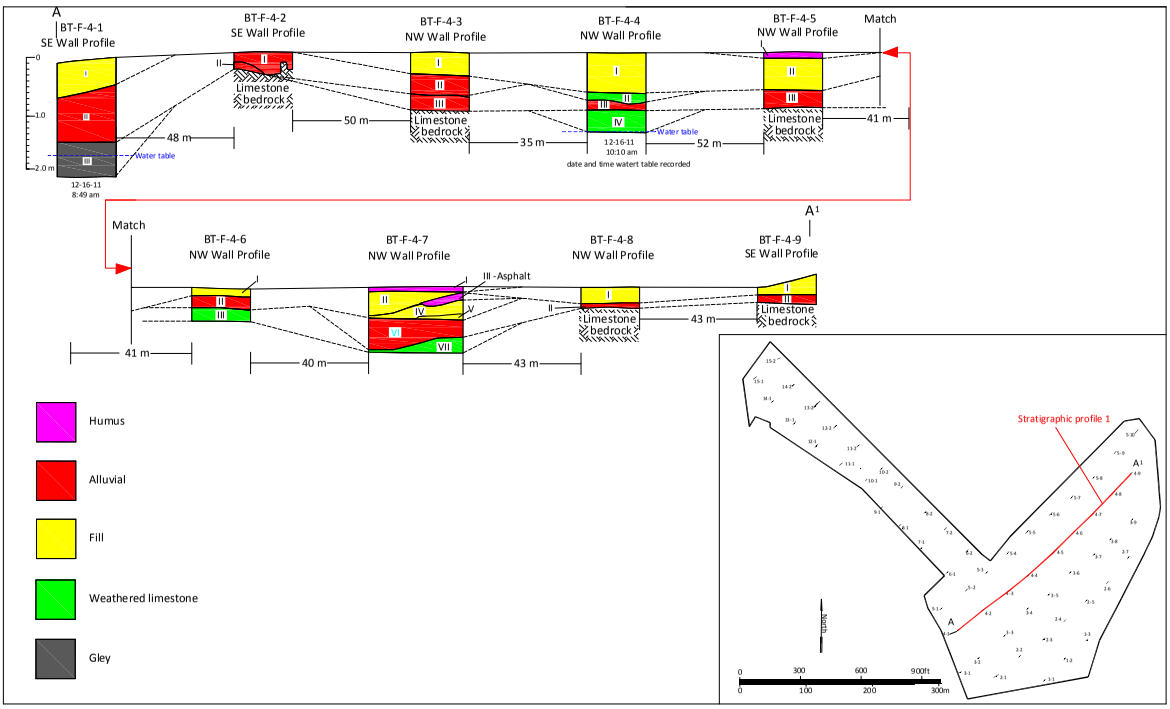


Figure 152. Test Area F stratigraphic profile 1

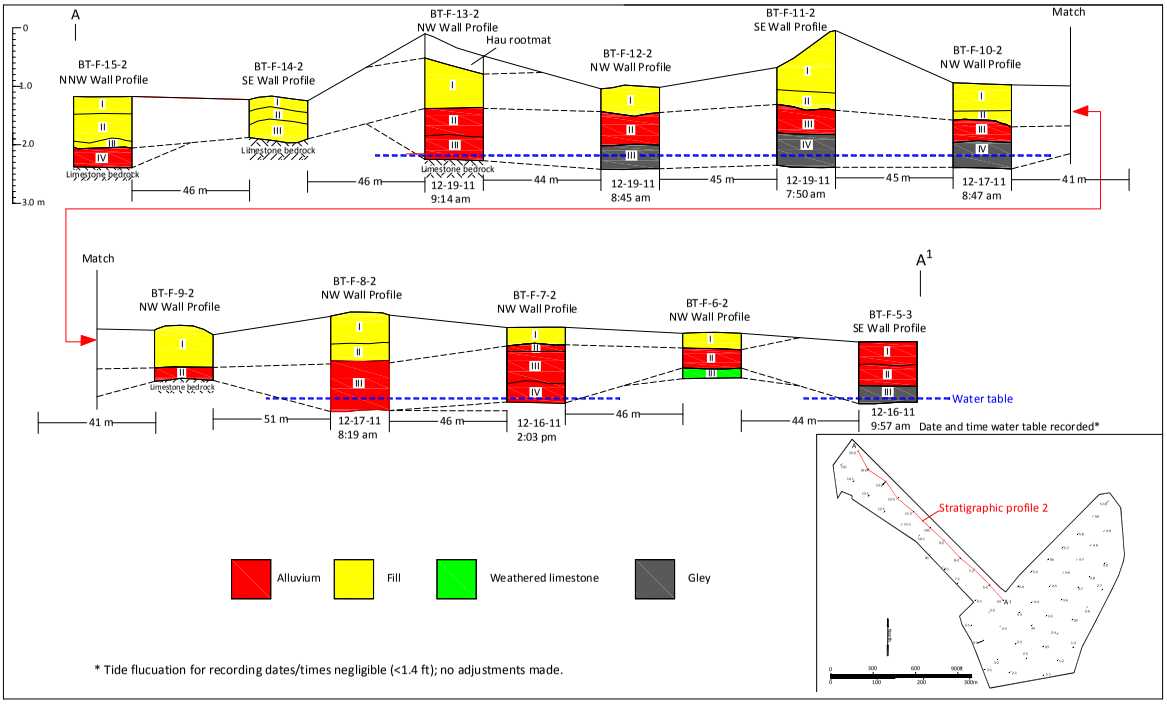


Figure 153. Test Area F stratigraphic profile 2

encountered in trenches where the water table overlies the limestone substrate (*Figure 154*) and a single deposit of tropical peat was encountered in BT-F-2-2 (*Figure 155*).

Test Area F is characterized by widespread surface disturbance associated with 20th Century infrastructure for the OR&L railroad, the Kahuku Army Airfield barracks, the Palmer golf course and ancillary access roads. Although intact alluvial deposits are preserved across much of Test Area F, no evidence of prehistoric subsurface cultural deposits was encountered. It is possible that prehistoric cultural deposits were destroyed as a result of 20th Century land modification, but the potential to encounter intact prehistoric cultural deposits in Test Area F is negligible.

Test Area G

Test Area G is located in gently sloping terrain and is covered by an invasive *haole koa* forest (see *Figure 85*). Marconi Road forms the east boundary, Kamehameha Highway the south, and by the 4th, 5th, and 6th holes of the Palmer Golf Course on the north and west. A single push pile was noted on the surface of Test Area G, but otherwise, the area did not contain surface evidence of 20th Century disturbance, except for agricultural use. No surface sites were identified in Test Area G and no LCAs were located in this part of the property. The former location of the Kahuku Army Airfield barracks is located north of Test Area G.

The soil series for Area G is Waialua Silty Clay (see *Figure 7*). Waialua series soils develop on alluvial fans and are derived from weathered igneous rock (Foote *et al.* 1972: 128-129). The surface layer in a representative profile is 30 cm of dark reddish-brown silty clay overlying c. 66 cm of dark reddish-brown silty clay subsoil with a sub-angular blocky structure. The substratum is dark reddish-brown silty clay.

Testing in Area G consisted of excavating 12 systematically placed trenches that varied in length from 4.5 to 6.4 m (average 5.35 m) and averaged 1.0 m wide (*Figure 156*). A total of 64.15 linear meters of trench were excavated. Trench excavation exposed two to five layers. Five trenches were excavated to the weathered and decomposing limestone substrate and 7 were terminated in the clay substratum; one trench reached the water table at 2.40 m bgs. Trench profiles are illustrated in **Appendix B** (*Figures B-334* through *B-345*). Trench dimensions and stratigraphic data are presented in **Appendix C**.

No historic or prehistoric cultural deposits or human remains were identified as a result of excavation of the Test Area G trenches. All trenches exhibited a surface plow zone deposit characterized by dark brown to dark reddish brown loose clay loam or silty loam (Layer I), varying in depth from 0.38 to 0.6 m (average 0.44 m). Modern debris was noted in BT-G-2-3 and G-4-3 along Marconi Road. The plow zone overlies 0.05 to 1.95 m (average 0.78 m) of one to four layers of alluvial clay or clay loam deposited during the development of the Kahuku Plain alluvial fan. The deposits consist predominately of dark brown compacted to blocky clays. Several deposits consist of gravelly clay and silty clay loam. The subsoil overlies the limestone substrate. A representative example of the soil stratigraphy documented in Test Area G is presented in *Figure 157.*

Figure 158 is a composite *mauka-makai* stratigraphic profile depicting the main strata by deposit type within Test Area G. The profile illustrates the deep alluvial deposits that cover the area. The number of recognizable layers in the trenches increases in relation to decreasing elevation, and reflects the increased amount of deposition as the gradient decreases toward to north.

Test Area G consists entirely of alluvial Waialua Silty Clay and was sampled by excavating one-trench per acre. The soil is more suitable for agricultural use than habitation and not surprisingly, no evidence of historic or prehistoric habitation was encountered. Test Area G exhibits very low potential for encountering subsurface cultural deposits.

Figure 154. Gley deposit in BT-F-2-3, view to southeast

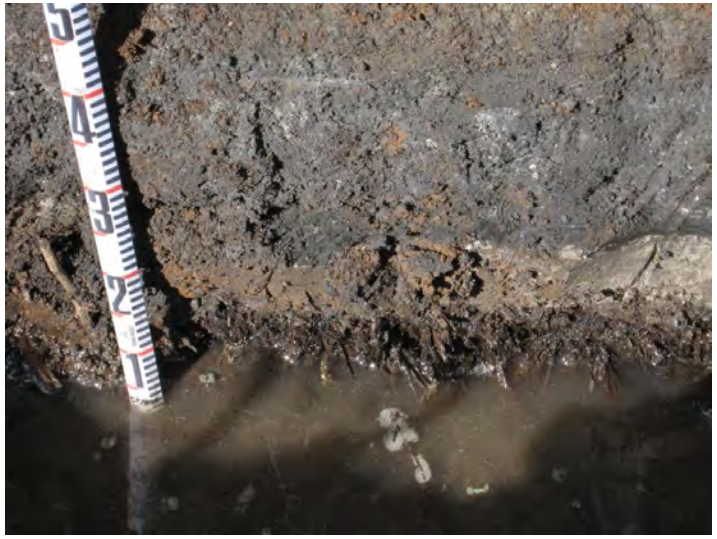


Figure 155. Tropical peat deposit in BT-F-2-2, view to northwest

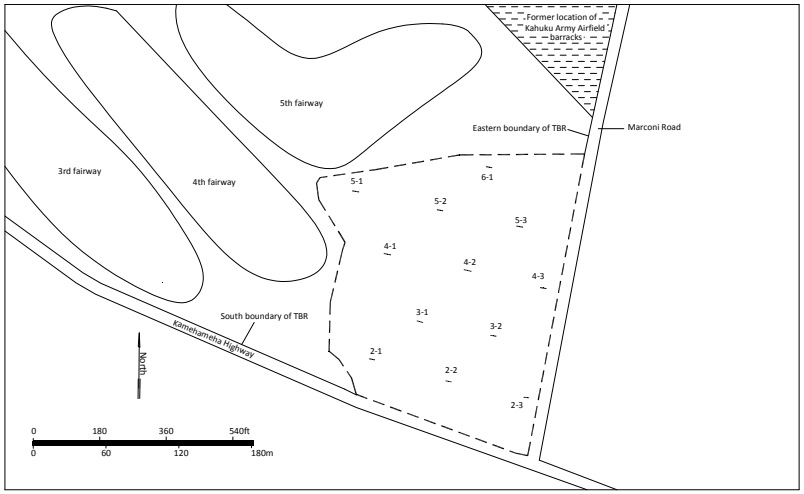


Figure 156. Location of Trenches in Test Area G

Figure 157. Typical Test Area G soil stratigraphy

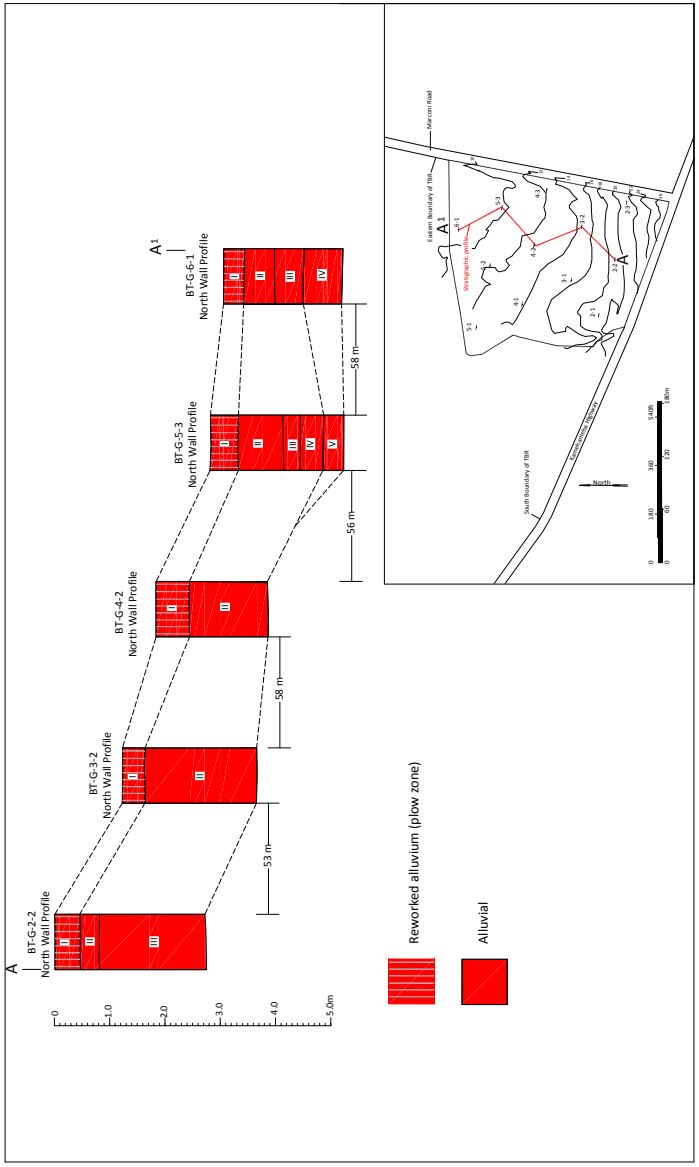


Figure 158. Test Area G stratigraphic profile

CONCLUSION

The SHPD-approved SAIS Plan (Haun *et al.* 2011) includes a thorough summary of previous land use for the TBR property, beginning with traditional Hawaiian land use through World War II and subsequent developments. The Plan was prepared in advance of the SAIS fieldwork, in accordance with the requirements for an Archaeological Inventory Survey Plan detailed in Hawai'i Administrative Rules (HAR) §13-13-284-5(c) and §13-13-276-5 (a) and (b). The Plan presents the results of historical documentary and archaeological background research for the general Kahuku area and specifically for the project area. The Plan also provides a synthesis of the background information and provides a research design with a methodology to guide the proposed SAIS fieldwork. As provided for in HAR §13-13-276-5(b)(3) the historic documentary and archaeological background research portions are not repeated in this document and the reader is referred to the Plan for this background information.

The SAIS Plan made predictions regarding expected site types based on previous archaeological research and historical documentary evidence. As expected, prehistoric to early historic remains documented in the project area include subsurface cultural deposits and subsurface features including a house floor, fire pit, post molds, and burials. Also as expected, historic remains dating to the 1800s to 1900s were documented, including the OR&L railroad and at least one probable Kahuku Ranch-related wall. Other expected sites are the extensive WW II military-related remains of Kahuku Army Airfield including the main runway, revetments, defensive fortifications and a variety of support facilities.

The SAIS fieldwork documented the extensive disturbance that has occurred throughout the TBR property. The only surface archaeological sites or features in Test Areas A, B, C, D or G are an abandoned 1950s-era transit bus in Test Area A and an isolated human skeletal element in Area C. The land altering impacts to the project area begin with historic cultivation of sugarcane that occurred throughout the inland portions of the project area (see *Figure 92*). Coastal areas where sand was unsuitable for cultivation and areas that were too wet in the vicinity of Punaho'olapa Marsh were the focus of World War II-era development including the construction and use of the expansive Kahuku Army Airfield complex (see *Figure 11*) and the subsequent development of the Turtle Bay resort and golf course facilities. Despite this extensive disturbance, extant surface sites were documented in Test Areas E and F, the Kahuku Point Preserve, and shore of Kawela Bay; and subsurface archaeological remains were identified in Test Areas B, D and E.

The SAIS Plan guided-surface and -subsurface surveys documented thirty-nine sites consisting of 10 traditional Hawaiian habitation sites, 2-3 sites dating to the late 1800s, 3 sites associated with 1930s operation of Marconi Wireless Station, 22 sites that were part of the United States Army Airfield at Kahuku, and an abandoned 1950s Honolulu City and County transit bus (*Figure 159* and *Table 4*). These sites include four sites identified by prior studies, including three that were not formally assigned site numbers by previous TBR studies (5791, 7275, 7299; *Table 5*)

Prehistoric Sites

The ten traditional Hawaiian sites documented are all likely prehistoric in age. Human remains were identified at three of these sites. Two sites (7288 and 7289) have intact, primary burials. The third site is Site 4488 where an isolated skeletal element was identified on the ground surface. Human remains representing at least 8 individual burials were previously discovered and recovered from Site 4488. At least one of these burials is likely historic based on probable coffin remains consisting of wood fragments and square nails and it is probable that most of the other burials are prehistoric. One site with a burial (7289) and seven other sites (7290-7296) have intact subsurface cultural deposits indicative of habitation-related occupations.

Archaeological and historical background research presented in the SAIS Plan (Haun *et al.* 2011:79-81) indicates that in late prehistory the Kahuku Point vicinity was well populated and extensively cultivated. There were permanent residences scattered along the coast. Larger settlements were present in areas such as Kahuku and Kawela Bay where sheltered ocean access was available. Temporary habitation, probably associated with

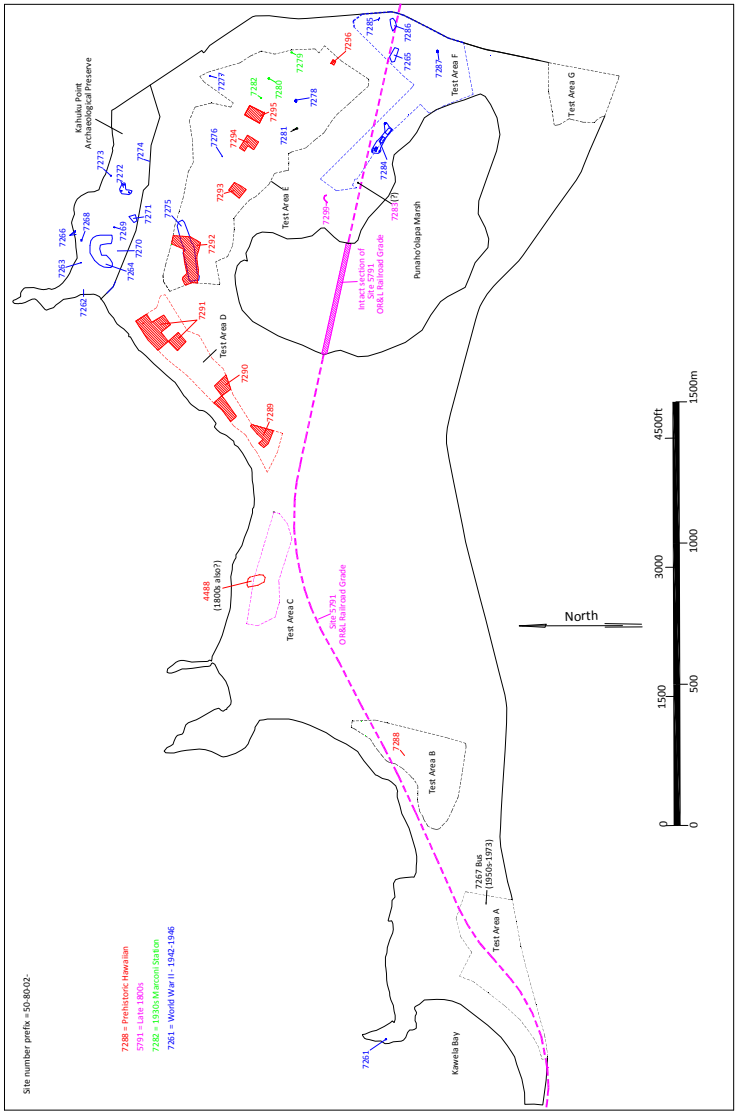


Figure 159. Location of sites identified during SAIS Fieldwork

Table 4. SAIS identified and relocated sites

SIHP Site No.	Formal type	Function	Area	Age	No. of Features
4488*	Human remains	Burial	C	Prehistoric and early historic	1
5791*	OR&L Railroad grade	Transportation	Punaho'olapa Marsh	1899-1946	1
7261	Concrete structure	Gun position	Kawela Bay	1942-1946	1
7262	Concrete slab	Indeterminate	Kahuku Point	1942-1946	1
7263	Concrete pier block	Antenna support?	Kahuku Point	1942-1946	1
7264	Revetment	Storage	Kahuku Point	1942-1946	1
7265	Concrete slab	Foundation	F	1942-1946	1
7266	Concrete pier blocks	Antenna support?	Kahuku Point	1942-1946	3
7267	Transit Bus	Transportation	A	1950s-1973	1
7268	Concrete structure	Indeterminate	Kahuku Point	1942-1946	1
7269	Concrete structure remnant	Indeterminate	Kahuku Point	1942-1946	1
7270	Metal tank	Storage	Kahuku Point	1942-1946	1
7271	Asphalt area	Transportation	Kahuku Point	1942-1946	1
7272	Concrete structure	Gun position?	Kahuku Point	1942-1946	1
7273	Concrete block	Indeterminate	Kahuku Point	1942-1946	1
7274	Concrete cylinder	Possible light fixture base	Kahuku Point	1942-1946	1
7275	Asphalt area	Runway remnant	E	1942-1946	1
7276	Concrete block	Anchor base	E	1942-1946	1
7277	Concrete slab	Foundation	E	1942-1946	1
7278	Concrete structure	Gun position?	E	1942-1946	1
7279	Concrete block	Antenna support?	E	1933	1
7280	Concrete structure	Antenna support?	E	1930s	1
7281	Concrete structure	Gun position?	E	1942-1946	1
7282	Concrete block	Antenna support?	E	1930s ?	1
7283	Stone mound	Possible agricultural	F	Prehistoric	1
7284	Complex	Barracks complex	F	1942-1946	5
7285	Metal posts	Gate	F	1942-1946	1
7286	Asphalt area	Pavement	F	1942-1946	1
7287	Concrete structures	Gun position?	F	1942-1946	1
7288	Human remains	Burial	B	Prehistoric	1
7289	Cultural deposit w/ burial	Habitation/Burial	D	Prehistoric	2
7290	Cultural deposit	Habitation	D	Prehistoric	1
7291	Cultural deposit	Habitation	D	Prehistoric	1
7292	Cultural deposit	Habitation	E	Prehistoric	1
7293	Cultural deposit	Habitation	E	Prehistoric	1
7294	Cultural deposit	Habitation	E	Prehistoric	1
7295	Cultural deposit	Habitation	E	Prehistoric	1
7296	Cultural deposit	Habitation	E	Prehistoric	1
7299*	Wall	Livestock control	Punaho'olapa Marsh	pre-1900	1

*Relocated Sites

Table 5. Previously identified sites

SIHP Site No.	Other Site No. /Name	Site Type	McAllister (1933)	Dye (1977)	Bath et al. (1984)	Neller (1984)	Walker et al. (1988a)	Walker et al. (1988b)	Davis et al. (1986)	Kennedy (1992)	Kennedy (1996)	Sullivan (1990, 1991), Dunn (1991), Donohue (1991)	Haun and Henry (2001)	Corbin (2003)	Current Status
4488	-	Cultural deposit with burials								X	X				Burials removed and reinterred
5791/ 9714	-	Railroad Grade											X		Intact segment present across Punaho'olapa Marsh
6410	-	Cultural deposit with burials			X		X							X	Mitigated through Data Recovery; Burials removed and reinterred
6411	T-1	Cultural deposit with burials		X	X	X		X						X	Preserved
6412	-	Cultural deposit in Marsh with 3 sinkholes		X	X				X						Preserved
6413	TM-1	Cultural deposit										X		X	Mitigated through Data Recovery
6414	TM-2	Cultural deposit										X		X	Mitigated through Data Recovery
6415	TM-3	Enclosure										X		X	Mitigated through Data Recovery
6416	TM-4	Cultural deposit										X		X	Mitigated through Data Recovery
6417	TM-5	Cultural deposit										X		X	Mitigated through Data Recovery
6418	TM-6	Cultural deposit										X		X	Mitigated through Data Recovery
6419	TM-7	Cultural deposit										X		X	Mitigated through Data Recovery
6420	TM-8	Alignment										X		X	Mitigated through Data Recovery
6421	TM-9	3 pools with walls										X		X	Destroyed prior to SAIS
6422	TM-10	Cultural deposit										X		X	Mitigated through Data Recovery
6423	TM-11	Cultural deposit with burials										X		X	Mitigated through Data Recovery; Burials removed and reinterred
6424	TM-12	Stone wall										X		X	Destroyed prior to SAIS
6425	TM-13	Cultural deposit										X		X	Mitigated through Data Recovery
6426	TM-14	Stone wall										X		X	Destroyed prior to SAIS
7275*	Kahuku Army Air Field														Intact runway identified in Test Areas D and E
7299*	T-5	Stone wall			X										Preserved as part of Site 6412
	262	Kukio Pond	X					X							Destroyed prior to 1977
	T-2	Stone wall			X										Destroyed prior to SAIS
	T-3	Cattle enclosure			X										Destroyed prior to SAIS
	T-4	Antenna Support?			X										Destroyed prior to SAIS
	T-7	Gray sand layer in dune (determined to be historic)		X	X										Status undetermined, located within coastal setback

agricultural activity and natural resource exploitation, occurred in inland overhangs, caves and walled shelters. Fishponds were present in sheltered areas and salt was collected from depressions along the shore. Fishing shrines and rock formations of legendary, and probably ritual significance were scattered along the coast. *Heiau* were sited on prominent topographic features overlooking the coast. Sand dunes and cliff face caves were used for burial.

Agricultural use included cultivation of taro in pond fields wherever topographically suitable locations could be provided with sufficient freshwater. The abundance of freshwater around Punahoʻolapa Marsh provided Ideal conditions for wet taro cultivation with minimal labor investment compared to pond field development of stream drainages. Dryland gardens were present around the coastal residences and on the lower volcanic slopes where bananas, sweet potatoes, *wauke*, sugar cane, gourds, breadfruit, and other crops were cultivated. Upland areas were also farmed. Food remains from archaeological excavations include dog, pig, birds, and a wide variety of fish and marine invertebrates, representing activities such as animal husbandry, hunting, fishing and gathering.

Previous archaeological studies of TBR property produced 77 radiocarbon age range determinations on charcoal from cultural deposits that fall within the timeframes associated with Polynesian cultural occupation and later (Haun *et al.* 2011:71-77). Of these 77 results, 23 (30%) are from the Kawela Bay Archaeological Area (Site 6410), 25 (32%) are from the Kahuku Point Archaeological Preserve (Site 6411), and 29 (38%) are from Punahoʻolapa Marsh (Site 6412) and its environs (Sites 6414, 6416, 6417, 6422, and 6423). The earliest cultural deposits (*i.e.* prior to c. A.D. 1000) are to be found on the periphery of the Marsh. These early age ranges support the inference that the wetland was a highly desirable locale for initial settlement. The earliest cultural age range determinations were recovered from Site 6412 where a sample obtained from the east trench spans A.D. 645 to 979 and a sample from the north trench spans A.D. 785 to 1160 (*Figure 160*). A second early cluster was obtained within and east of the Marsh from Site 6423. Age ranges from Site 6423 span A.D. 793 to 1105.

The A.D. 1000 to 1200-age ranges show continued use of the area east of Punahoʻolapa Marsh, along with settlements in the sand dunes east and west of Kahuku Point and around Kawela Bay. Settlement in these areas intensified in the period between A.D. 1200 and 1400. The earliest cultural deposits sampled along Turtle Bay post-date A.D. 1200. Sites dating to the period between A.D. 1400 to 1600 have been documented on the west and southwest of Punahoʻolapa Marsh, as well as southwest of Kahuku Point. Use of the area east of Punahoʻolapa Marsh, Kawela Bay and Kahuku Point continued as a population focal point into the A.D. 1600 to 1800s.

More than 100 Land Commission Awards (LCA) claims were awarded in the mid-1800s in the area spanning the region from Kawela to Kahuku (*ibid*.: 2011:17-27). Thirty-five LCA claims with at least 24 house lots were awarded in the project area. The LCA claim testimonies refer to numerous *loʻi* (taro pond fields) and cultivated plots of bananas, sweet potatoes, *wauke* (paper mulberry*)*, sugar cane, bitter melon, *noni* (*Morinda citrifolia*) and an orange tree. Other named plants are *hala* (*Pandanus*) groves and *koa* trees for canoes. A brackish spring and a fishery also are mentioned in the testimonies.

Figure 161 depicts the distribution of traditional Hawaiian sites and *Figure 162* illustrates the distribution of mid-1800s LCAs. The two distributions show a high degree of correlation and demonstrate that the historic LCA pattern reflects the earlier prehistoric settlement pattern. The only exception to this correlation is the lack of prehistoric sites on the coast immediately south of Kaleokaunui (Kuilima) Point where five LCAs are present. It is likely that prehistoric sites were also present there, but were destroyed by 1800s-1900s sugarcane cultivation and early 1970s resort development that occurred before any systematic archaeological surveys were conducted. The late prehistoric to early historic (mid-1800s) settlement pattern likely extends back to at least the 13th Century based on radio-carbon dating results (see *Figure 160*) and potentially to the 11th Century.

The traditional Hawaiian sites primarily consist of subsurface cultural deposits. Previously identified Hawaiian sites at Kawela Bay, Kahuku Point and the areas surrounding Punahoʻolapa Marsh were, with the exception of Kahuku Point previously mitigated through data recovery. After initial data recovery work the landowner elected to preserve the Kahuku Point site. The data recovery work documented stratified, cultural deposits at Kawela Bay and Kahuku Point that contained numerous soil features including post molds, burials and hearths; and abundant and diverse assemblages of artifacts and food remains. Data recovery at the inland sites generally encountered either isolated subsurface features or remnant subsurface deposits with limited quantities of food remains and artifacts.

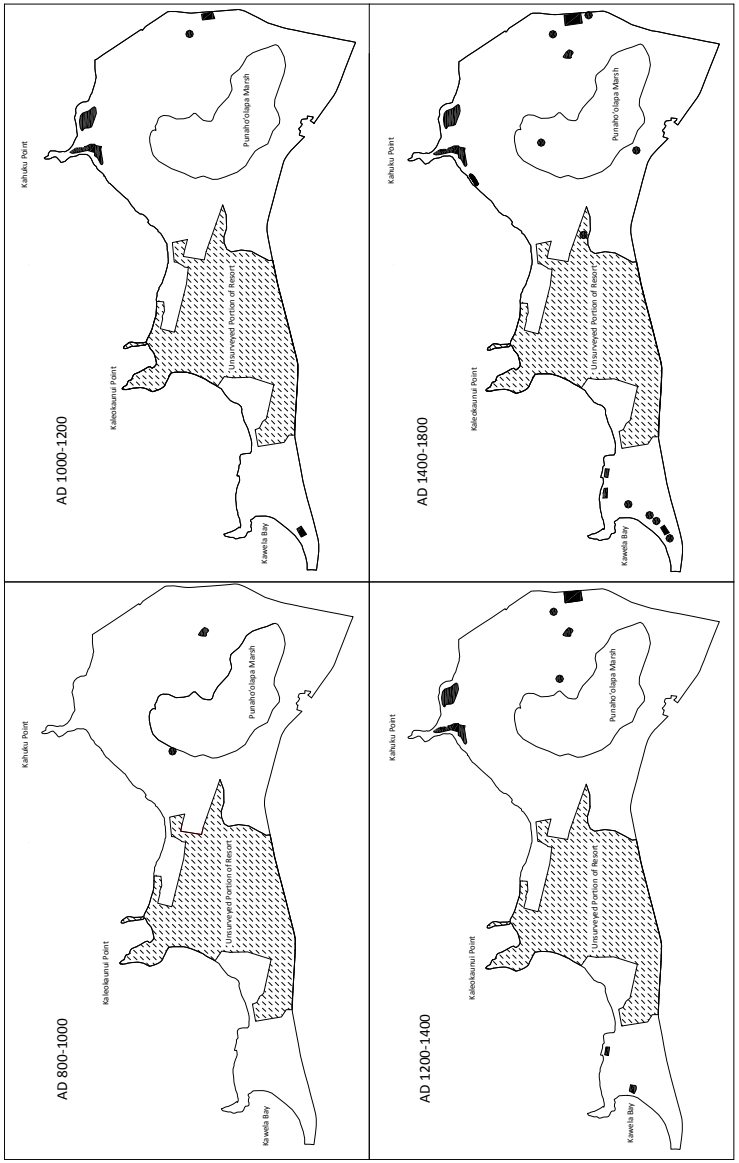


Figure 160. Pre-1800 chronology of occupation within project area

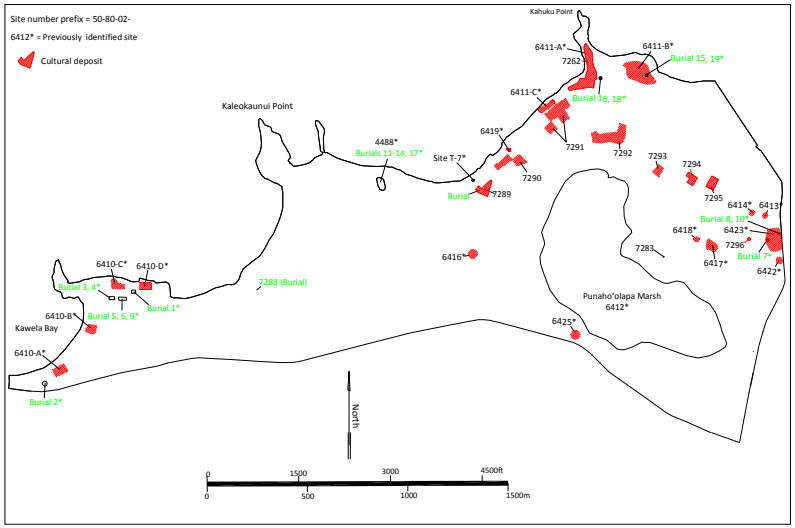


Figure 161. Prehistoric sites

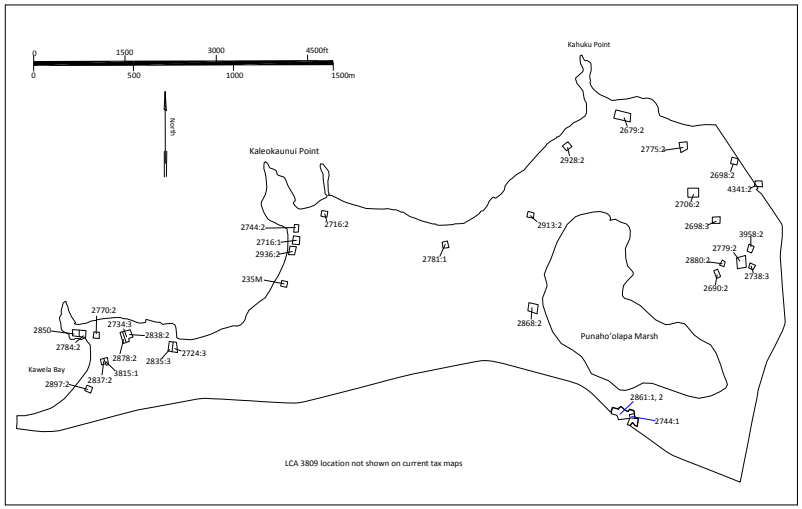


Figure 162. Land Commission Awards within project area

The eight sites with cultural deposits documented by the SAIS study comprise more than 32,000 sq m and are situated in the remnant dunes along the coast southwest of Kahuku Point (Test Area D) and the lowlands northeast of Punahoʻolapa Marsh (Test Area E). The deposits in the dunes are usually stratified with two cultural layers and the inland ones typically have a single cultural deposit that was vertically truncated by World War II or subsequent land modification. The very limited sampling of these subsurface deposits recovered artifacts (basalt and volcanic glass stone debitage and tools), charcoal, *kukui* nutshells, and food remains including marine invertebrates (gastropods, bivalves, sea urchins, crustacean), fish bone and terrestrial vertebrate bone (dog, pig, bird).These cultural deposits reflect traditional Hawaiian habitation. Mortuary use was also documented. In Test Area B, an intact primary burial of probable Hawaiian ancestry was identified during subsurface testing (Site 7288). An isolated human metatarsal was identified in Test Area C that is likely from one of the eight individual burials that were previously discovered at Site 4488. Another intact primary burial was identified in Test Area D at Site 7289. This brings the total number of burials identified at TBR to 27 (*Table 6*). The majority of the burials were found in coastal Jaucus Sand deposits near Kawela Bay and Kahuku Point (see *Figure 161*). Three burials (Nos. 7-10) were discovered during archaeological monitoring in Pearl Harbor Clay east of Punahoʻolapa Marsh in Site 6423.

The SAIS subsurface testing consisted of both high density (2 trenches per acre) and low density (1 trench per acre) testing with high intensity testing for all Jaucus Sand and Pearl Harbor Clay sediments. All of the human remains identified during testing were encountered in Jaucus Sand. While traditional Hawaiian burials are potentially present in numerous soil types and topographic settings of sufficient age and integrity, there is an increased potential for such remains to be encountered in areas of intact Jaucus Sand deposits. In addition to burials there is an increased potential to encounter cultural deposits and other subsurface features such as post molds and hearths in intact Jaucus Sand deposits as well as intact Pearl Harbor Clay deposits. Based on the density of test trenches for these soil types, the areal extent of any potential additional cultural deposits would be less than one half acre, and likely much smaller, consisting of isolated remnant deposits and truncated subsurface features.

Although it was not an explicit goal of the SAIS subsurface testing, mapping and interpretation of natural, in addition to cultural stratigraphy, was facilitated by the detailed description of trench-excavated sediments. At least one and in most cases two or three composite stratigraphic profiles were presented in the subsurface findings section for each test area. These profiles summarize the subsurface stratigraphy across each test area and permit a general characterization of natural depositional processes and episodes of cultural deposition and disturbance. In addition, for all coastal test areas (Test Areas A-D) maps depicting maximum trench depths and deposit types by layer are presented. Together these two maps convey vertical and horizontal data. Both figures divide each test area into cells that average approximately one acre for low density sampled areas (Test Area A) and approximately one-half acre cells for the high density sampled areas (Test Areas B and D).

Test Area A has a low potential for encountering intact subsurface cultural deposits or human remains during future excavations based on the results of subsurface testing. Any potential cultural deposits in Area A would be confined to the alluvial sediments overlying the marine-deposited sand. The alluvial deposits are no more than 0.66 m thick and most are substantially less, but the average thickness is 0.37 m. The alluvial deposits are surficial in some places and in others are buried by fill. Testing documented that the entire area has been disturbed by historic agricultural activity that would have destroyed the physical integrity of surficial prehistoric cultural deposits. Prehistoric agricultural use of the alluvial land along Kawela Bay is probable, but evidence for agricultural use is negligible.

Test Area B was formerly used as the staging area for equipment and material during construction of the Turtle Bay hotel and is currently used for generalized recreation-related activities, including horse stables and pasture. Most of the surface is relatively flat and grass-covered, punctuated by clumps of trees around the Test Area boundary, with a perceptible but gentle rise toward the shore. The relatively flat surface lacks visual evidence of the presence of deeply buried sediments. In fact, the limestone substrate at the south end is as shallow as 16 cm below the surface and overlain by minimal alluvial deposition. Trenches across the *mauka* half of Test Area B encountered abundant evidence of fill deposits, extending 1.80 m deep in some places. It is on the *makai* side of Test Area A that aeolian sand deposits exceed 2.5 m and are capped by marine-deposited sand. This area constitutes the back slope of the coastal dune. Prior to development, alluvial sediments behind the bay front were

covered by aeolian sand. Episodically deposited marine sand covered the dune and some alluvial deposits on the *mauka* side of the dune.

An intact subsurface human burial (Site 7288) was encountered in an aeolian sand deposit in Test Area B. The topographical setting of the intact burial at Site 7288 and location of sand deposits is the key to identifying areas of increased potential for encountering additional burials in Test Area B. The burial was preserved in an aeolian dune deposit 44 cm below the surface. The aeolian deposit was capped by c. 25 cm of marine deposited sand. There was no evidence of an associated cultural deposit, *per se*. That is, no dark staining, no charcoal flecks, no cultural material other than the burial exposed in the trench wall. Yet, cultural materials characteristic of habitation deposits were recovered from the screened excavation deposits containing mixed Layer I and II sand while recovering bone fragments. The cultural materials are either associated with the burial or with the marine deposited sand, possibly in secondary context, since the burial is presumably in a pit underlying a cultural surface. In either case, intact sand deposits in Test Area B exhibit increased potential for encountering additional subsurface cultural deposits and subsurface features including burials. *Figure 163* illustrates the locations exhibiting increased potential for encountering subsurface cultural remains in Test Area B. These deposits encompass an area of approximately 23,600 sq m (5.8-acres) of Test Area B.

Test Area C is a forested coastal sand dune on the west side of Kaihalulu Bay, c. 90-135 m from the shoreline. The central *makai* side of the dune contains 4.75 to 6.7 m of aeolian sand overlying the limestone substrate. The southwest side of the dune contains 1.0 to 2.60 m of aeolian sand and fill overlying limestone. The southeast side of the dune was possibly mined for sand during WW II, and the pits subsequently filled with trash of the same era. In the late 1980's and early 1990's the north side of the dune was mined for sand in connection with resort development; the pits remain as open holes to this day.

As many as 8 individual burials from the central portion of the dune (Site 4488) have been documented (Kennedy 1992, Carson *et al*. 1996) and an isolated skeletal element was recovered on the ground surface near SP-7 during fieldwork for the SAIS, presumed to be a bone displaced from one of the eight burials. The SAIS study identified relatively shallow disturbance (roads, trash pits, areas of fill) across the dune, but deep, intact aeolian and marine deposited sand deposits remain. The upper 1.5 m of these intact sand deposits exhibit an increased potential for encountering cultural deposits in future excavations and encompass approximately 22,300 sq m (5.5-acres; 68.7%) of Test Area C. The area of increased potential for cultural deposits is depicted in *Figure 164.*

Test Area D is located inland of the forested sand dunes parallel to the shoreline on the west side of Kaihalulu Bay and is undeveloped. The terrain is fairly level and varies in elevation from c. 4 ft to 16 ft. The south one-third of Test Area D contains aeolian sand deposits to a depths exceeding 2.8 m above the water table, overlying gley deposits. The northeastern two-thirds of Test Area D contain c. 0.1 to 3.8 m of tsunami deposits overlying alluvial deposition formed on tropical peat or the limestone substrate. The absence of surface sites in Test Area D can be attributed to widespread land modification associated with the Kahuku Army Airfield and the destructive effects of the 1946 tsunami. Subsurface cultural deposits were identified between 1988-1992 on the north side of Area D at Site 6411-Feature C and Site 6419.

Stratified subsurface prehistoric habitation deposits, including an adult burial, were documented in association with the aeolian deposition at the south end of Test Area D. These deposits are exposed from 0.30 to 0.80 m bgs at Site 7289. Intact stratified subsurface prehistoric habitation deposits were also documented in alluvial deposits in the center of Test Area D at Site 7290 from 0.17 to 0.85 m bgs; Kahuku Army Airfield deposits (Site 7275) seal the underlying prehistoric deposits. Similarly, widespread subsurface prehistoric habitation deposits were documented at the north end of Test Area D, where Site 7291 was documented from 0.38 to 3.53 m bgs in association with alluvial deposition and sealed by Airfield deposits or tsunami deposits. Buried alluvial A horizons that could contain subsurface cultural deposits were identified in an area between Sites 7290 and 7291. Because of the demonstrated association between prehistoric habitation deposits and burials, intact deposits around the prehistoric sites in Test Area D exhibit an increased potential to contain cultural deposits. These deposits and the areas of the three sites comprise approximately 36,500 sq m (9 acres; 56%) of Test Area D. The extent of these areas is presented in *Figure 165*.

Table 6. Summary of burials identified on TBR property

Site Number	Burial Number	Location	Number of Burials	Researchers	Description	Final Disposition of Remains
4488*	11-14, 17	West side of Kaihalala Bay - Test Area C	8	Kennedy (1992), Maly and Rosendahl (1992), Carson *et al.* (1996, 1999), Haun et al. (2012)	Burials 11-14 consist of 4 disturbed burials (3 sub-adults; 1 adult female) removed from dune south of Kulima Point (Kennedy 1992). Disturbed remains of 3+ adults and 1 bone from sub-adult noted by Carson *et al.* (1996, 1999) in same area and designated as Burial 17. Wood and nails suggesting a coffin were found in associated with one set of the Burial 17 remains. Burials 11-14 reinterred following Maly and Rosendahl (1992) BTP. Burial 17 curated with SHPD in 1996 and subsequently reinterred. Isolated metatarsal identified during SAIS	Burials 11-14, 17 Reinterred, Treatment of metatarsal to be determined by O'ahu Island Burial Council (OIBC)
6410	1	TU-20, Makai Test Area A	1	Bath et al. (1984), Walker et al. (1988a), Jensen (1989), Maly and Rosendahl (1992), Kalima (1993)	Adult female burial in wooden coffin within stone-lined cyst noted 1st by Bath et al. (1984), then Walker et al. (1988a). Burial disinterred following guidelines in (1989b) mitigation program. Osteological analysis by conducted by Kalima (1993). Burial reinterred at Reinterment Site as specified in Maly and Rosendahl (1992) Burial Treatment Plan (BTP).	Reinterred
6410	2	TU-9	1	Walker et al. (1988a), Jensen (1989), Maly and Rosendahl (1992), Kalima (1993)	Adult male burial in flexed position noted in pit feature (HF-45) by Walker *et al.* (1988a). Burial disinterred as part of Jensen (1989b) mitigation program. Osteological analysis by Kalima (1993). Burial reinterred following Maly and Rosendahl (1992) BTP.	Reinterred
6410	3, 4, 5, 6, 9	Makai Test Area A	5	Sullivan (1991), Jensen (1989), Maly and Rosendahl (1992), Kalima (1993)	Human remains noted during monitoring of grading for Hotel H-2. Two clusters of two burials found 15 m apart. Burial 3 is a juvenile, Burial 4 is a infant, Burials 5 and 6 are adults. Burials disinterred following guidelines in Jensen (1989b) mitigation plan. During osteological analysis of Burials 5 and 6 by Kalima (1993), single humerous of third individual was noted, designated as Burial 9. Burial reinterred following Maly and Rosendahl (1992) BTP.	Reinterred
6423	7	BT-1, TUs 11 and 13, East side TBR Property	1	Sullivan (1991), Jensen (1989b), Maly and Rosendahl (1992), Kalima (1993)	Human remains noted during monitoring at Site 6423 area, found within a natural sinkhole feature used as a burial pit (HF-12). Cranium and infracranial skeletal remains interpreted as those of female adult from 25 to 30 years of age. Burials disinterred following guidelines in Jensen (1989b) mitigation plan and analysis conducted by Kalima (1993). Burial reinterred following Maly and Rosendahl (1992) BTP.	Reinterred
6423	8, 10	TU-14, East side TBR Property	2	Sullivan (1991), Jensen (1989b), Maly and Rosendahl (1992), Kalima (1993)	Human remains noted during monitoring at Site 6423 area, beneath resort access road and west fork of Marconi Road. Remains were partially articulated and are those of adult female. Burials disinterred following guidelines in Jensen (1989b) mitigation plan and osteological analysis conducted by Kalima (1993). During analysis, fragmentary remains of an additonal sub-adult were found and designated as Burial 10. Both sets of remains reinterred following Maly and Rosendahl (1992) BTP.	Reinterred
6411	15, 19	East Kahuku Point Burial Area	5	Neller (1984), Walker *et al.* (1988b), Maly and Rosendahl (1992)	Burial 15 noted in dunes east of Kahuku Point was exhumed and examined by SHPD (Neller (1984) and determined to be two complete skeletons and one partial skeleton. Walker *et al.* (1988b) identified two burials (Burial 19) in pits in TU-2 in Area B. Burial 19 was re-buried in original location.	Reinterred (Burial 15), Left *in situ* (Burial 19)
6411	16, 18	West Kahuku Point Burial Area	2	Neller (1989), Walker *et al.* (1988b), Maly and Rosendahl (1992)	Burial 16 noted in dunes to west of Kahuku Point and exhumed by Honolulu Police. Remains were subsequently examined by SHPD (Neller (1989). Burial 18 identified by Walker *et al.* (1988b) in TU-24 in Area A. Burial 18 was re-buried in its original location.	Reinterred (Burial 16), Left *in situ* (Burial 18)
7288	-	Test Area B	1	Haun et al. 2012	Burial identified during trenching in Test Area B in BT-B-6-2. Primary sub-adult burial, estimated age of 6 to 8 years, undetermined gender. Displaced remains reburied in original location	To be determined by OIBC
7289	-	Test Area D	1	Haun et al. 2012	Burial identified during trenching in Test Area D in BT-D-2-1b. Complete adult male primary burial. Displaced remains reburied in original location	To be determined by OIBC
		Total	**27**			

4488* - isolated metatarsal likely element of a previous identified burial

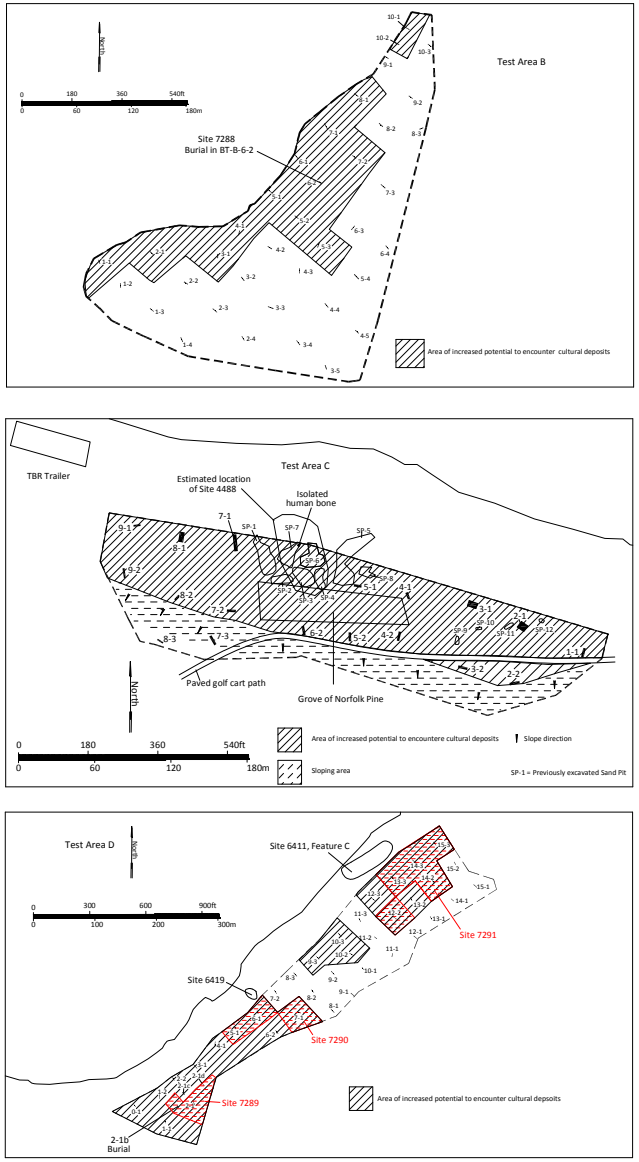


Figure 163. Areas of increased potential for encountering cultural deposits in Test Areas B-D

Test Area E is a relatively level, low lying and currently undeveloped ironwood and *haole koa* forest east of Punahoʻolapa Marsh. The ground surface of Test Area E was extensively modified during construction of the main NW-SE runway of the Kahuku Army Airfield (Site 7275) and peripheral support facilities. A sod farm and nursery formerly used by the resort occupied the south end of Test Area E in the recent past. Testing in Area E documented widespread fill deposits associated with the Airfield overlying alluvial deposits and gley developed on the limestone substrate. WW II-era fill deposits vary in depth from 0.25 to 1.38 m bgs. Where preserved, alluvial deposition was encountered 0.16 to 0.82 m bgs, overlying gley or the limestone substrate. Many fill deposits directly overlie bedrock in Test Area E, but where no fill deposits were encountered, testing documented that alluvial deposits overlying gley or limestone were at least 0.45 to 0.82 m deep. Five subsurface prehistoric habitation sites were identified as a result of testing in Area E (Sites 7292-7296). All are associated with buried alluvial deposition and overlying fill seals many of the cultural deposits. Prehistoric subsurface cultural deposits cover approximately 14,325 sq m (3.5-acres) or 5% of Test Area E.

Test Area F is characterized by widespread surface disturbance associated with 20th Century infrastructure for the OR&L railroad, the Kahuku Army Airfield barracks, the Palmer golf course and ancillary access roads. Although intact alluvial deposits are preserved across much of Test Area F, no evidence of prehistoric subsurface cultural deposits was encountered. It is possible that prehistoric cultural deposits were destroyed as a result of 20th Century land modification, but the potential to encounter intact prehistoric cultural deposits or burials in Test Area F is negligible.

Test Area G consists entirely of alluvial Waialua Silty Clay and was sampled by excavating one-trench per acre. The soil is more suitable for agricultural use rather than habitation and not surprisingly, no evidence of historic or prehistoric habitation was encountered. Test Area G exhibits very low potential for encountering subsurface cultural deposits or burials.

Historic Sites

One site that is potentially prehistoric to early historic in age, is Site 7283, a possible agricultural mound. One of the burials previously documented at Site 4488 was associated with coffin remnants including square nails that likely indicate interment in the 1800s. A section of dry-stacked limestone wall (Site 7299), which probably functioned as a livestock wall associated with Kahuku Ranch was documented and likely dates to the mid- to late 1800s. Charles Hopkins purchased 8,000 acres at Kahuku in 1850-1851 from Kamehameha III and established the Kahuku Ranch (Haun *et al.* 2011:26-27). Forests were cleared for pasture for free-ranging herds of sheep and cattle, which soon plagued the small Hawaiian farms that were scattered throughout the area, eventually displacing many of the farmers. Hopkins land subsequently passed through a series of owners and was sold to James Campbell for $63,500.00 in 1876

In 1889, Benjamin Franklin Dillingham chartered the Oʻahu Railroad and Land Company (OR&L) and leased the Kahuku lands from James Campbell for 50 years (*ibid.*). Dillingham then subleased the lands to James Castle. Castle's Kahuku Plantation Company received its charter in 1890. The company began commercial production of sugarcane using pumped spring water, streams and rain for irrigation. The first sugarcane crop from 2,800 cultivated acres was harvested in 1892. *Figure 164* is based on an 1890 map of Kahuku Plantation and shows areas in sugarcane cultivation. A series of walled enclosures correspond to LCAs surrounding Punahoʻolapa Marsh. An old school and a church are located seaward of the Old Government Road and the Kahuku Ranch buildings are located in the central portion of the TBR property, immediately west of the marsh. The Site 7299 wall (see *Figure 84*), initially identified by Bath *et al.* in 1984, that may be a remnant of a ranch wall shown on *Figure 164*, extends from the inland side of the marsh to the coast east of Kahuku Point.

Bath *et al.* (1984:33) identified another wall site (T-2) on the east side of the marsh that probably was part of the Kahuku Ranch facility (see *Figure 164*). Although not mapped, the site was described as "an L-shaped stacked coral wall. The SE leg is 30 meters long; the NE leg was not followed beyond 40 meters from the wall corner. It appears to go out into the present marsh" (*ibid.*). These walls described by Bath *et al.* are probably part of the

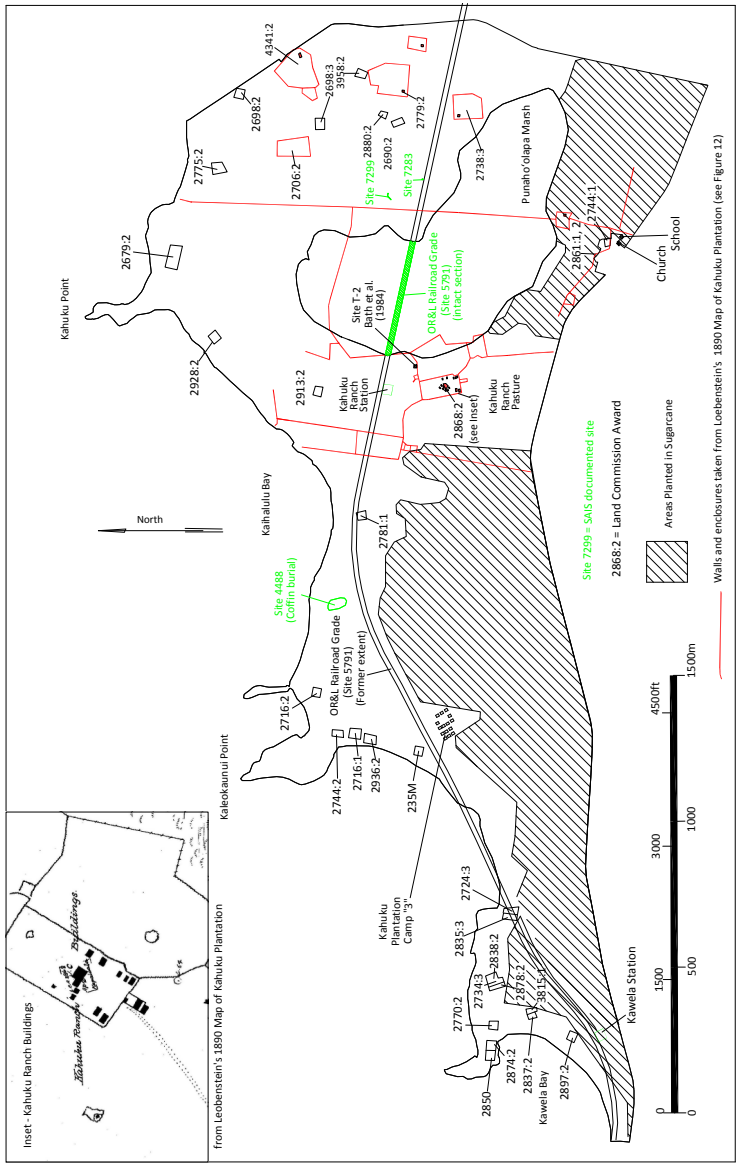


Figure 164. Mid-1800s to early 1900s Sites

complex of walls depicted on *Figure 164* on the east side of the Kahuku Ranch buildings based on Loebenstein's 1890 map of Kahuku Plantation (see inset *Figure 164*).

By 1900, the OR&L Railroad line (Site 5791) extended from Honolulu to Kahuku. Site 5791 is an intact portion of the OR&L railroad grade that consists of a 475 m long causeway extending across Punaho'olapa Marsh (see *Figure 166*). By the early 1900s there were railroad stations at Kawela, Kahuku Ranch, and Marconi. A plantation camp was established along the railroad between Kawela and Kahuku Ranch Stations to house plantation workers by at least 1932 (see *Figure 164*, "Camp 3"). Marconi Station was located just east of the TBR property at Punamanō Marsh.

Two sites, and potentially a third, date to the early 1930s operation of Marconi Station that was situated adjacent to the TBR property near Kahuku Point (*Figure 165*). The wireless communication facility was established by the Marconi Company in 1914, and its operation was taken over by Radio Corporation of America (RCA) by the 1930s (Bennett 2011:52). The SAIS survey documented two concrete structures (Sites 7279, 7282; see *Figures 51-55*) that functioned to support the station's extensive antenna array (see *Figures 56-57*). Site 7280 is an unusual octagonal concrete structure that also potentially served to support an antenna and may also date to the station's operation in the 1930s (see *Figure 59*). A nearly identical octagonal structure was reported by Bath *et al.* (1984) in the same vicinity as 7280 (Site T-4), but differences in reported dimensions and location indicates it is not the same feature identified at Site 7280, but rather a second one.

The majority of the sites (22 of 39) documented by the SAIS work are associated with the Kahuku Army Airfield (see *Figure 165*). The SIHP Site Number 7275 is applied to the main runway in Area E, but is also used here generically to refer to the entire airfield facility. The airfield was a large military complex covering 12,000 acres, that was initially transferred by the James Campbell Estate to the US Navy for use as a bombing range and subsequently to the US Army for use as an airfield. Construction on the runway began in December 1941 and the airfield was in use until March 1946, and was not returned to the landowner until sometime between June 1947 and March 1948 (Bennett 2011: 52, 59).

David Trojan of the Hawaiian Aviation Preservation Society (Trojan, n.d.) presents a brief history of the construction and use of the airfield:

> There are references to Kahuku as an emergency field dating to the 1930's, but it was not until the United States entered World War II that the airfield was developed. Kahuku Army Airfield was classified as an auxiliary field and had a very short life span, from 1942 until it was closed in the late 1940's. Ground troops were stationed in the area to protect the airfield and man the shoreline fortifications. The northern tip of Oahu had a total of three airfields in close proximity during World War II. The Kahuku Point Airfield was located near the tip of Kahuku Point, and was evidently the most elaborate.
>
> The Kahuku Army Airfields were used for training of pilots from Wheeler AAF for instrument flying on different types of aircraft. The airfield was ideal for training because it had a good approach, runway length, and take off clearance. This field was not over populated like Hickam or Wheeler. It is documented that the 18th Air base Group, 47th Pursuit Squadron was stationed there along with B-24s and B-17s that were based at Kahuku for short periods of time during World War II.

The Airfield encompassed runways, taxiways, revetments, bunkers and artillery emplacements. A composite of three blueprint sheets of the airbase shows its various components (see *Figure 17*); note the U-shape revetments used for airplane storage located adjacent to the runways. A recent aerial photograph of the TBR property (Figure 20 in Haun *et al.* 2011:36) shows the extent of the Kahuku Army Airfield facility superimposed on it as well as a large area for barracks and other facilities inland of the Airfield (see *Figure 11*). The Airfield, revetments and barracks occupied approximately 195 acres (23%) of the TBR property.

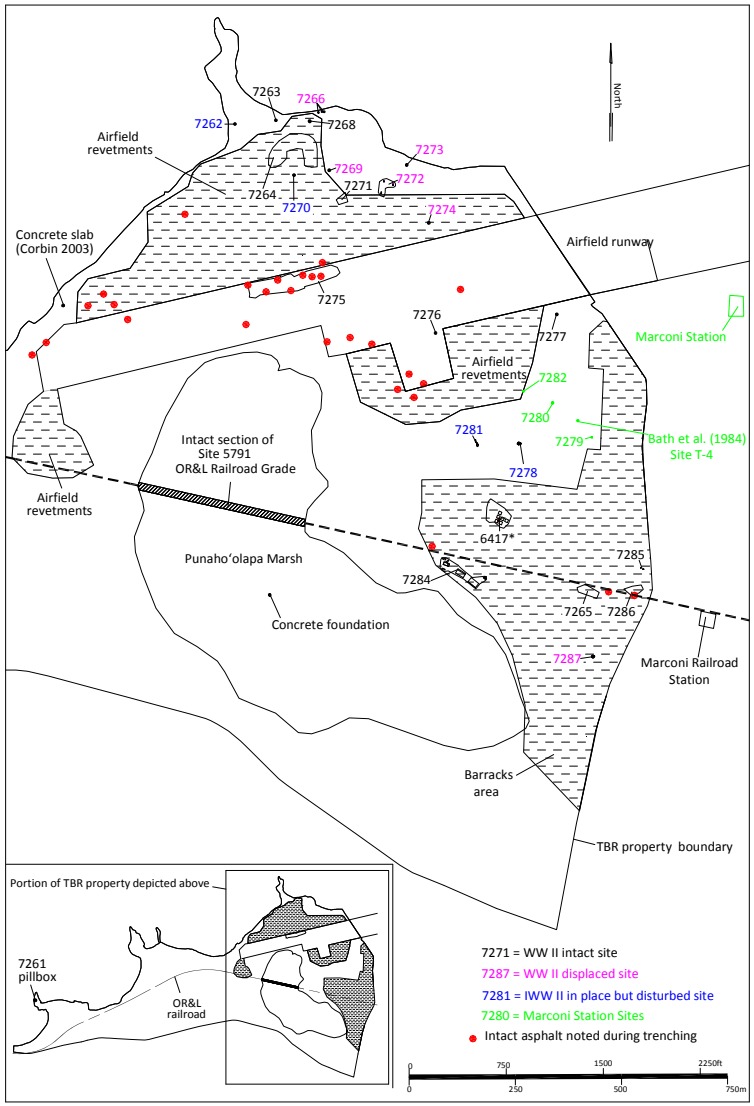


Figure 165. World War II and Marconi Station Sites

The surviving remnants of the airfield recorded during the SAIS fieldwork consist of a concrete pillbox located at Kawela Bay (Site 7261; see inset *Figure 165*), 11 sites located in the Kahuku Point Archaeological Preserve (Sites 7262-7264, 7266 and 7268-7274), six sites located in Test Area E (Sites 7275-7278 and 7280-7281) and five sites located in Test Area F (Sites 7265 and 7284-7287). Although many of the structures are displaced and badly damaged, likely by tsunami in 1946 and 1957 and during the construction of the golf course, intact remnants of the complex are present. *Figure 165* depicts the distribution of all World War II era sites documented by the SAIS and prior studies.

The central feature of the Airfield facility is Site 7275, a 717' long section of the original 6,500' long airfield runway. The NE-SW main runway served as the primary feature of the airfield and was used for pilot training. Following the war, the runway was used as a race course and as a civilian airfield. An intact earthen revetment (Site 7264) is present to the north of the runway, used for the storage and protection of the military aircraft. It is the only documented revetment of 32 or more that were situated on the north and south sides of the main runway. As is illustrated in *Figure 165*, the extant exposed portion of the runway represents a tiny portion of the overall surface. The SAIS subsurface testing encountered intact asphalt pavement in 27 locations that are depicted as red dots on *Figure 165*. The dots shown within the area of the Site 7275 portion of the runway are surface exposures of the pavement and the other red dots denote intact runway pavement in subsurface contexts in test trench walls. The dots within the runway foot-print shown on *Figure 165* were part of the main runway and the ones situated elsewhere represent remnants of taxiways, service aprons, roads, and other paved areas; however, no attempt was made to correlate these with specific features.

Figure 165 color codes the Airfield SIHP site numbers with degraded physical integrity, in which pink indicates displaced remains, and blue indicating in place, but damaged features. All except for one of the displaced sites are situated adjacent to the shoreline and probably represent structural remnants that were displaced by the 1946 and/or 1957 tsunamis. The one displaced structure situated inland is Site 7287, located in the airfield barracks area (see *Figure 83*). The structure is situated upside down on a mechanically-piled berm of boulders and other debris. Site 7287 appears to be identical to a relatively intact concrete structure, Site 7278 (based on dimensions and other construction attributes), situated in the central portion of the airfield facility in between the main runway and the inland barracks area (see *Figures 48-50*). Two other sites consist of concrete structural remnants that probably are from the same type of structure (Sites 7272 and 7281). The structures all are interpreted as possible gun positions, potentially open revetments for anti-aircraft guns, based on their morphology and locations around the periphery of the main runway facility.

Figures 166 and *167* show the locations of several sites associated with the Airfield. *Figure 166* is a 1942 aerial photograph showing the Airfield facility as originally constructed. It shows the OR&L Railroad line (Site 5791) extending through the facility and the probable locations of several sites along the rail line. The railroad was used to transport troops to base (Bennett 2011). A group of faintly visible structures potentially includes a cluster of six concrete pads recorded as Site 6417 by Corbin (2003; see Haun *et al.* 2011:63, Figure 32). *Figure 167* is a 1943 map of the main cantonment, or barracks area from Bennett (2011:54). It shows the same area depicted in the *Figure 166* aerial.

The map (see *Figure 167*) also shows the location of the most intact group of Airfield structures on the TBR property. These are the foundations of three buildings at Site 7284 (Features A, B and D) that were apparently constructed in 1943 based on their absence in the aerial photograph from the previous year. Also shown are the locations of the Site 7265 concrete slab and Site 7286 pavement. The concrete slab apparently was the foundation for a large building, probably a warehouse situated on the inland side of the OR&L railroad. The Site 7286 asphalt pavement is correlated with an expanse of pavement at a road intersection on the seaward side of the railroad grade. Trench F-3-9 was excavated on the inland side of the pavement and encountered an asphalt pavement overlying probable railroad grade fill indicating the Site 7286 pavement also served as a railroad crossing. The gate posts recorded as Site 7285 probably were positioned on either side of a main road leading from this paved intersection seaward toward the main runway. The estimated locations of the slab, pavement, and gate posts are also shown on the *Figure 166* aerial photograph.

The remaining site identified during the SAIS fieldwork is an abandoned 1950s era bus in Test Area A (see *Figures 31-34*). The Site 7267 bus was operated by the Honolulu Rapid Transit Company for the City and County of Honolulu until at least 1973. Sugarcane cultivation continued until 1971 when the Turtle Bay Resort and golf course were constructed. Some inland portions of the property continued to be used for vegetable farming until the 1980s.

Consultation

This SAIS Plan was prepared in consultation with DLNR-SHPD, the Office of Hawaiian Affairs (OHA), and the Oʻahu Island Burial Council (OIBC). The consultation ensures that the work complies with applicable laws, regulations and rules. This consultation also ensures that the Plan reflects a mutually acceptable scope of work for the SAIS fieldwork prior to implementation. Consultation with the OIBC included an informational briefing regarding the SAIS work to solicit input regarding the study, and to identify any additional interested parties.

The consultation process sought input from interested organizations and individuals, including the local community, Hawaiian cultural organizations, potential lineal and cultural descendants and individuals knowledgeable about the TBR property cultural resources and land use history. SAIS consultation included TBR management meetings with the Kahuku Burial Committee (KBC), composed of families who have a connection to TBR lands and who have expressed a desire to take an active role in caring for ancestral remains on the property. Consultation also included TBR management meetings with the Koʻolauloa and Koʻolaupoko Hawaiian Civic Clubs. TBR management has invited cultural practitioners, *kūpuna* and knowledgeable individuals to be part of a cultural advisory council to share their *mana'o* on the cultural issues associated with TBR.

Public notices seeking to identify interested parties, including potential lineal and cultural descendants, were published in Honolulu Star-Advertiser (May 5, 2011) and the monthly OHA newsletter Ka Wai Ola (June 2011). Two responses to the notices were received, including one individual who owns a *kuleana* parcel surrounded by the TBR property.

Consultation is also part of the Cultural Impact Assessment (CIA) prepared by Pacific Legacy, Inc. for the TBR property and was conducted in accordance with HAR §13-13-284-(c)-(3) and §13-13-276-5-(g). The CIA study concluded:

> In summary, the Turtle Bay Resort property contains an array of cultural resources that are currently being used for traditional cultural practices, including marine food sources, medicinal plants, plants used in crafts, wood for woodcarving, and salt for various uses. The presence of human burials on the property has also been established. Furthermore, supernatural and/or divine phenomenon in the project area experienced by a few informants and acknowledged by others, suggests that there is still cultural significance and spiritual connection for those who have ancestral ties to the land (Mooney and Cleghorn 2012:75).

The DLNR-SHPD and KBC were consulted concerning SAIS identification of all human remains. KBC members conducted a site visit following the identifications and provided cultural protocols for the isolated bone at Site 4488 in Test Area C and the burials in Test Area B (Site 7288) and Test Area D (Site 7289). According to a memorandum dated March 12, 2012, from the KBC to TBR and Haun & Associates, at a Committee meeting on March 8, 2012, the Committee members recommended:

1. Reburial of the isolated element in Area C at a reinterment site on TBR property where the previously discovered remains of eight individuals from the same location were reburied;
2. Preservation in place for the burial in Test Area D because it is situated in area that the TRB Revised Master Plan designates for park use; and

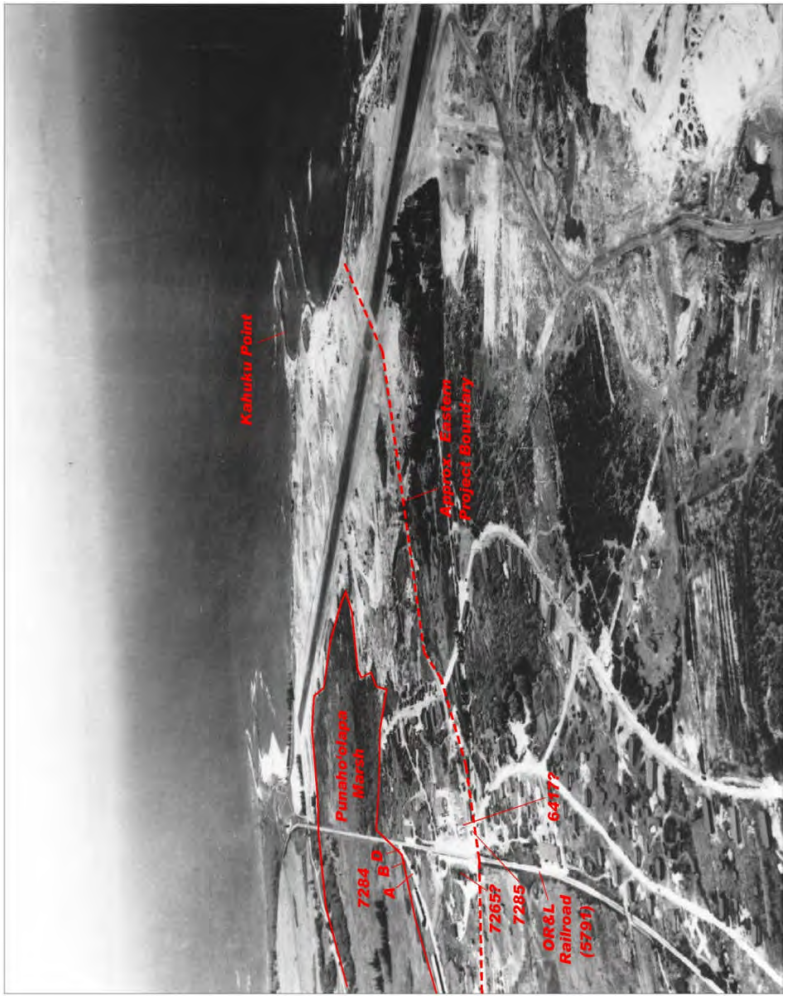


Figure 166. August 20, 1942 photograph of Kahuku Army Airfield

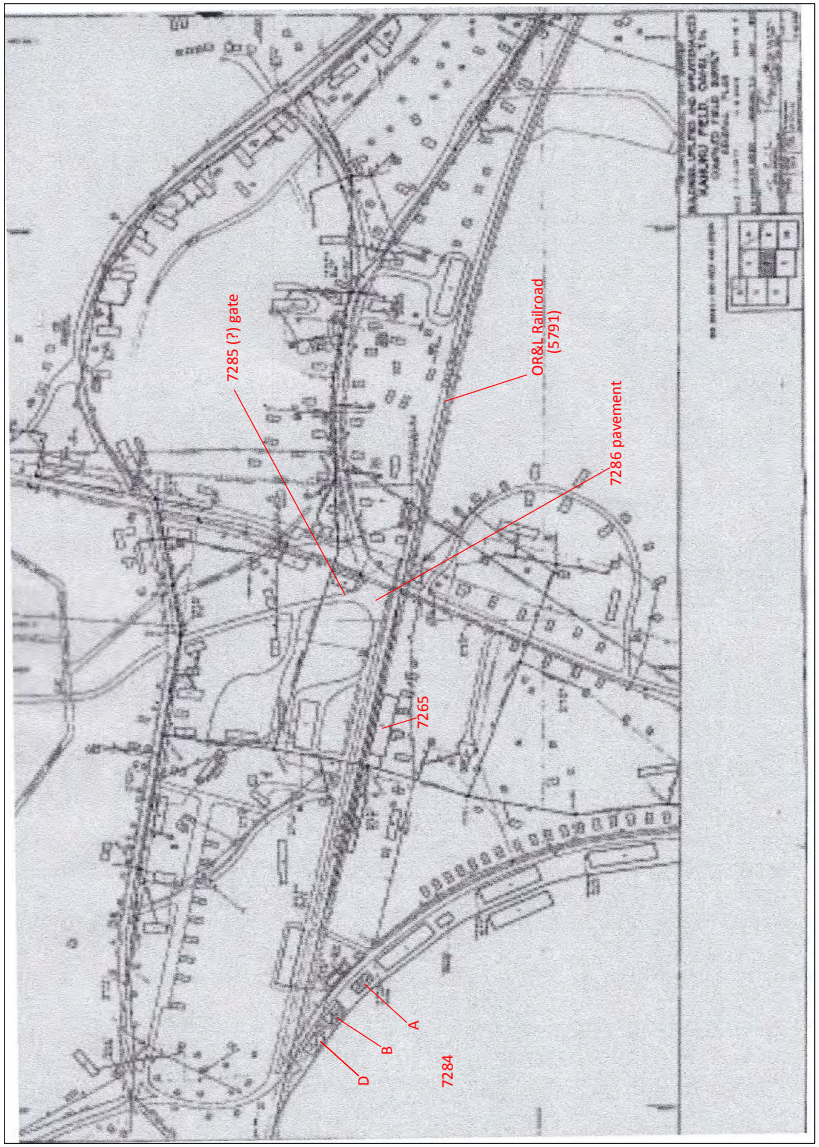


Figure 167. Main cantonment of Kahuku Army Airfield (from Bennett 2011:54)

3. Relocation of the Test Area B burial to a permanent preservation site within a Revised Master Plan-proposed park in Hanakaʻoe Ahupuaʻa.

The Committee further recommended that planned park areas be used for reburial of any future inadvertently discovered burials from the same *ahupuaʻa*. TBR concurs with the KBC's recommendations on disposition of the three previously identified human remains.

Significance Assessments

Pursuant to DLNR (2003) Chapter 275-6 (d), the initial significance assessments provided herein are not final until concurrence from the DLNR has been obtained. The sites documented during the survey are assessed for significance based on the criteria outlined in the Rules Governing Procedures for Historic Preservation Review (DLNR 2003: Chapter 275). According to these rules, a site must possess integrity of location, design, setting, materials, workmanship, feeling, and association and shall meet one or more of the following criteria:

1. Criterion "a". Be associated with events that have made an important contribution to the broad patterns of our history;

2. Criterion "b". Be associated with the lives of persons important in our past;

3. Criterion "c". Embody the distinctive characteristics of a type, period, or method of construction; represent the work of a master; or possess high artistic value;

4. Criterion "d". Have yielded, or is likely to yield, information important for research on prehistory or history; and

5. Criterion "e". Have an important traditional cultural value to the native Hawaiian people or to another ethnic group of the state due to associations with traditional cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts--these associations being important to the group's history and cultural identity.

Table 7 lists the significance assessments and recommended treatments for the 39 sites documented by the SAIS project. Two other sites the Kahuku Point Archaeological Preserve (Site 6411) and Punahoʻolapa Marsh (Site 6412) are also included in the table for a comprehensive list of extant sites on TBR property. These two sites were previously assessed as significant for their research value and approved for data recovery (Walker *et al.* 1987); however, the landowner subsequently elected to preserve both sites. The remaining 39 sites are all assessed as significant under Criterion "d". The sites have yielded information important for understanding prehistoric and historic land use in project area. Two sites (7261 and Features A, C and D of 7284) are assessed as significant under Criterion "c" as good site type examples because they are the most intact remaining structures on TBR property that are associated with Kahuku Army Airfield. Three sites are additionally assessed as significant under Criterion "e" because human burials of probable Hawaiian ancestry are present (Sites 4488, 7288 and 7289).

Recommended Treatments

The mapping, written descriptions and photography at 16 sites adequately document them and no further work or preservation is recommended (see *Table 7*). These sites consist of World War II era features (Sites 7265, 7275-7278, 7281 and 7284-7287), three sites that date to the early 1930s used in conjunction with Marconi Station (Sites 7279, 7280 and 7282), a stone wall (Site 7299), a stone mound (7283) and an abandoned 1950s era bus (Site 7267).

Treatment of the human remains identified at Sites 4488, 7288 and 7289 will be determined by the O'ahu Island Burial Council (OIBC) in consultation with the Kahuku Burial Committee, other SHPD-recognized lineal or cultural descendants, and TBR. The determination process will require preparation of a Burial Treatment Plan.

Fourteen sites and two features of an additional site are recommended for preservation. These sites consist of the Kahuku Point Archaeological Preserve (Site 6411) and Punaho'olapa Marsh (Site 6412), the extant section of the Site 5791 railroad grade across the marsh, the Site 7261 military pillbox and 11 WWII-era sites situated within the boundaries of the Kahuku Point Archaeological Preserve (Sites 7262-7264, 7266 and 7268-7274).
The eight remaining sites (Sites 7283 and 7290-7296) and the non-burial portion of Site 7289 retain the potential to yield information important for understanding prehistoric and early historic land use. These sites are recommended for data recovery, which would entail excavation to obtain a larger sample of portable remains and dating samples. The plans for data recovery would be detailed in a Data Recovery Plan prepared for DLNR-SHPD review and approval.

Specific plans for treatment of the burial features would be detailed in a Burial Treatment Plan prepared for DLNR-SHPD and the O'ahu Island Burial Council (OIBC) review and approval. Measures to protect the non-burial sites recommended for preservation would be described in an Archaeological Site Preservation Plan prepared for DLNR-SHPD review and approval.

It is also recommended that all ground disturbing activities within the project area be monitored by an archaeologist. The extent and nature of this monitoring activity would be described in an Archaeological Monitoring Plan prepared for DLNR-SHPD review and approval. The monitoring plan should have provisions for variable intensity monitoring. The highest intensity would be for areas determined to have an increased potential for encountering cultural deposits (see *Figure 163*). At a minimum, construction excavation work in these areas should be done in a manner that maximizes archaeological monitoring effectiveness. The excavation of sand should be done by excavators and not with bulldozers or graders. Each excavating machine should have at least two monitors; one observing the excavation equipment as it digs and the other scanning the excavated material.

Table 7. Site Significance and Recommended Treatments

SIHP Site No.	Formal type	Function	Area	Significance Criteria	Recommended Treatment
4488	Human remains	Burial	C	D, E	OIBC*
5791	Railroad grade	Transportation	Punaho'olapa Marsh	D	PR
6411	Cultural deposit with burials	Habitation/Burial	Kahuku Point	D, E	PR
6412	Punaho'olapa Marsh	Agriculture/Resource Area	Punaho'olapa Marsh	D	PR
7261	Concrete structure	Gun position	Kawela Bay	C, D	PR
7262	Concrete slab	Indeterminate	Kahuku Point	D	PR**
7263	Concrete pier block	Antenna support?	Kahuku Point	D	PR**
7264	Revetment	Storage	Kahuku Point	D	PR**
7265	Concrete slab	Foundation	F	D	NFW
7266	Concrete pier blocks	Antenna support?	Kahuku Point	D	PR**
7267	Transit bus	Transportation	A	D	NFW
7268	Concrete structure	Indeterminate	Kahuku Point	D	PR**
7269	Concrete structure remnant	Indeterminate	Kahuku Point	D	PR**
7270	Metal tank	Storage	Kahuku Point	D	PR**
7271	Asphalt area	Transportation	Kahuku Point	D	PR**
7272	Concrete structure	Gun position?	Kahuku Point	D	PR**
7273	Concrete block	Indeterminate	Kahuku Point	D	PR**
7274	Concrete cylinder	Possible light fixture base	Kahuku Point	D	PR**
7275	Asphalt area	Runway remnant	E	D	NFW
7276	Concrete block	Anchor base	E	D	NFW
7277	Concrete slab	Foundation	E	D	NFW
7278	Concrete structure	Gun position?	E	D	NFW
7279	Concrete block	Antenna support?	E	D	NFW
7280	Concrete structure	Antenna support?	E	D	NFW
7281	Concrete structure	Gun position?	E	D	NFW
7282	Concrete block	Antenna support?	E	D	NFW
7283	Stone mound	Possible agricultural	F	D	NFW
7284	Foundation Complex	Military Support	F	D	NFW
7285	Metal posts	Gate	F	D	NFW
7286	Asphalt area	Pavement	F	D	NFW
7287	Concrete structures	Gun position?	F	D	NFW
7288	Human remains	Burial	B	D, E	OIBC*
7289	Cultural deposit with burial	Habitation/Burial	D	D, E	DR/OIBC*
7290	Cultural deposit	Habitation	D	D	DR
7291	Cultural deposit	Habitation	D	D	DR
7292	Cultural deposit	Habitation	E	D	DR
7293	Cultural deposit	Habitation	E	D	DR
7294	Cultural deposit	Habitation	E	D	DR
7295	Cultural deposit	Habitation	E	D	DR
7296	Cultural deposit	Habitation	E	D	DR
7299	Wall	Livestock control	Punaho'olapa Marsh	D	NFW

Signficance Criteria - C = Good site type example, D = Important for information content, E = Cultural Value
Treatments - DR = Data Recovery, PR = Preservation, NFW = No further Work
OIBC = Treatment of human remains to be determined by O'ahu Island Burial Council*
*PR** = Sites within the Kahuku Point Archaeological Preserve*

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APPENDIX A- SHPD Acceptance Letter for SAIS Plan

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

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AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
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CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
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HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

HISTORIC PRESERVATION DIVISION
KAHUHIPWA BUILDING
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December 12, 2011

Alan E. Haun, Ph.D
Principal Investigator
73-1168 Kahuna A'o road a
Kailua, Kona Hi 96740

Log# 2011.3197
Doc # 1112PA02

Dear Dr. Haun:

Re: Revised Plan for Supplemental Archaeological Inventory Survey
Lands of Kahuku, Punalau, Ulupehupehu, 'Oio, Hanaka'oe, Kawela, and 'Opana
Koolauloa District, Island of Oahu
TMK (1) 5-6-003:040-042, 044; 5-7-001:001, 013, 016, 017, 020, 022, 028, 030, 031, 033;
5-7-006:001-017, 019, 020

Thank you for the above referenced document entitled, *Plan for Supplemental Archaeological Inventory Survey, Lands of Kahuku, Punalau, Ulupehupehu, 'Oio, Hanakaoe, Kawela and 'Opana, Koolauloa District, Island of Oahu, TMK (1) 5-6-003:040-042, 044; 5-7-001:001, 013, 016, 017, 020, 022, 028, 030, 031, 033; 5-7-006:001-017, 019, 020* (Haun, A.E, Berrigan, D.M, & Henry, D. Revised November 2011). We received your report on December 1.

The plan proposes to supplement earlier archaeological inventories done of the project area, and focuses mainly on untested areas of jaucus sand and Pearl Harbor Clay deposits, and expanding study areas where burial, or significant cultural layers were found that are being proposed for development. We had asked for three corrections and all have been addressed in the revised document.

Based on the information provided in the report, we believe that an adequate study area is being proposed, and that your research question regarding site types, site density and where feasible, dates or occupation are all appropriate. This plan meets the requirements of HAR 13-284 (c). Please provide a copy of this letter, and one copy of the report, clearly marked FINAL to the Kapolei office, as well as an electronic version on CD.

Sincerely,

Pua Aiu
Administrator

APPENDIX B- Trench Profiles

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Area A Trenches

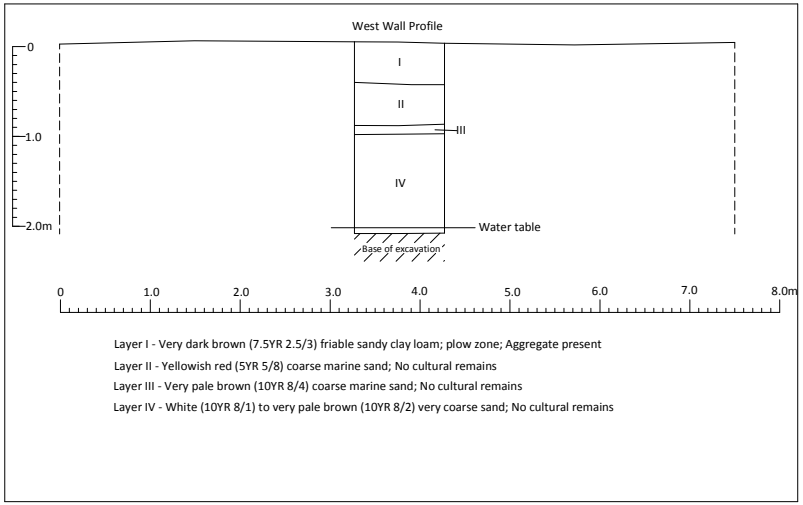


Figure B-1. Profile of BT-A-1-1

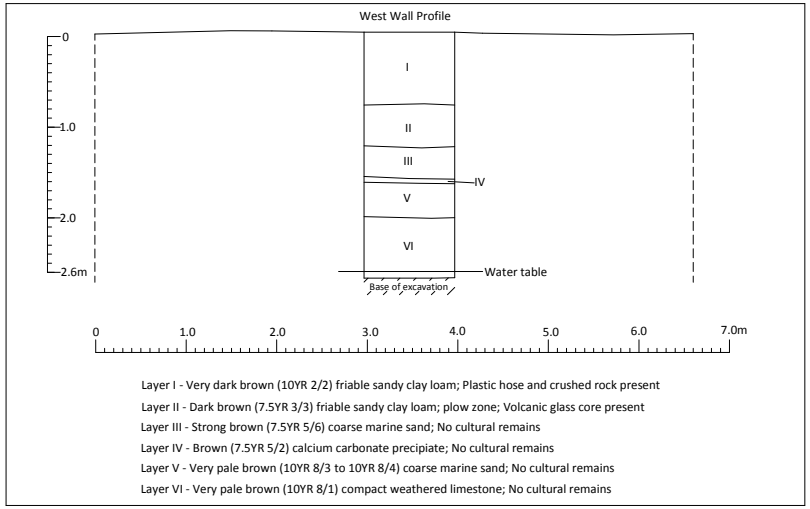


Figure B-2. Profile of BT-A-1-2

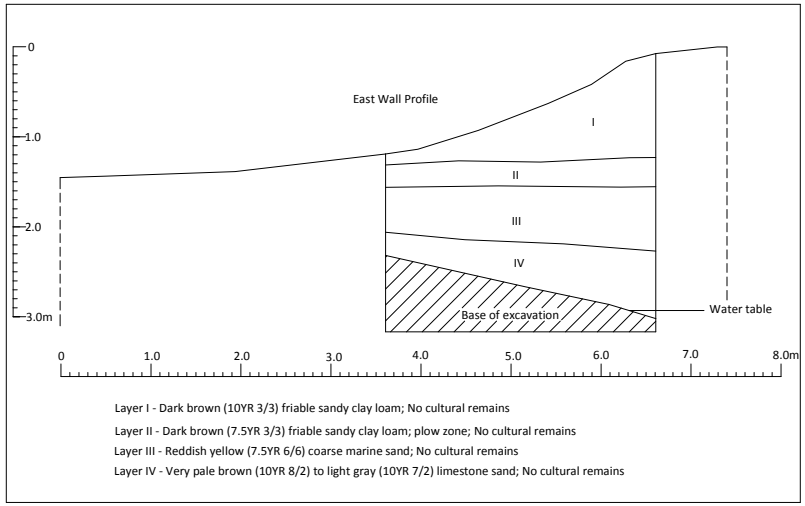


Figure B-3. Profile of BT-A-1-3

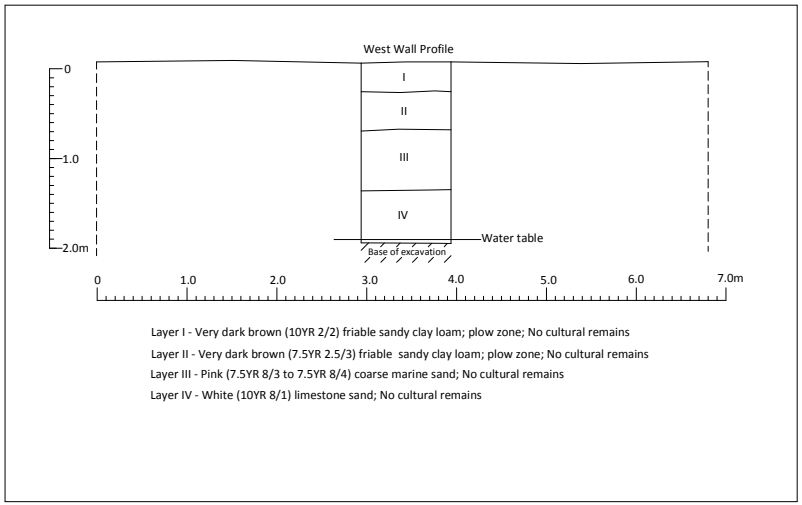
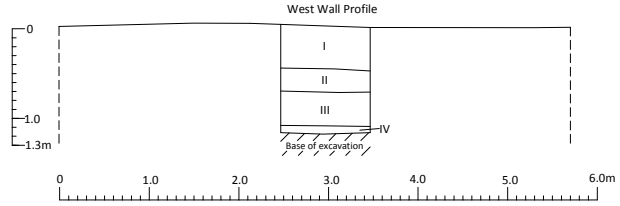
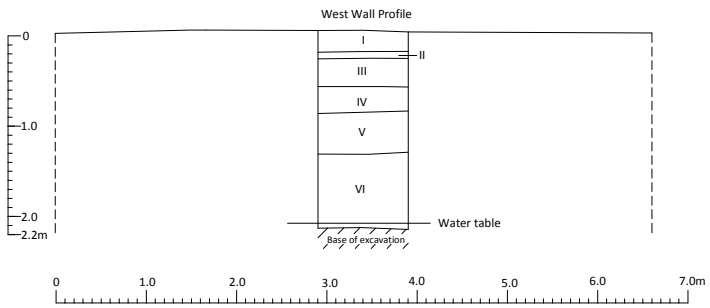


Figure B-4. Profile of BT-A-2-1



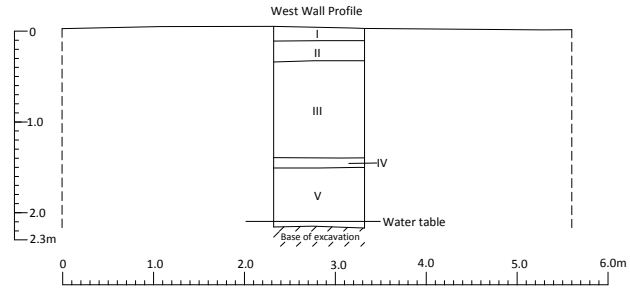
Layer I - Dark brown (7.5YR 3/2) friable sandy clay loam; plow zone; No cultural remains
Layer II - Reddish yellow (7.5YR 6/6) coarse marine sand; No cultural remains
Layer III - Very pale brown (10YR 7/3) loose aeolian sand; No cultural remains
Layer IV - Very pale brown (10YR 7/3) limestone sand; No cultural remains

Figure B-5. Profile of BT-A-2-2



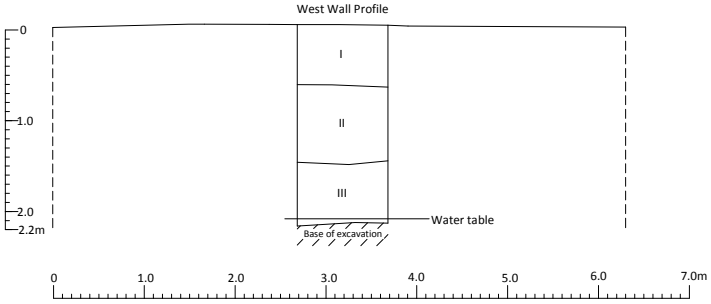
Layer I - Dark brown (7.5YR 3/3) friable sandy loam; plow zone; No cultural remains
Layer II - Light yellowish brown (10YR 6/4) loose sand; No cultural remains
Layer III - Dark brown (7.5YR 3/3) friable sandy loam; plow zone; No cultural remains
Layer IV - Reddish yellow (7.5YR 6/6) fine marine sand ; No cultural remains
Layer V - Very pale brown (10YR 8/2) coarse marine sand; No cultural remains
Layer VI - White (10YR 8/1) limestone sand; No cultural remains

Figure B-6. Profile of BT-A-2-3



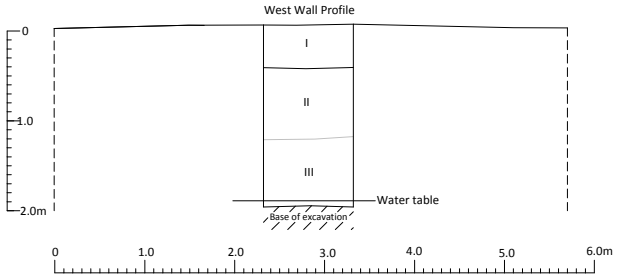
Layer I - Light yellowish brown (10YR 6/4) clay loam fill; Aggregate present
Layer II - Dark brown (7.5YR 3/2) friable sandy clay loam; plow zone; No cultural remains
Layer III - Reddish yellow (7.5YR 6/6) coarse marine sand; No cultural remains
Layer V - Very pale brown (10YR 7/3) weathered limestone; No cultural remains
Layer VI - Very pale brown (10YR 8/2) limestone sand; No cultural remains

Figure B-7. Profile of BT-A-3-1



Layer I - Very dark brown (7.5YR 2.5/3) friable sandy clay loam; plow zone; No cultural remains
Layer II - Reddish yellow (7.5YR 7/6 to 7.5YR 6/6) coarse marine sand; No cultural remains
Layer III - Very pale brown (10YR 8/2) limestone sand; No cultural remains

Figure B-8. Profile of BT-A-3-2

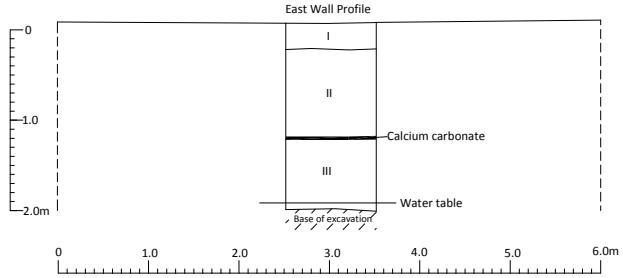


Layer I - Very dark brown (7.5YR 2.5/3) friable sandy clay loam; plow zone; No cultural remains

Layer II - Strong brown (7.5YR 5/8) coarse marine sand; No cultural remains

Layer II - White (10YR 8/1) to very pale brown (10YR 8/2) limestone sand; No cultural remains

Figure B-9. Profile of BT-A-3-3



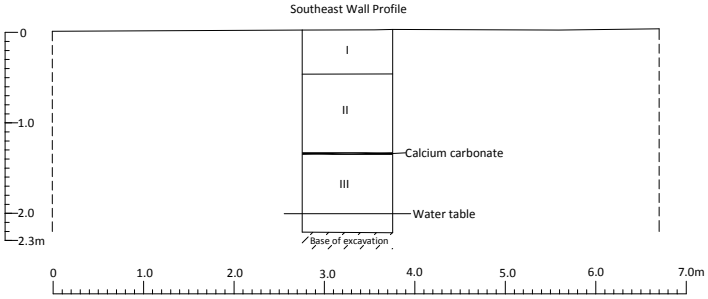
Layer I - Very dark grayish brown (10YR 3/2) to dark brown (10YR 3/3) friable sandy loam; plow zone; No cultural remains

Layer II - Very pale brown (10YR 7/4 to 10YR 8/2) coarse marine sand; No cultural remains

Calcium carbonate = Brown (7.5YR 5/2) precipitate; No cultural remains

Layer IIII - White (10YR 8/1) to very pale brown (10YR 8/2) limestone sand; No cultural remains

Figure B-10. Profile of BT-A-4-1



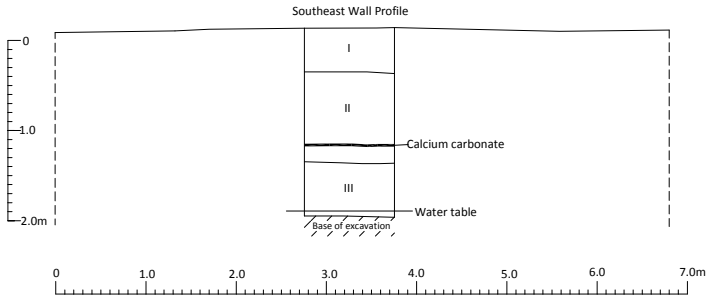
Layer I - Dark brown (10YR 3/3) friable sandy loam; plow zone; No cultural remains

Layer II - Reddish yellow (7.5YR 6/6) to very pale brown (10YR 7/4) coarse marine sand; No cultural remains

Calcium carbonate = Brown (7.5YR 5/2) precipitate; No cultural remains

Layer III - White (10YR 8/1) to very pale brown (10YR 8/2) limestone sand; No cultural remains

Figure B-11. Profile of BT-A-4-2



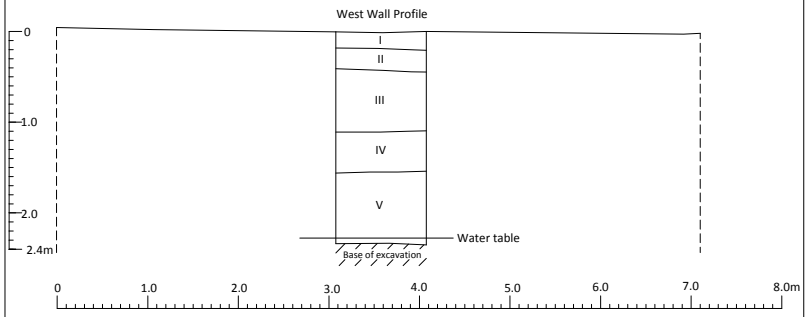
Layer I - Dark brown (10YR 3/3) friable sandy loam; plow zone; No cultural remains

Layer II - Very pale brown (10YR 8/3 to 10YR 8/4) coarse marine sand; No cultural remains

Calcium carbonate = Brown (7.5YR 5/2) precipitate; No cultural remains

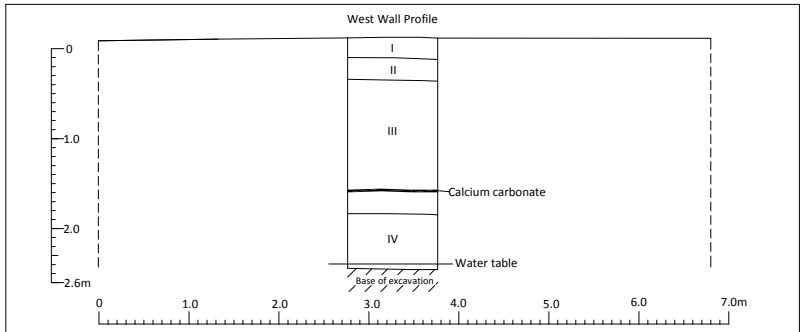
Layer III - White (10YR 8/1) to very pale brown (10YR 8/2) limestone sand; No cultural remains

Figure B-12. Profile of BT-A-4-3



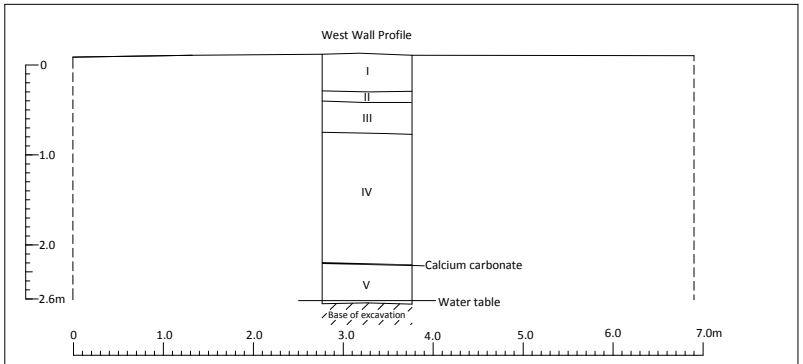
Layer I - Very dark grayish brown (10YR 3/2) to dark brown (10YR 3/3) loose silty loam fill; No cultural remains
Layer II - Pale brown (10YR 6/3) compact crushed limestone fill; Aggregate present
Layer III - Dark brown (7.5YR 3/4) to brown (7.5YR 5/3) friable bedded clay loam fill; No cultural remains
Layer IV - Brown (10YR 3/3) friable clay loam; Asphalt and metal fragments present
Layer V - White (10YR 8/1) to very pale brown (10YR 8/2) coarse marine sand; No cultural remains

Figure B-13. Profile of BT-A-5-1



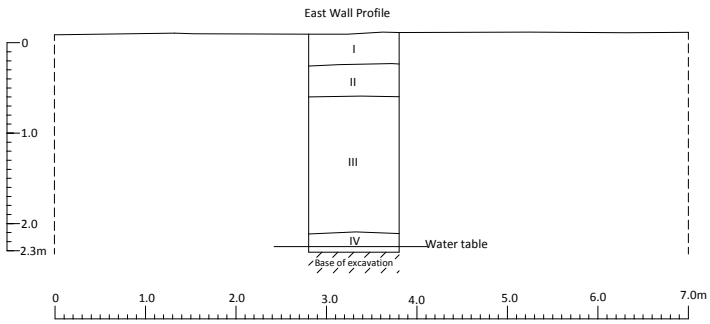
Layer I - Dark reddish brown (5YR 3/3) friable clay loam fill; No cultural remains
Layer II - Dark gray (10YR 4/1) to dark grayish brown (10YR 4/2) loose loamy sand; plow zone; No cultural remains
Layer III - White (10YR 8/1) to very pale brown (10YR 8/2) coarse marine sand; No cultural remains
Calcium carbonate = Brown (7.5YR 5/2) precipitate; No cultural remains
Layer IV - White (10YR 8/1) limestone sand; No cultural remains

Figure B-14. Profile of BT-A-5-2



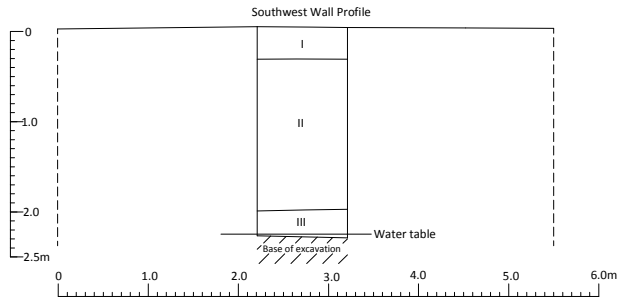
Layer I - Brown (10YR 5/3) friable clay loam fill; No cultural remains
Layer II - Dusky red (2.5YR 3/4) blocky clay fill; No cultural remains
Layer III - Very dark grayish brown (10YR 3/2) to dark brown (10YR 3/3) loose silty sand; plow zone; Charcoal flecks and plastic
Layer IV - Very pale brown (10YR 8/3 to 10YR 8/4) coarse marine sand; No cultural remains
Calcium carbonate = Brown (7.5YR 5/2) precipitate; No cultural remains
Layer V - White (10YR 8/1) limestone sand; No cultural remains

Figure B-15. Profile of BT-A-5-3



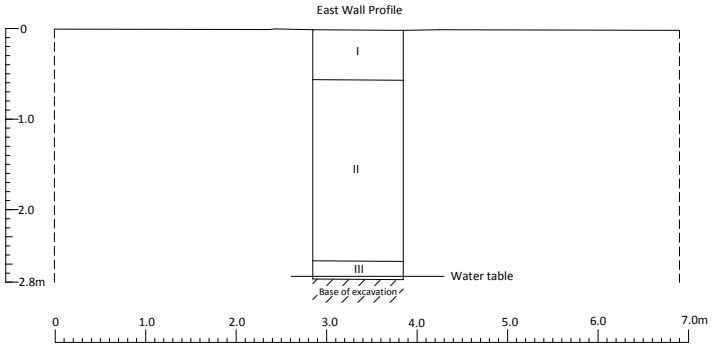
Layer I - Dusky red (2.5YR 3/4) blocky clay fill; No cultural remains
Layer II - Very dark grayish brown (10YR 3/2) loose silty sand; plow zone; Conus sp. shell
Layer III - Very pale brown (10YR 8/3 to 10YR 7/3) coarse marine sand; No cultural remains
Layer IV - White (10YR 8/1) compact sand; No cultural remains

Figure B-16. Profile of BT-A-5-4



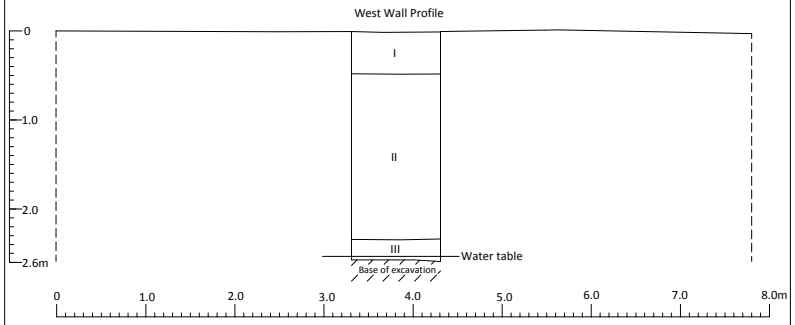
Layer I - Dark brown (10YR 3/3) friable silt loam; plow zone; No cultural remains
Layer II - Reddish yellow (7.5YR 6/6) loose marine sand; No cultural remains
Layer III - White (10YR 8/1) coarse marine sand; No cultural remains

Figure B-17. Profile of BT-A-6-1



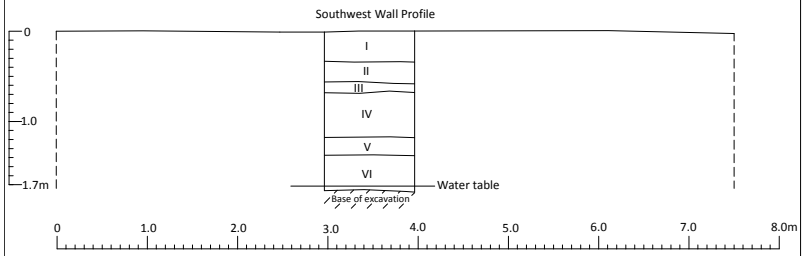
Layer I - Very dark gray (3/1) to very dark grayish brown (10YR 3/2) loose silty sand; plow zone; No cultural remains
Layer II - Very pale brown (10YR 8/3 to 10YR 7/3) coarse marine sand; No cultural remains
Layer III - White (10YR 8/1) compact sand; No cultural remains

Figure B-18. Profile of BT-A-6-2



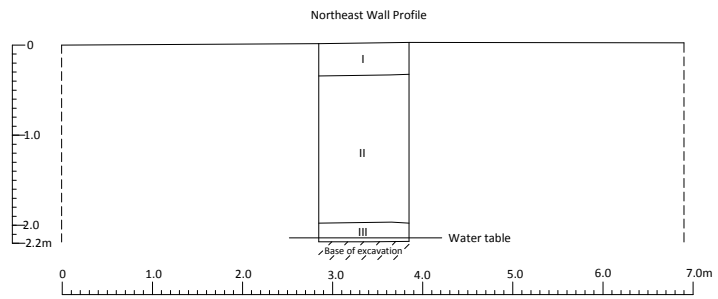
Layer I - Dark grayish brown (10YR 4/2) to brown (10YR 4/3) loose silty sand; plow zone; No cultural remains
Layer II - Very pale brown (10YR 8/3 to 10YR 7/3) coarse marine sand; No cultural remains
Layer III - White (10YR 8/1) limestone sand; No cultural remains

Figure B-19. Profile of BT-A-6-3



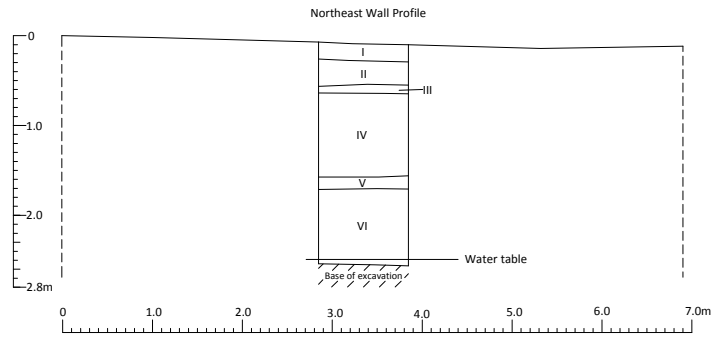
Layer I - Dark brown (7.5YR 3/3) to brown (7.5YR 4/3) friable sandy loam; plow zone; No cultural remains
Layer II - Very dark gray (10YR 3/1) to black (10YR 2/1) loose silty sand buried A horizon; No cultural remains
Layer III - Brown (10YR 5/3) loose marine slightly silty sand stained by Layer II; No cultural remains
Layer IV - Light gray (10YR 7/2) to very pale brown (10YR 7/3) coarse marine sand; No cultural remains
Layer V - White (10YR 8/1) lithified marine deposited very compacted sand; No cultural remains
Layer VI - White (10YR 8/1) compact sand; No cultural remains

Figure B-20. Profile of BT-A-7-1



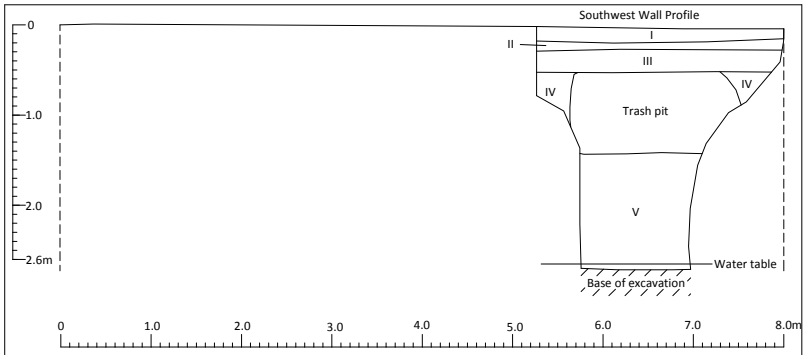
Layer I - Dark brown (10YR 3/3) friable silty loam; plow zone; No cultural remains
Layer II - Reddish yellow (7.5YR 6/6) coarse marine sand; No cultural remains
Layer III - White (10YR 8/1) limestone sand; No cultural remains

Figure B-21. Profile of BT-A-7-2



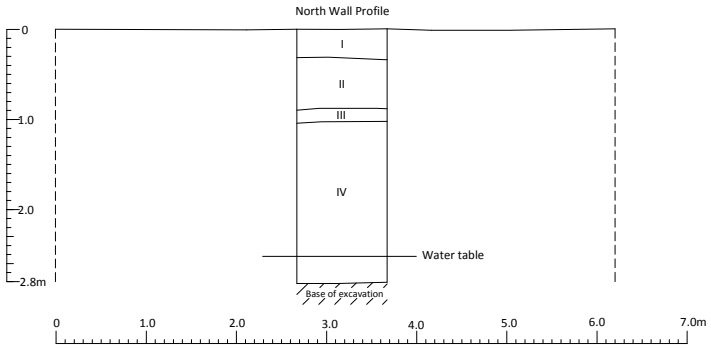
Layer I - Very dark brown (10YR 2/2) loose loamy sand fill; Plastic fragments
Layer II - Very dark grayish brown (10YR 3/2) compact loamy sand plow zone; No cultural remains
Layer III - Strong brown (7.5YR 4/6) coarse marine slightly silty sand; No cultural remains
Layer IV - Very pale brown (10YR 8/2 to 10YR 8/4) coarse marine sand; No cultural remains
Layer V - Reddish yellow (7.5YR 7/6) compact marine sand; No cultural remains
Layer VI - White (10YR 8/1) to very pale brown (10YR 8/2) compact sand; No cultural remains

Figure B-22. Profile of BT-A-8-1



Layer I - Dark reddish brown (5YR 3/3) blocky clay fill; No cultural remains
Layer II - Pale brown (10YR 6/3) to dark grayish brown (10YR 4/2) loose sand; No cultural remains
Layer III - Black (10YR 2/1) loose loamy sand; plow zone; No cultural remains
Trash pit in very pale brown (10YR7/3) loamy sand; Historic materials present
Layer IV - Very pale brown (10YR 8/3 to 10YR 7/4) coarse marine sand; No cultural remains
Layer V - Brownish yellow (10YR 6/6) weathered limestone and clay; No cultural remains

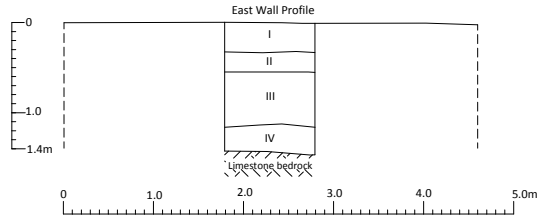
Figure B-23. Profile of BT-A-9-1



Layer I - Dark brown (10YR 3/3) loose silty sand; plow zone; No cultural remains
Layer II - Light gray (10YR 7/2) to very pale brown (10YR 7/4) coarse marine sand; No cultural remains
Layer III - Strong brown (7.5YR 4/6) coarse marine sand; No cultural remains
Layer IV - Brown (7.5YR 4/4) massive clay; No cultural remains

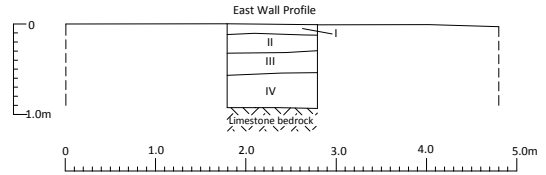
Figure B-24. Profile of BT-A-10-1

Area B Trenches



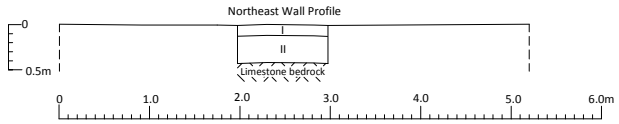
Layer I - Dark brown (7.5YR 3/3) friable sandy clay loam; Rubber hose and aluminum cans
Layer II - Brown (10YR 4/3) to very pale brown (10YR 7/3) loose silty sand; Sparce charcoal
Layer III - White (10YR 8/1) to very pale brown (10YR 7/4) loose marine sand; No cultural remains
Layer IV - Brown (7.5YR 4/4) compact clay; No cultural remains

Figure B-25. Profile of BT-B-1-1



Layer I - Very pale brown (10YR 7/4) to White (10YR 8/1) coarse sand; No cultural remains
Layer II - Brown (10YR 5/3) friable sandy loam alluvium; No cultural remains
Layer III - Very pale brown (10YR 7/4) to light yellowish brown (10YR 6/4) compact marine sand; No cultural remains
Layer IV - Brown (7.5YR 4/4) massive clay; No cultural remains

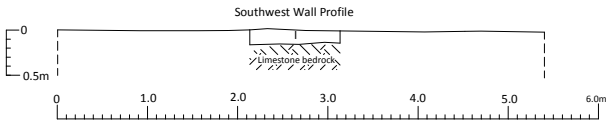
Figure B-26. Profile of BT-B-1-2



Layer I - Dark brown (10YR 3/3) friable sandy clay loam alluvium; No cultural remains

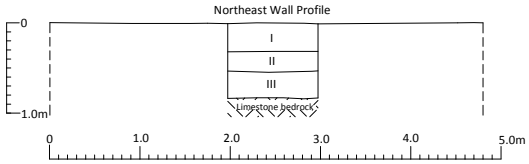
Layer II - Brown (10YR 4/3) friable clay; No cultrual remains

Figure B-27. Profile of BT-B-1-3



Layer I - Dark brown (7.5YR 3/3) friable clay loam alluvium; No cultural remains

Figure B-28. Profile of BT-B-1-4

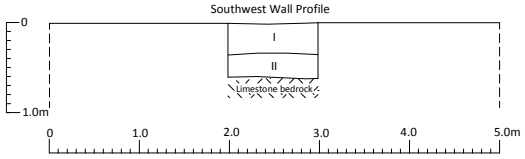


Layer I - Brown (10YR 5/3) loose slightly silty sand; No cultural remains

Layer II - Very pale brown (10YR 7/4) fine aeolian sand; No cultural remains

Layer III - Strong brown (7.5YR 4/6) single grain sandy clay; No cultural remains

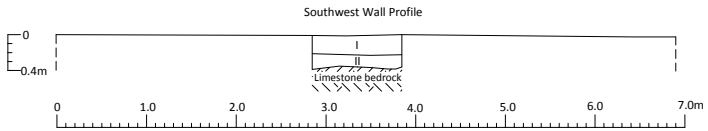
Figure B-29. Profile of BT-B-2-1



Layer I - Dark brown (10YR 3/3) friable sandy clay loam alluvium; No cultural remains

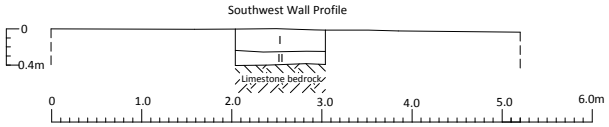
Layer II - Brown (7.5YR 4/4) massive clay; No cultural remains

Figure B-30. Profile of BT-B-2-2



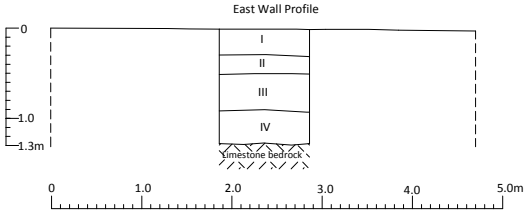
Layer I - Dark brown (7.5YR 3/2) friable clay loam alluvium; No cultural remains
Layer II - Dark brown (7.5YR 3/4) friable clay; No cultural remains

Figure B-31. Profile of BT-B-2-3



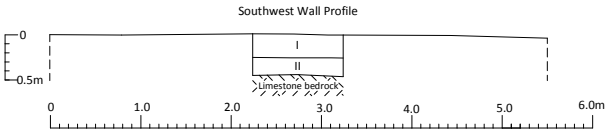
Layer I - Dark brown (7.5YR 3/2) friable clay loam alluvium; No cultural remains
Layer II - Dark brown (7.5YR 3/4) friable clay; No cultural remains

Figure B-32. Profile of BT-B-2-4



Layer I - Dark brown (10YR 3/3) loose loamy sand; No cultural remains
Layer II - Dark brown (7.5YR 3/4) friable sandy loam alluvium; No cultural remains
Layer III - Very pale brown (10YR 7/4) loose marine sand; No cultural remains
Layer IV - Dark brown (7.5YR 3/4) massive clay; No cultural remains

Figure B-33. Profile of BT-B-3-1



Layer I - Dark brown (7.5YR 3/3) friable sandy clay loam alluvium; No cultural remains
Layer II - Brown (7.5YR 4/4) massive clay; Bottle glass present

Figure B-34. Profile of BT-B-3-2

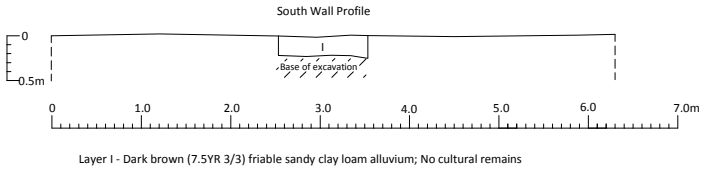


Figure B-35. Profile of BT-B-3-3

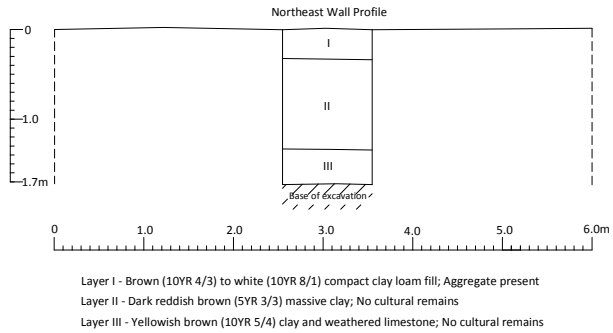
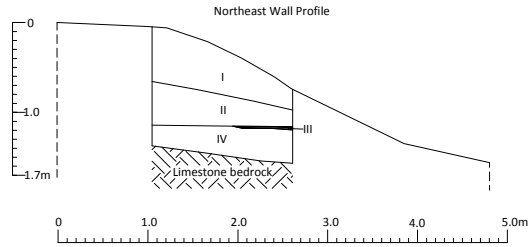
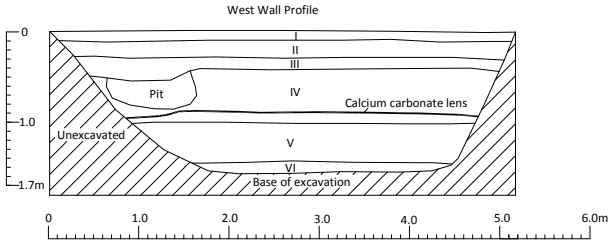


Figure B-36. Profile of BT-B-3-4



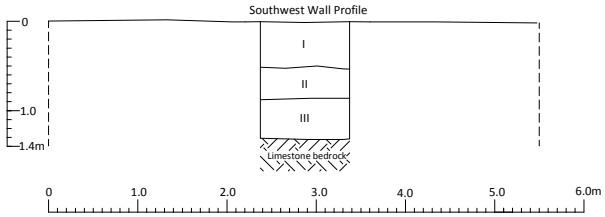
Layer I - Dark brown (7.5YR 3/2) friable clay loam fill; Basalt aggregate, asphalt and plastic fragments, ceramic tile
Layer II - Brown (10YR 4/3) friable sandy clay loam fill; Basalt aggregate
Layer III - Light gray (10YR 7/2) to light brownish gray (10YR 6/2) loose marine sand; No cultural remains
Layer IV - Dark reddish brown (5YR 3/2) massive clay; No cultural remains

Figure B-37. Profile of BT-B-3-5



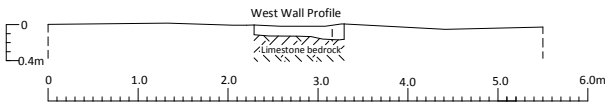
Layer I - Brown (10YR 5/3) compact silty sand; No cultural remains
Layer II - Very pale brown (10YR 7/3) to pale brown (10YR 6/3) loose slightly silty sand; Bottle glass present
Layer III - Brown (10YR 4/3) to very dark grayish brown (10YR 3/2) moderately compact silty sand; No cultural remains
Layer IV - White (10YR 8/1) loose aeolian sand; No cultural remains
Pit - Pale brown (10YR 6/3) to brown (10YR 5/3) compact banded silty sand pit; No cultural remains
Layer V - Very pale brown (10YR 8/2 to 10YR 8/3) coarse marine sand; No cultural remains
Layer VI - Yellowish red (5YR 5/8) to reddish yellow (5YR 6/8) limestone sand; No cultural remains

Figure B-38. Profile of BT-B-4-1



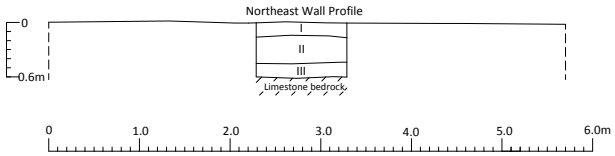
Layer I - Very dark grayish brown (10YR 3/2) friable sandy clay loam alluvium; No cultural remains
Layer II - Reddish yellow (7.5YR 6/6) single grain marine sand; No cultural remains
Layer III - Brown (7.5YR 5/4) massive clay; No cultural remains

Figure B-39. Profile of BT-B-4-2



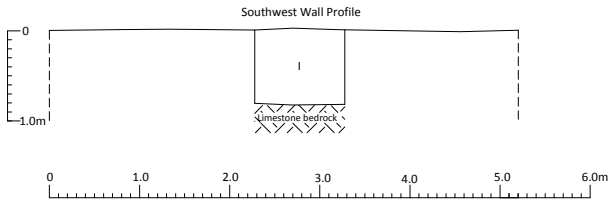
Layer I - Dark brown (7.5YR 3/3) friable clay; Basalt aggregate

Figure B-40. Profile of BT-B-4-3



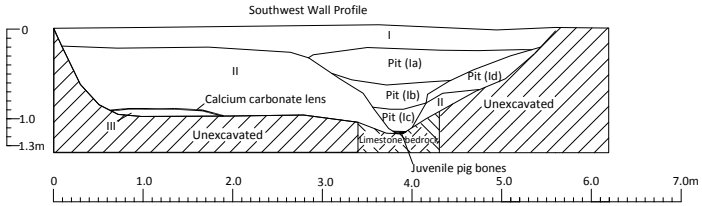
Layer I - Dark brown (10YR 3/3) friable clay loam fill; No cultural remains
Layer II - Brown (10YR 5/3) to very dark grayish brown (10YR 3/2) single grain silty sand; No cultural remains
Layer III - Dark brown (7.5YR 3/2) massive clay; No cultural remains

Figure B-41. Profile of BT-B-4-4



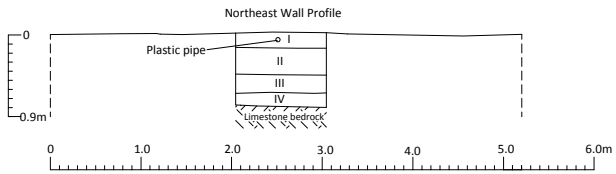
Layer I - Very dark brown (7.5YR 2.5/3) to dark grayish brown (10YR 4/2) friable sandy clay fill; Asphalt fragments present

Figure B-42. Profile of BT-B-4-5



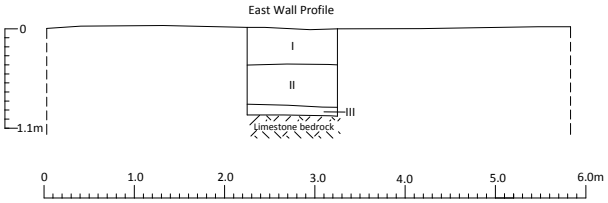
Layer I - Pale brown (10YR 6/3) single grained slightly silty sand; Electrical wires and plastic fragments
Pit (Layer Ia) - Dark gray (10YR 4/1) compact slightly silty sand pit fill; Conus sp. shell
Pit (Layer Ib) - Grayish brown (10YR 5/2) to very dark grayish brown (10YR 3/2) loose sand pit fill; Ash
Pit (Layer Ic) - Grayish brown (10YR 5/2) to white (10YR 8/1) loose slightly silty sand pit fill; Pig bones
Pit (Layer Id) - Gray (10YR 6/1) to light gray (10YR 7/2) loose sand fill; No cultural remains
Layer II - White (10YR 8/1) loose aeolian sand; No cultural remains
Layer III - Very pale brown (10YR 8/4) coarse marine sand; No cultural remains

Figure B-43. Profile of BT-B-5-1



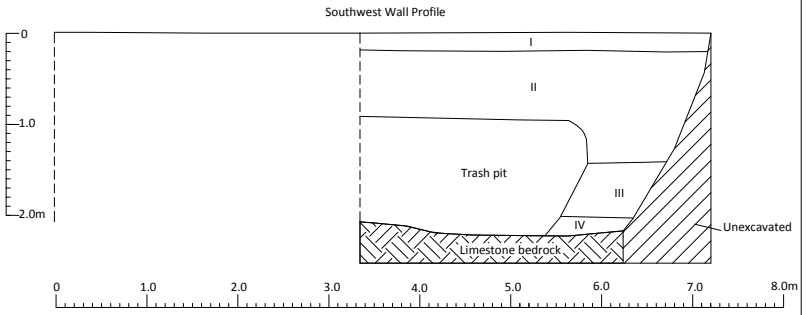
Layer I - Dusky red (2.5YR 3/4) friable clay fill; Plastic pipe present
Layer II - Brown (10YR 4/3) friable sandy clay loam fill; Plastic fragments present
Layer III - Pale brown (10YR 6/3) loose silty marine sand; No cultural remains
Layer IV - Dark brown (7.5YR 3/3) massive clay; No cultural remains

Figure B-44. Profile of BT-B-5-2



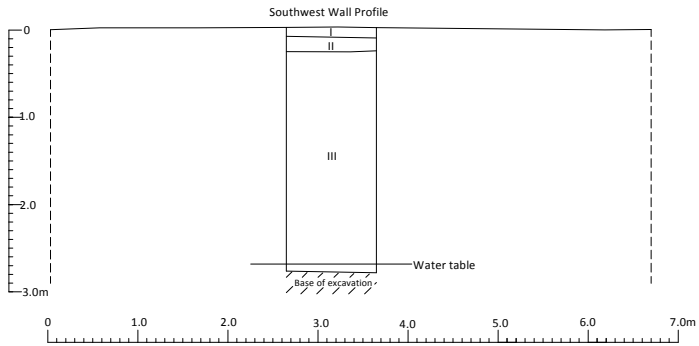
Layer I - Dark brown (10YR 3/3) friable sandy clay loam fill; No cultural remains
Layer II - Dark brown (7.5YR 3/4) friable clay loam fill; Asphalt fragments present
Layer III - Very pale brown (10YR 8/2 to 10YR 7/3) loose marine sand; No cultural remains

Figure B-45. Profile of BT-B-5-3



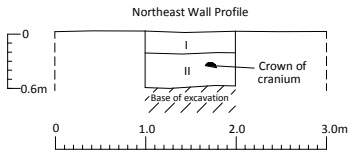
Layer I - Dark reddish brown (5YR 3/4) friable clay fill; No cultural remains
Layer II - Dark brown (7.5YR 3/2 and 7.5YR 3/3) friable clay fill; No cultural remains
Trash pit - Brown (10YR 4/3) to dark brown (10YR 3/3) friable clay pit fill; Milled lumber, plastic hose, plastic fragments
Layer III - Dark brown (7.5YR 3/3) massive clay; No cultural remains
Layer IV - Brown (10YR 5/3) massive clay; No cultural remains

Figure B-46. Profile of BT-B-5-4



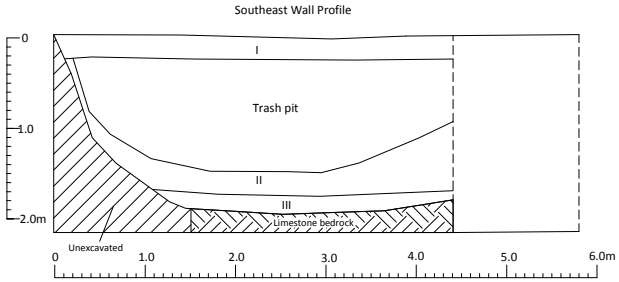
Layer I - Brown (10YR 5/3) compact silty sand; No cultural remains
Layer II - Brown (10YR 4/3) to pale brown (10YR 6/3) compact silty sand; No cultural remains
Layer III - Very pale brown (10YR 8/2 to 10YR 7/3) loose aeolian sand; Coral fragment

Figure B-47. Profile of BT-B-6-1



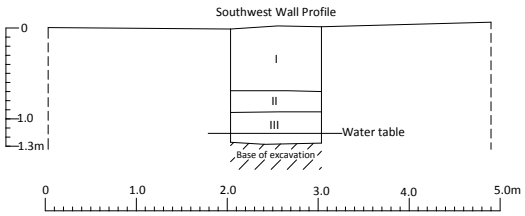
Layer I - Brown (10YR 4/3) to pale brown (10YR 6/3) moderately compact slightly silty sand; Cultural remains present
Layer II - Very pale brown (10YR 8/2 to 10YR 7/3) loose aeolian sand; Human burial insitu

Figure B-48. Profile of BT-B-6-2



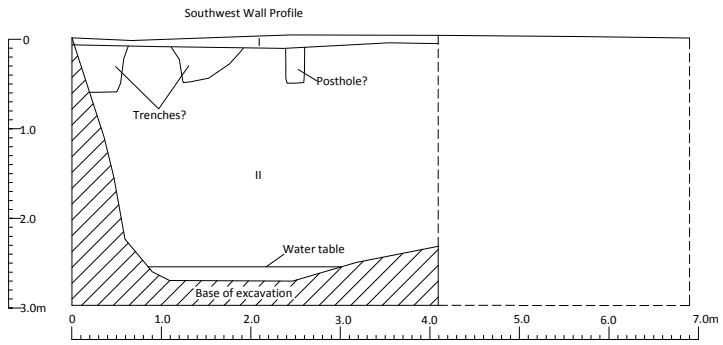
Layer I - Dark reddish brown (5YR 3/4) friable clay fill; No cultural remains
Trash pit - Black (10YR 2/1) to very dark grayish brown (10YR 3/2) friable clay pit fill; Modern trash present
Layer II - Dark brown (7.5YR 3/2) massive clay; No cultural remains
Layer III - Brown (10YR 4/3) massive clay; No cultural remains

Figure B-49. Profile of BT-B-6-3



Layer I - Dusky red (2.5YR 3/2) friable clay fill; No cultural remains
Layer II - Pale brown (10YR 6/3) friable clay; No cultural remains
Layer III - Brown (10YR 4/2) massive clay; No cultural remains

Figure B-50. Profile of BT-B-6-4

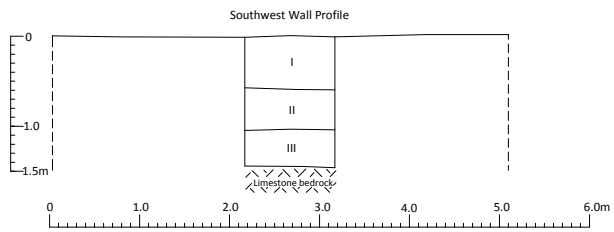


Layer I - Very dark grayish brown (10YR 3/2) compact silty sand; No cultural remains

Trench and posthole fill - Very dark grayish brown (10YR 3/2) compact silty sand; No cultural remains

Layer II - Very pale brown (10YR 8/2) loose aeolian sand; No cultural remains

Figure B-51. Profile of BT-B-7-1

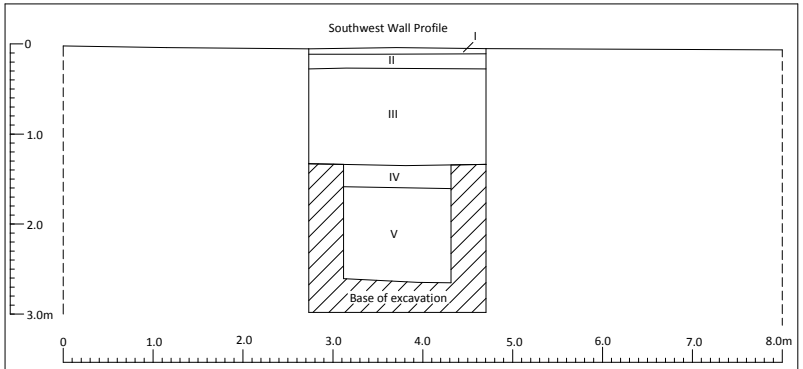


Layer I - Very dark gray (10YR 3/1) friable clay fill; No cultural remains

Layer II - Yellowish brown (10YR 5/4) very fine slightly silty marine sand; No cultural remains

Layer III - Brown (10YR 5/3 to 10YR 4/3) coarse marine sand; No cultural remains

Figure B-52. Profile of BT-B-7-2



Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains

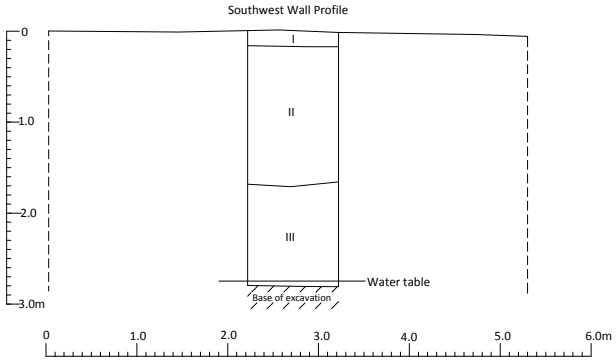
Layer II - Brown (10YR 5/3) single grain sand fill; Aggregate present

Layer III - Very pale brown (10YR 8/2) loose sand fill; No culltural remains

Layer IV - Dark reddish brown (5YR 3/3) very fine clay loam fill; No cultural remains

Layer V - Very pale brown (10YR 7/4) very fine aeolian sand; No cultural remains

Figure B-53. Profile of BT-B-7-3

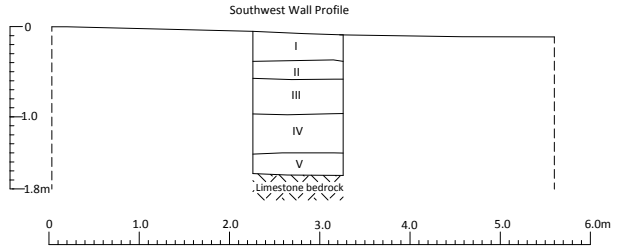


Layer I - Grayish brown (10YR 5/2) lsingle grain slightly silty aeolian sand; No cultural remains

Layer II - Very pale brown (10YR 8/2) single grain aeolian sand; No cultural remains

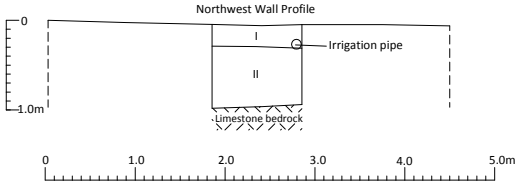
Layer III - Very pale brown (10YR 7/3) coarse marine sand; No cultural remains

Figure B-54. Profile of BT-B-8-1



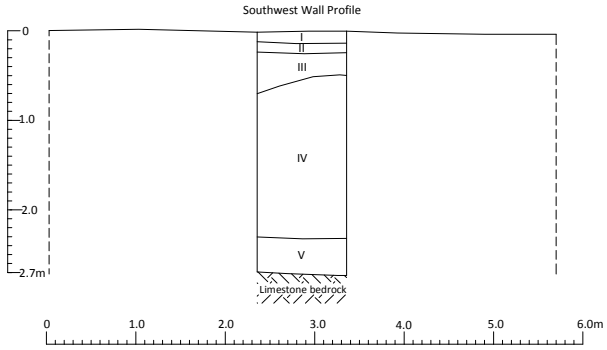
Layer I - Brown (7.5YR 4/4) to grayish brown (10YR 5/2) compact clay and silty sand fill; Plastic bag present
Layer II - Very pale brown (10YR 8/2) loose sand; No cultural remains
Layer III - Dark brown (7.5YR 3/3) compact silty sand alluvium; No cultural remains
Layer IV - Strong brown (7.5YR 5/6) compact silty marine sand; No cultural remains
Layer V - Brown (10YR 5/3) loose marine sand; No cultural remains

Figure B-55. Profile of BT-B-8-2



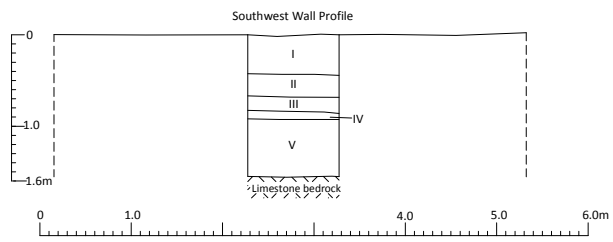
Layer I - Dark brown (7.5YR 3/3) compact clay fill; Irrigation pipe present
Layer II - Dark yellowish brown (10YR 4/4) single grain loamy sand alluvium; No cultural remains

Figure B-56. Profile of BT-B-8-3



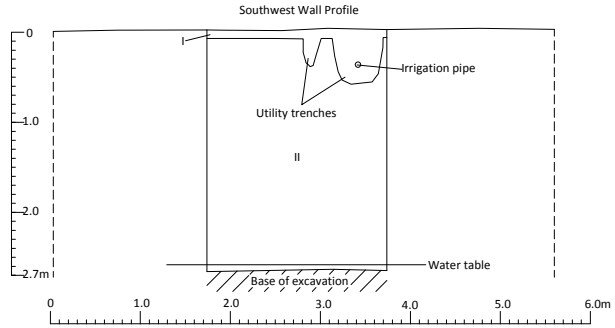
Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains
Layer II - Light gray (10YR 7/2) to very pale brown (10YR 7/3) compact sand fill; No cultural remains
Layer III - Dark grayish brown (10YR 4/2) to very pale brown (10YR 7/3) compact silty sand fill; No cultural remains
Layer IV - Dark brown (7.5YR 3/3) to brown (10YR 4/3) massive sandy clay fill; No cultural remains
Layer V - Light brownish gray (10YR 6/2) coarse sand deposit; No cultural remains

Figure B-57. Profile of BT-B-9-1



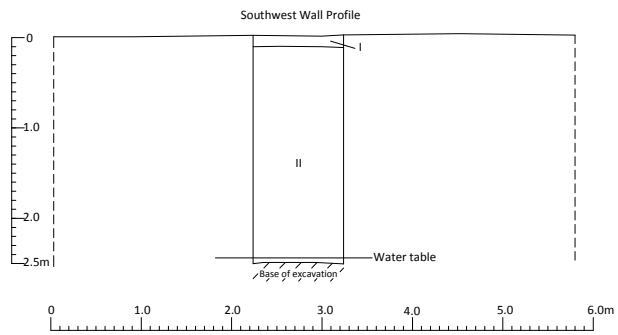
Layer I - Brown (10YR 4/3) friable sandy clay loam fill; No cultural remains
Layer II - Pale brown (10YR 6/3) friable silty sand fill; Aggregate present
Layer III - Very pale brown (10YR 7/3) compact silty sand fill; Aggregate present
Layer IV - Brown (10YR 4/3) compact sandy clay loam alluvium; No cultural remains
Layer V - Strong brown (7.5YR 4/6) compact silty marine sand; No cultural remains

Figure B-58. Profile of BT-B-9-2



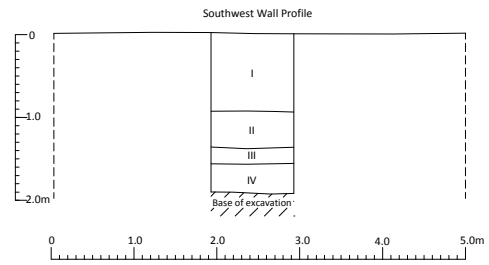
Layer I - Brown (7.5YR 5/4) friable loamy sand fill; Irrigation pipe present
Layer II - Very pale brown (10YR 8/2) loose aeolian sand; No cultural remains

Figure B-59. Profile of BT-B-10-1



Layer I - Brown (7.5YR 4/4) single grain aeolian sand; No cultural remains
Layer II - White (10YR 8/1) to very pale brown (10YR 8/2) loose aeolian sand; No cultural remains

Figure B-60. Profile of BT-B-10-2



Layer I - Dark reddish brown (5YR 3/4) to very dark brown (7.5YR 2.5/3) sandy clay fill; Basalt aggregate present
Layer II - Dark reddish brown (5YR 4/4) to dark gray (10YR 4/1) compact clay fill; No cultural remains
Layer III - Very dark gray (7.5YR 3/1) coarse marine sand; No cultural remains
Layer IV - Brownsih yellow (10YR 6/6) weathered limestone; No cultural remains

Figure B-61. Profile of BT-B-10-3

Area C Trenches

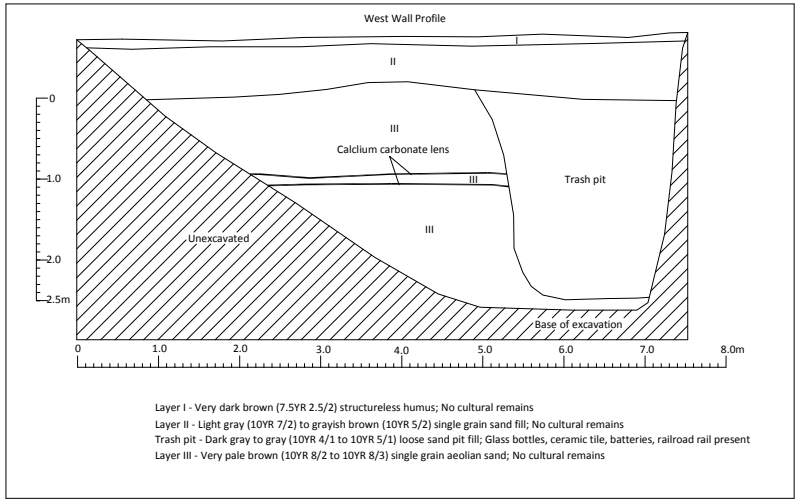


Figure B-62. Profile of BT-C-1-1

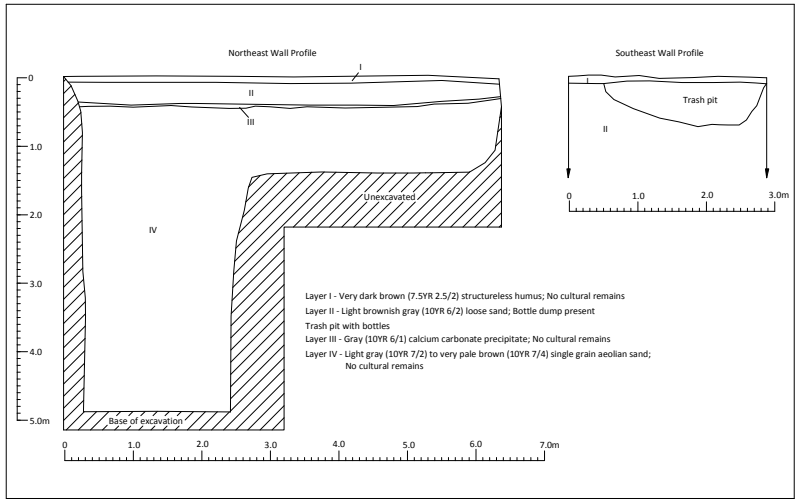
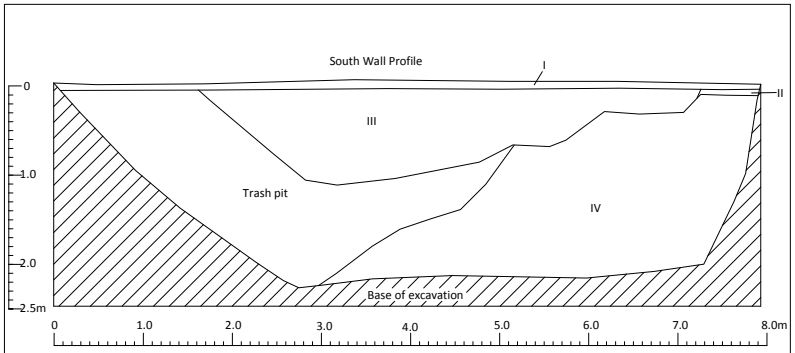
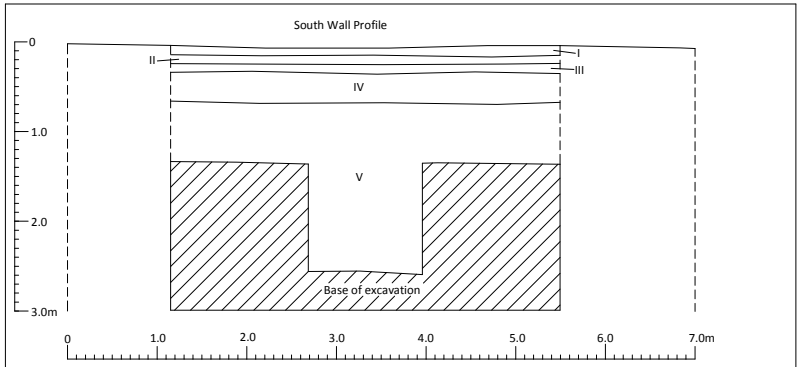


Figure B-63. Profile of BT-C-2-1



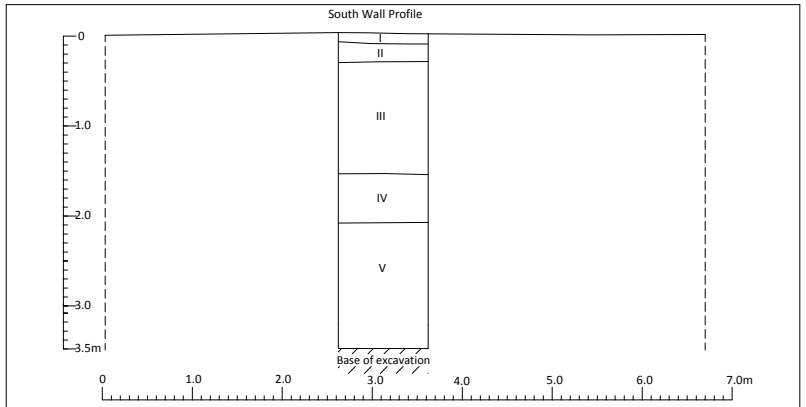
Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains
Layer II - Pale brown (10YR 6/3) single grain slightly loam sand; No cultural remains
Trash pit - Grayish brown to light gray (10YR 5/2 with pocktes of 10YR 7/2) single grain slightly loamy sand pit fill; Glazed ceramics, glass bottles
Layer III - Light brownish gray (10YR 6/2) single grain sand; No cultural remains
Layer IV - Very pale brown (10YR 8/2) moderately compact aeolian sand; No cultural remains

Figure B-64. Profile of BT-C-2-2



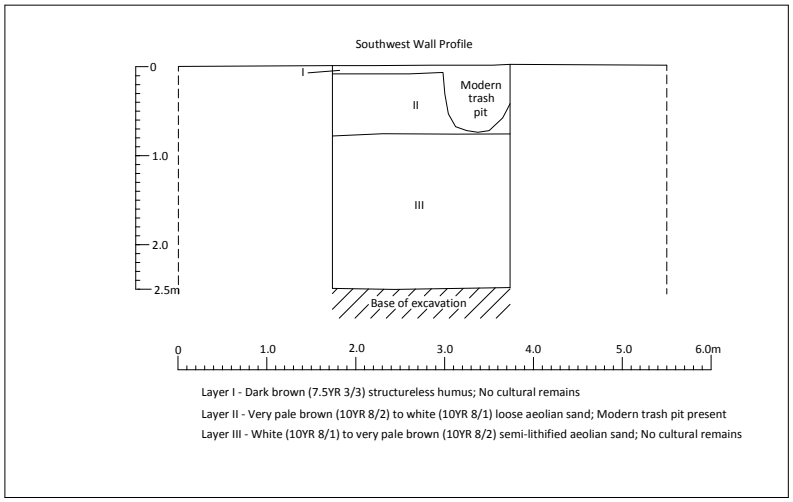
Layer I - Dark brown (7.5YR 3/2 structureless humus; No cultural remains
Layer II - Very pale brown (10YR 8/3) loose aeolian sand; No cultural remains
Layer III - Light brownish gray (10YR 6/2) to very pale brown (10YR 7/3) loose banded sand; No cultural remains
Layer IV - Pale brown (10YR 6/3) massive cemented very compact aeolian sand; No cultural remains
Layer V - Very pale brown (10YR 8/2) loose aeolian sand; No cultural remains

Figure B-65. Profile of BT-C-3-1



Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains
Layer II - Light brownish gray (10YR 6/2) single grain sand; No cultural remains
Layer III - Very pale brown (10YR 8/2) and light brownish gray (10YR 6/2) banded single grain sand; Broken glass throughout
Layer IV - Very pale brown (10YR 8/2) single grain aeolian sand; No cultural remains
Layer V - Very pale brown (10YR 8/2) and light gray (10YR 7/2) compacted banded sand; No cultural remains

Figure B-66. Profile of BT-C-3-2



Layer I - Dark brown (7.5YR 3/3) structureless humus; No cultural remains
Layer II - Very pale brown (10YR 8/2) to white (10YR 8/1) loose aeolian sand; Modern trash pit present
Layer III - White (10YR 8/1) to very pale brown (10YR 8/2) semi-lithified aeolian sand; No cultural remains

Figure B-67. Profile of BT-C-4-1

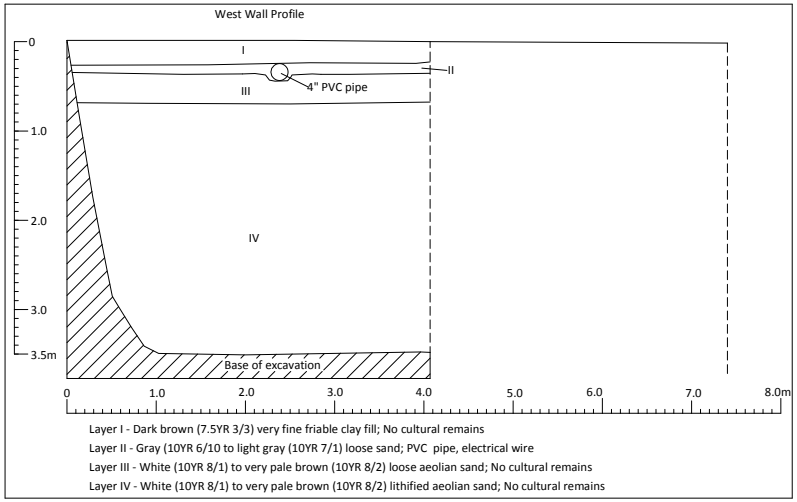


Figure B-68. Profile of BT-C-4-2

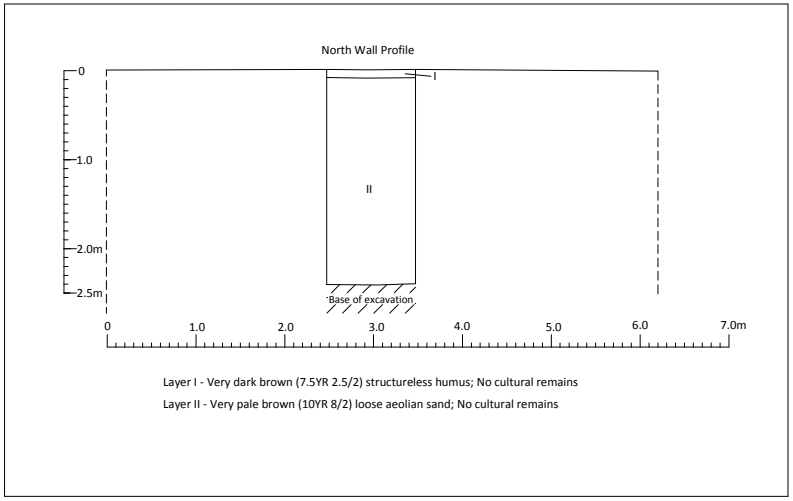


Figure B-69. Profile of BT-C-5-1

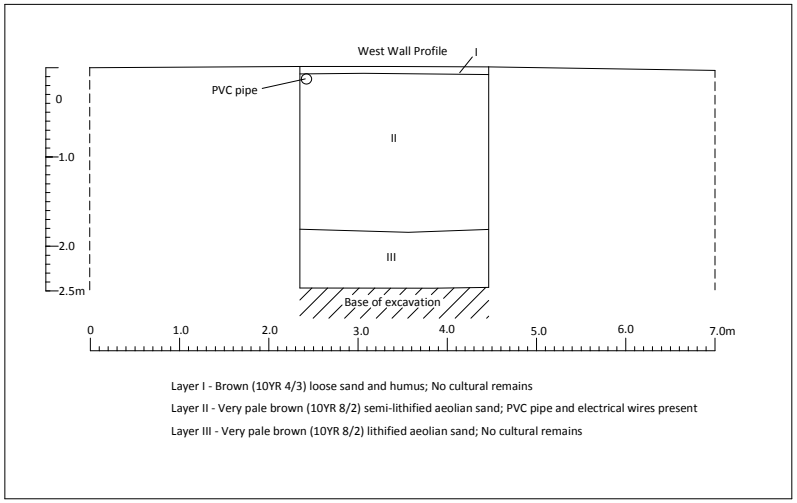


Figure B-70. Profile of BT-C-5-2

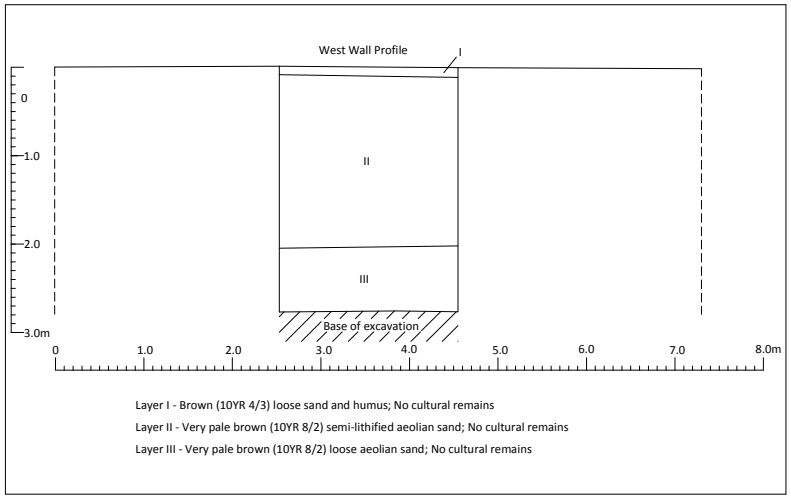
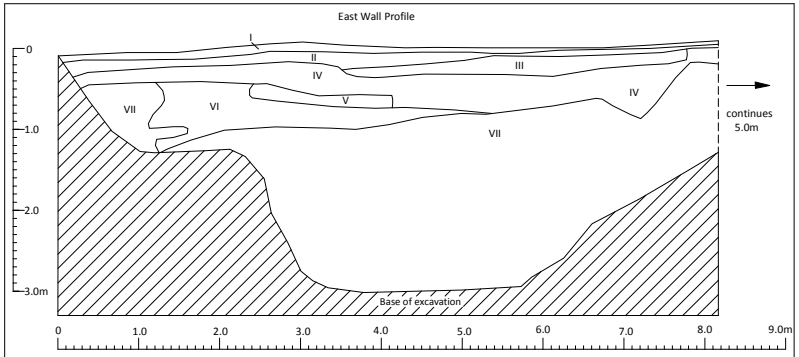
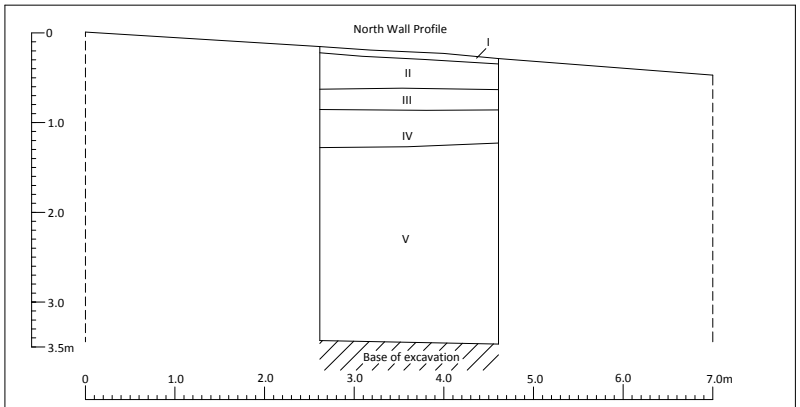


Figure B-71. Profile of BT-C-6-2



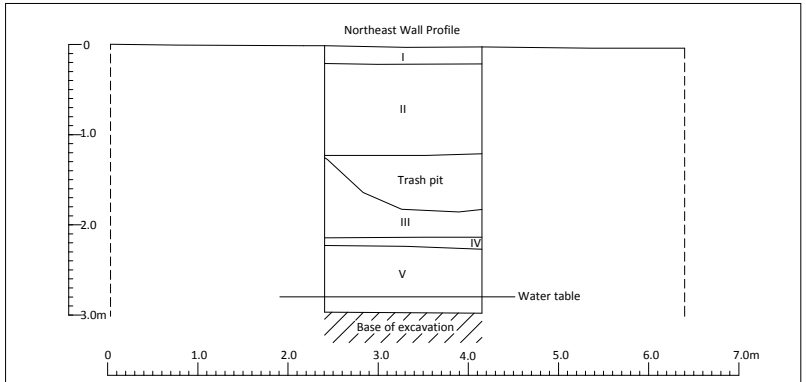
Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains
Layer II - Pale brown (10YR 6/3) loose aeolian sand; No cultural remains
Layer III - Gray (10YR 5/1) to black (7.5YR 2.5/1) compact sand; Pig bone and coral pebble present
Layer IV - Light brownish gray (10YR 6/2) to pale brown (10YR 6/3) moderately compact sand; No cultural remains
Layer V - Very pale brown (10YR 8/2 to 10YR 8/3) loose sand; No cultural remains
Layer VI - Pale brown (10YR 6/3) to brown (10YR 5/3) moderately compact sand; No cultural remains
Layer VII - Very pale brown (10YR 8/3) single grain aeolian sand; No cultural remains

Figure B-72. Profile of BT-C-7-1



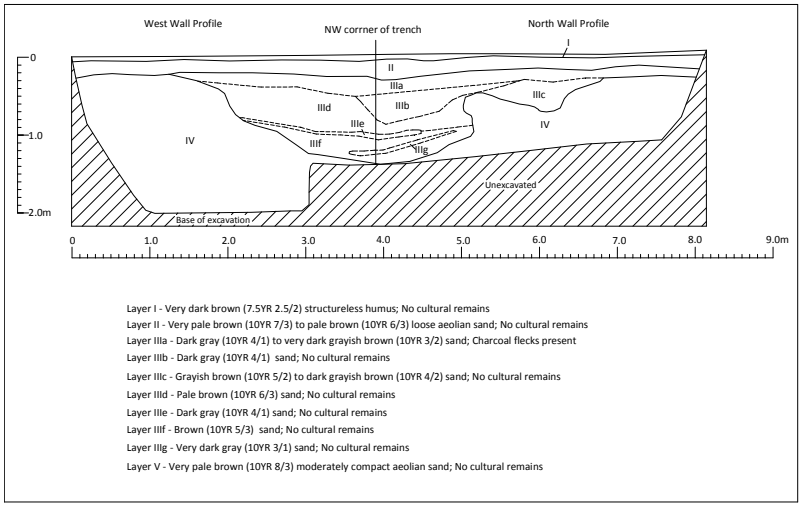
Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains
Layer II - Very pale brown (10YR 8/2 to 10YR 7/4) loose sand; No cultural remains
Layer III - Pale brown (10YR 6/3) to brown (10YR 5/3) moderately compact aeolian sand; No cultural remains
Layer IV - Very pale brown (10YR 8/2) moderately compact aeolian sand; No cultural remains
Layer V - Very pale brown (10YR 8/2 to 10YR 8/3) single grain aeolian sand; No cultural remains

Figure B-73. Profile of BT-C-7-2



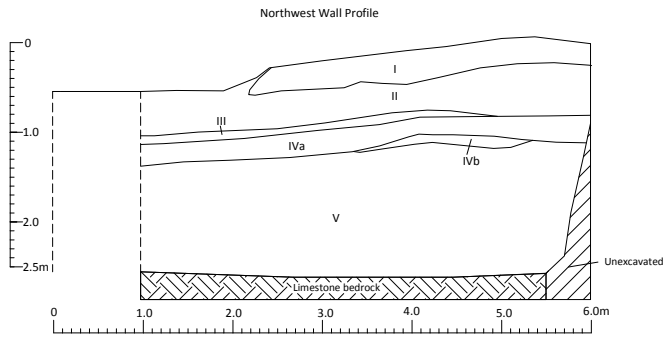
Layer I - Dark brown (7.5YR 3/3) friable clay fill; No cultural remains
Layer II - Dark yellowish brown (10YR 3/4) friable sandy clay loam fill; No cultural remains
Trash pit - Light gray (10YR 7/2) to dark brown (7.5YR 3/4) friable clay loam pit fill; Modern trash present
Layer III - Yellowish brown (10YR 5/4) single grain loamy marine sand; No cultural remains
Layer IV - White (10YR 8/1) weathered limestone; No cultural remains
Layer V - Brown (10YR 4/3) massive clay residual deposit; No cultural remains

Figure B-74. Profile of BT-C-7-3



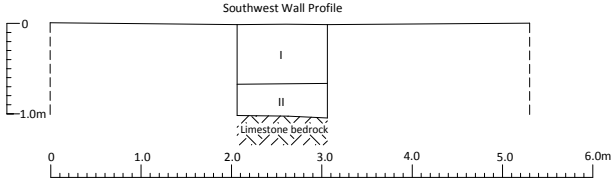
Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains
Layer II - Very pale brown (10YR 7/3) to pale brown (10YR 6/3) loose aeolian sand; No cultural remains
Layer IIIa - Dark gray (10YR 4/1) to very dark grayish brown (10YR 3/2) sand; Charcoal flecks present
Layer IIIb - Dark gray (10YR 4/1) sand; No cultural remains
Layer IIIc - Grayish brown (10YR 5/2) to dark grayish brown (10YR 4/2) sand; No cultural remains
Layer IIId - Pale brown (10YR 6/3) sand; No cultural remains
Layer IIIe - Dark gray (10YR 4/1) sand; No cultural remains
Layer IIIf - Brown (10YR 5/3) sand; No cultural remains
Layer IIIg - Very dark gray (10YR 3/1) sand; No cultural remains
Layer V - Very pale brown (10YR 8/3) moderately compact aeolian sand; No cultural remains

Figure B-75. Profile of BT-C-8-1



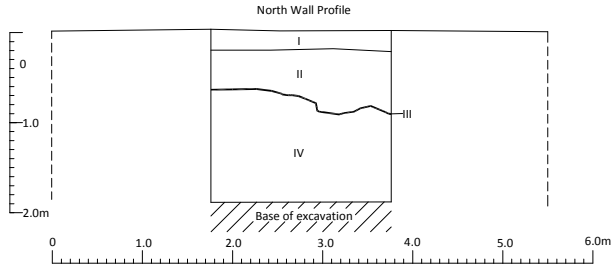
Layer I - Brown (7.5YR 4/3) loose loamy sand; No cultural remains
Layer II - White (10YR 8/1) to light brownish gray (10YR 6/2) single grain sand; No cultural remains
Layer III - White (10YR 8/1) loose sand; No cultural remains
Layer IVa - Gray (10YR 5/1) compact slightly loamy sand; Sparse charcoal and waterworn marine shells
Layer IVb - Dark gray (10YR 4/1) compact sand; No cultural remains
Layer V - Very pale brown (10YR 8/2 to 10YR 8/3) moderately compact aeolian sand; No cultural remains

Figure B-76. Profile of BT-C-8-2



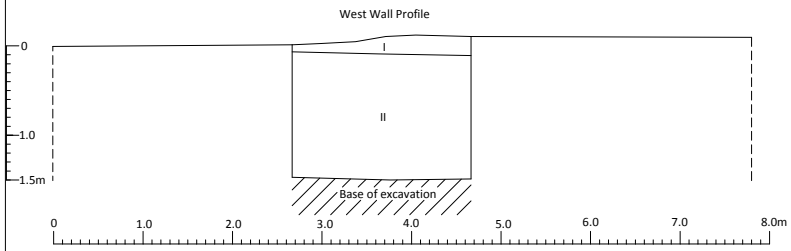
Layer I - Dusky red (2.5YR 4/4) compact clay fill; Asphalt and gravel present
Layer II - Dark grayish brown (10YR 4/2) compact clay fill; Aggregate present

Figure B-77. Profile of BT-C-8-3



Layer I - Dark grayish brown (10YR 4/2) loose sand; PVC pipe and electrical wires present
Layer II - Very pale brown (10YR 8/2) to light brownish gray (10YR 6/2) moderately compact aeolian sand; No cultural remains
Layer III - Grayish brown (10YR 5/2) calcium carbonate precipitate; No cultural remains
Layer IV - Very pale brown (10YR 8/2 to 10YR 8/3) moderately compact aeolian sand; No cultural remains

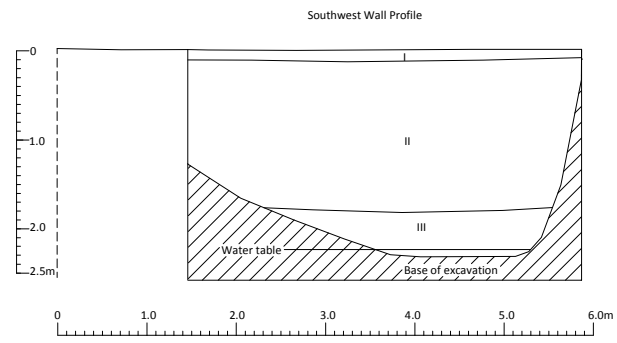
Figure B-78. Profile of BT-C-9-1



Layer I - Dark brown (10YR 3/3) to dark yellowish brown (10YR 3/4) friable sandy clay loam fill; Plastic and glass fragments and milled lumber
Layer II - Light gray (10YR 7/2) to very pale brown (10YR 8/2) compact aeolian sand; No cultural remains

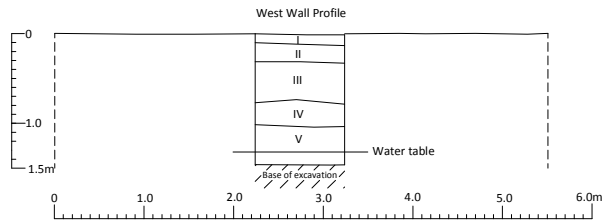
Figure B-79. Profile of BT-C-9-2

Area D Trenches



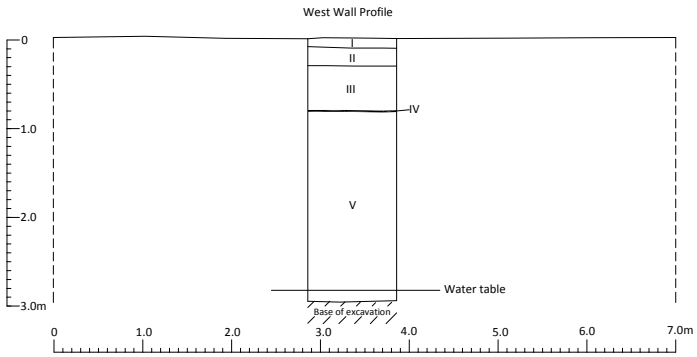
Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains
Layer II - Very pale brown (10YR 8/2 and 10YR 8/3) fine aeolian sand; No cultural remains
Layer III - Light gray (Gley 7/N) fine saturated gley and sand; No cultural remains

Figure B-80. Profile of BT-D-0-1



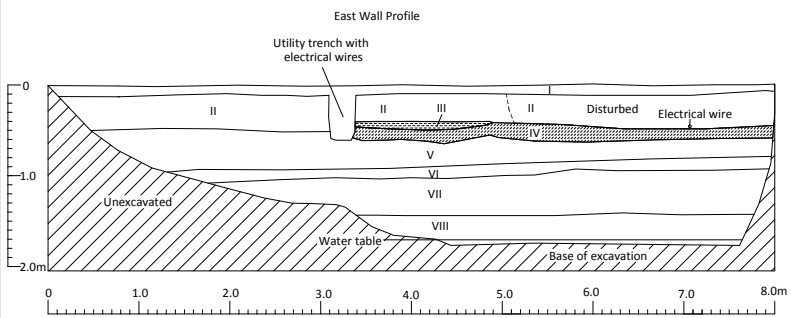
Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains
Layer II - Yellowish brown (10YR 5/4) loose aeolian sand; No cultural remains
Layer III - Very pale brown (10YR 7/3) to pale brown (10YR 6/3) single grain aeolian sand; No cultural remains
Layer IV- Pink (7.5YR 8/3 to 7.5YR 8/4) single grain aeolian sand; No cultural remains
Layer V - Light gray (10YR 7/1) single grain aeolian silty sand; No cultural remains

Figure B-81. Profile of BT-D-1-1



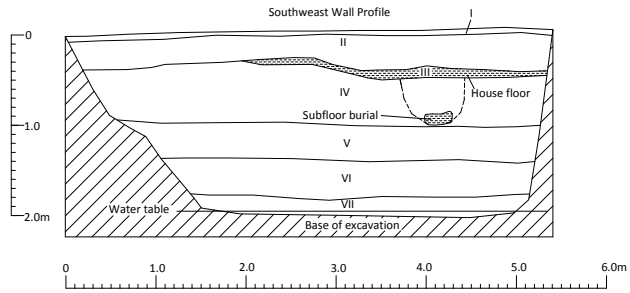
Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains
Layer II - Light brownish gray (10YR 6/2) loose aeolian sand; No cultural remains
Layer III - Very pale brown (10YR 8/3) compact aeolian sand; No cultural remains
Layer IV - Gray (10YR 6/1) calcium carbonate precipitate; No cultural remains
Layer V - Very pale brown (10YR 8/3 to 10YR 8/4) moderately compact aeolian sand; No cultural remains

Figure B-82. Profile of BT-D-1-2



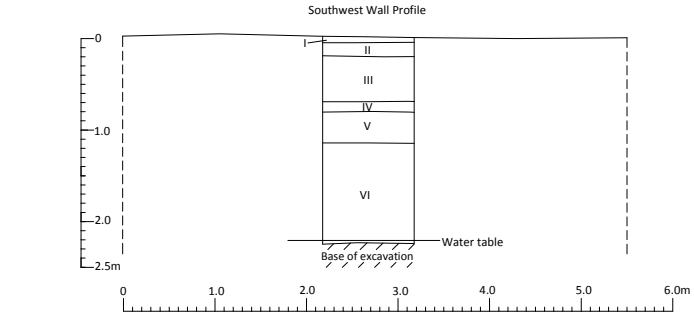
Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains
Layer II - Dark grayish brown (10YR 4/2) compacted aeolian loamy sand; Electrical wires and utility trench present
Layer III - Black (7.5YR 2.5/1) very fine friable loamy sand; Site 7289 cultural deposit
Layer IV - Brown (10YR 4/3 to 7.5YR 5/4) single grain aeolian slightly loamy sand; Site 7289 cultural deposit
Layer V - Very pale brown (10YR 8/2) compacted aeolian sand; No cultural remains
Layer VI - Light gray (10YR 7/2) compacted semi-lithified aeolian sand; No cultural remains
Layer VII - Very pale brown (10YR 8/2) single grain aeolian sand; No cultural remains
Layer VIII - White (10YR 8/1) very fine single grain aeolian sand; No cultural remains

Figure B-83. Profile of BT-D-2-1



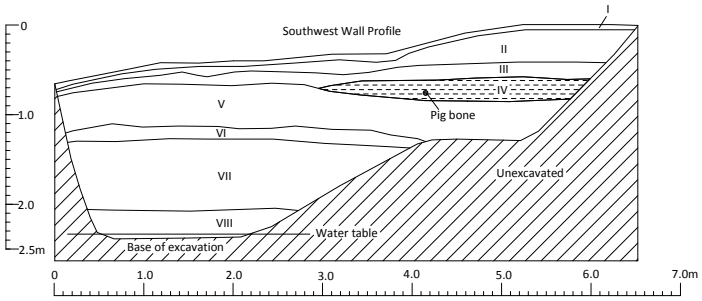
Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains
Layer II - Grayish brown (10YR 5/2) and brown (7.5YR 4/3) loose slightly loamy sand; No cultural remains
Layer III - Grayish brown (10YR 5/2) and Dark grayish brown (10YR 4/2) and brown (10YR 5/3) moderatelysit compacted loamy sand; Site 7289 cultural deposit
Layer IV - Very pale brown (10YR 8/2) loose aeolian sand; Human remainsin sub-floor burial pit
Layer V - Very pale brown (10YR 8/2) semi-lithified aeolian sand; No cultural remains
Layer VI - Very pale brown (10YR 8/2) loose aeolian sand; No cultural remains
Layer VII - White (Gley 1 8/N) single grain aeolian sand; No cultural remains

Figure B-84. Profile of BT-D-2-1b



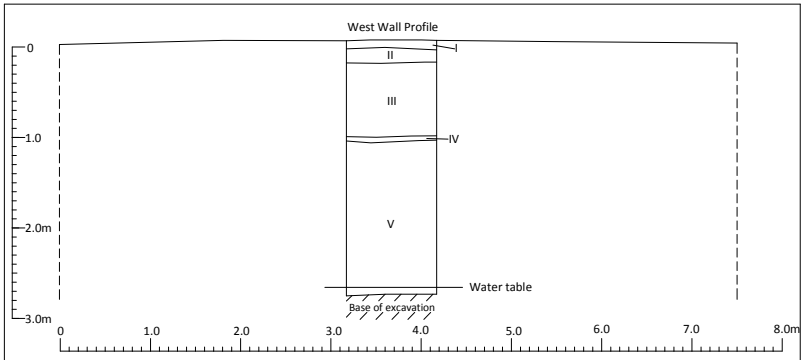
Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains
Layer II - Pale brown (10YR 6/3) single grain sand; No cultural remains
Layer III - Very pale brown (10YR 8/2) single grain aeolian sand; No cultural remains
Layer IV - Pale brown (10YR 6/1) calcium carbonate precipitate; No cultural remains
Layer V - Very pale brown (10YR 8/3) semi-lithified aeolian sand; No cultural remains
Layer VI - Very pale brown (10YR 8/2) loose aeolian sand; No cultural remains

Figure B-85. Profile of BT-D-2-1c



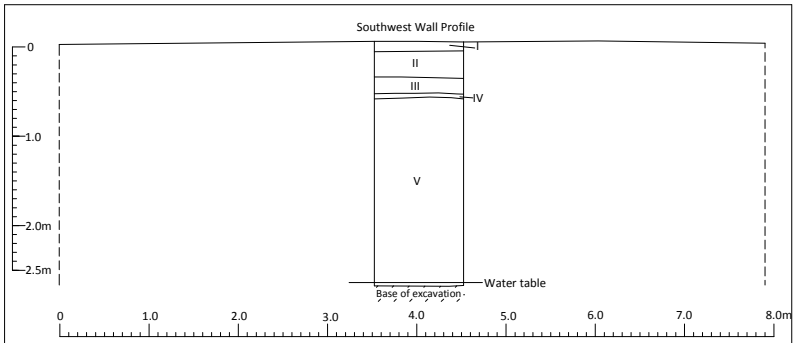
Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains
Layer II - Very pale brown (10YR 8/2) loose sand; No cultural remains
Layer III - Gray (10YR 5/1) compacted loamy sand; 50% basalt aggregate
Layer IV - Grayish brown (10YR 5/2) compacted loamy sand; Site 7289 cultural deposit (pig bones and charcoal)
Layer V - Very pale brown (10YR 8/2) single grain aeolian sand; No cultural remains
Layer VI - Grayish brown (10YR 5/2) calcium carbonate precipitate - cemented aeolian sand; No cultural remains
Layer VII - Very pale brown (10YR 8/3) loose aeolian sand; No cultural remains
Layer VIII - Light gray (10YR 7/1) loose aeolian sand; No cultural remains

Figure B-86. Profile of BT-D-2-1d



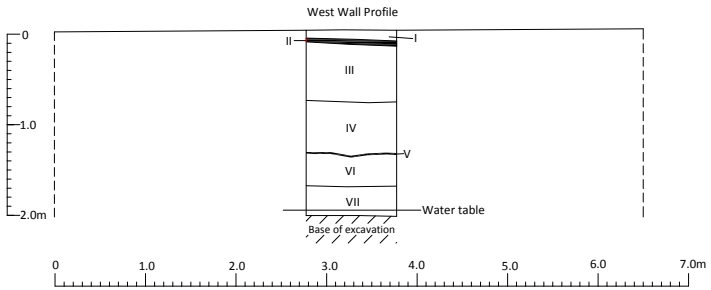
Layer I - Very dark brown (7.5YR 2.5/3) structureless humus; No cultural remains
Layer II - Light yellowish brown (10YR 6/4) loose aeolian sand; No cultural remains
Layer III - Very pale brown (10YR 8/3) to gray (10YR 6/1) single grain aeolian sand; No cultural remains
Layer IV - Gray (10YR 6/1) compact calcium carbonate precipitate lenses; No cultural remains
Layer V - Very pale brown (10YR 8/2) loose aeolian sand; No cultural remains

Figure B-87. Profile of BT-D-2-2



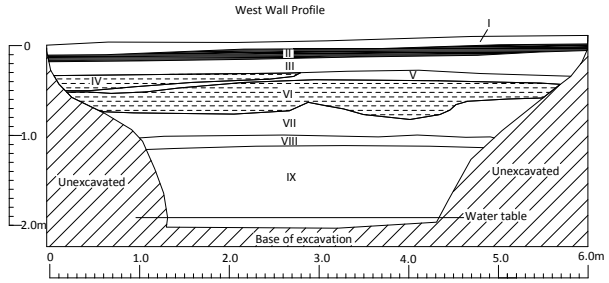
Layer I - Very dark brown (7.5YR 2.5/3) structureless humus; No cultural remains
Layer II - Light yellowish gray (10YR 6/2) to pale brown (10YR 6/3) loose aeolian sand; No cultural remains
Layer III - Very pale brown (10YR 8/3) to gray (10YR 6/1) calcium caronate precipiate lenses; No cultural remains
Layer IV - Gray (10YR 6/1) compact sand; No cultural remains
Layer V - Very pale brown (10YR 8/3) loose aeolian sand; No cultural remains

Figure B-88. Profile of BT-D-3-1



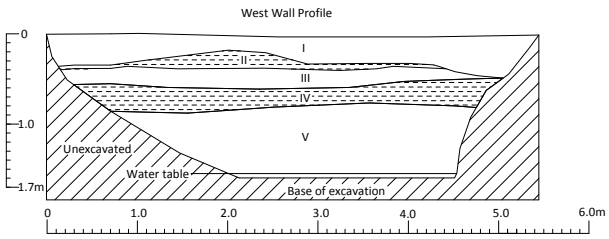
Layer I - Very dark grayish brown (10YR 3/2) friable sandy loam fill; Aggregate present
Layer II - Black (10YR 2/1) intact asphalt layer
Layer III - Light brownish gray (10YR 6/2) to yellowish brown (10YR 5/4) fine friable sandy loam fill; Aggregate present
Layer IV - Very pale brown (10YR 8/3 to 10YR 8/4) single grain aeolian sand; No cultural remains
Layer V - Gray (10YR 6/1) to light brownish gray (10YR 6/2) calcium carbonate precipitate; No cultural remains
Layer VI - Very pale brown (10YR 8/3) loose aeolian sand; No cultural remains
Layer VII - White (7.5YR 8/1) single grain aeolian silty sand; No cultural remains

Figure B-89. Profile of BT-D-4-1



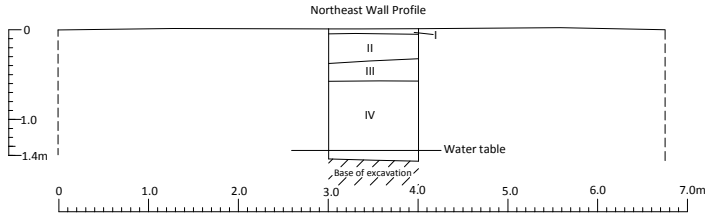
Layer I - Dark grayish brown (10YR 4/2) to light brownish gray (10YR 6/2) single grain loamy sand fill; No cultural remains
Layer II - Black (10YR 2/1) intact asphalt layer; WWII airfield pavement
Layer III - Very dark grayish brown (10YR 3/2) to yellowish brown (10YR 5/4) very fine friable clay loam fill; Aggregate for Airfield pavement bedding
Layer IV - Very dark gray (10YR 3/1) to very dark grayish brown (10YR 3/2) single grain loamy sand; Site 7290 cultural deposit
Layer V - Pale brown (10YR 6/3) single grain sand; No cultural remains
Layer VI - Very dark gray (10YR 3/1) to grayish brown (10YR 5/2) mottled single grain carbon stained slightly loamy sand; Site 7290 cultural deposit
Layer VII - Very pale brown (10YR 8/2) single grain aeolian sand; No cultural remains
Layer VIII - White (10YR 8/1) calcium carbonate precipitate; No cultural remains
Layer IX - Very pale brown (10YR 8/3) single grain aeolian sand; No cultural remains

Figure B-90. Profile of BT-D-5-1



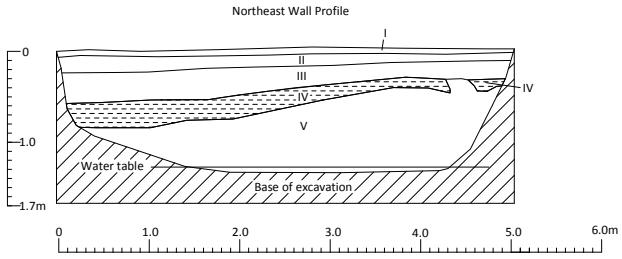
Layer I - Brown (10YR 5/3) compacted sandy clay loam; Aggregate for Airfield pavement bedding
Layer II - Black (7.5YR 2.5/1) and very dark brown (10YR 2/2) single grain banded loamy sand; Site 7290 cultural deposit (Marine shells and charcoal)
Layer III - Grayish brown (10YR 5/2) and dark grayish brown (10YR 4/2) and pale brown (10YR 6/3) single grain sand; No cultural remains
Layer IV - Very dark grayish brown (10YR 3/2) very fine friable sandy loam; Site 7290 cultural deposit (Marine shells and charcoal)
Layer V - Very pale brown (10YR 7/3) very fine single grain aeolian slightly silty sand; No cultural remains

Figure B-91. Profile of BT-D-6-1



Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains
Layer II - Brown (10YR 5/3) compact sandy clay loam; Aggregate present
Layer III - White (10YR 8/1) compacted sand; No cultural remains
Layer IV - Light gray (10YR 7/2) very fine silty sand; No cultural remains

Figure B-92. Profile of BT-D-6-2



Layer I - Dark brown (7.5YR 2.5/2) structureless humus; No cultural remains
Layer II - Light gray (10YR 7/2) and light brownish gray (10YR 6/2) compacted crushed limestone fill; Aggregate for Airfield runway shoulder
Layer III - Very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) fine friable sandy clay loam; No cultural remains
Layer IV - Very dark gray (7.5YR 3/1)fine friable carbon flecked sandy clay loam; Site 7290 cultural deposit (Marine shells and probable avian bones)
Layer V - Very pale brown (10YR 8/2) weathered limestone; No cultural remains

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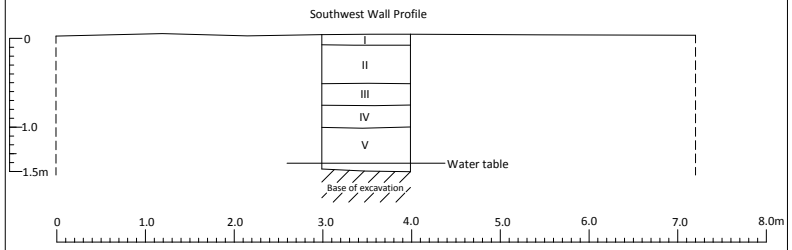
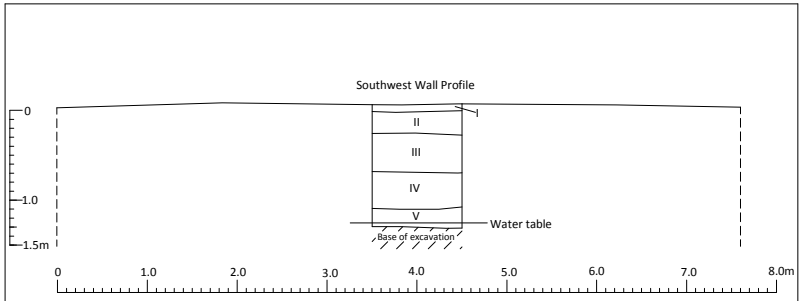
Figure B-93. Profile of BT-D-7-1



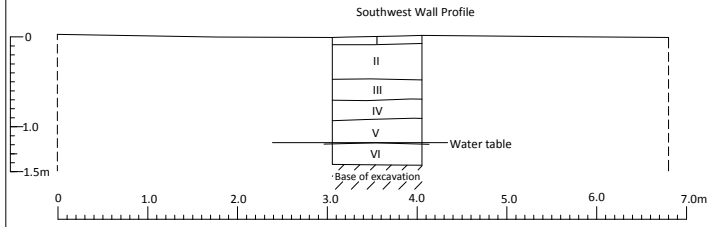
Layer I - Very dark brown (7.5YR 2.5/2) structureless humus ; No cultural remains
Layer II - Light brownish gray (10YR 6/2) to light gray (10YR 7/2) compact crushed limestone fill; Aggregate present
Layer III - Very dark grayish brown (10YR 3/2) to dark grayish brown (10YR 4/2) very fine friable sandy clay loam buried A horizon; No cultural remains
Layer IV - Dark yellowish brown (10YR 4/4) very fine friable sandy clay loam; No cultural remains
Layer V - Very pale brown (10YR 7/3) compact weathered limestone; No cultural remains

Figure B-94. Profile of BT-D-7-2



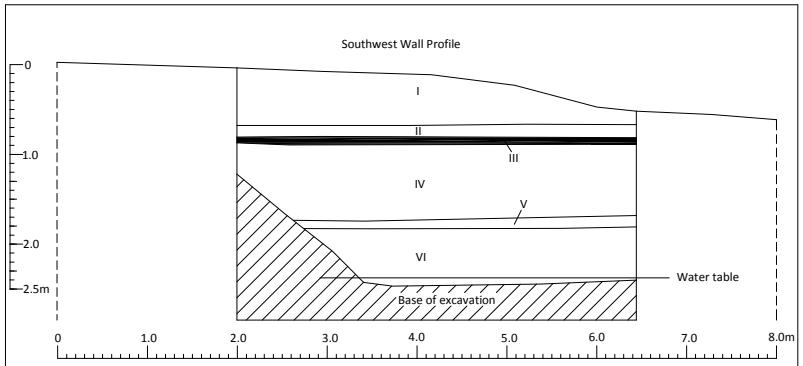
Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains
Layer II - Dark grayish brown (10YR 4/2) compact clay loam; Metal pipe and aggregate present
Layer III - Brown (10YR 4/3) to dark grayish brown (10YR 4/2) very fine friable sandy clay loam; No cultural remains
Layer IV - Dark grayish brown (10YR 4/2) very fine friable clay No cultural remains
Layer V - Very dark gray (7.5YR 3/1) massive clay; No cultural remains

Figure B-95. Profile of BT-D-8-1



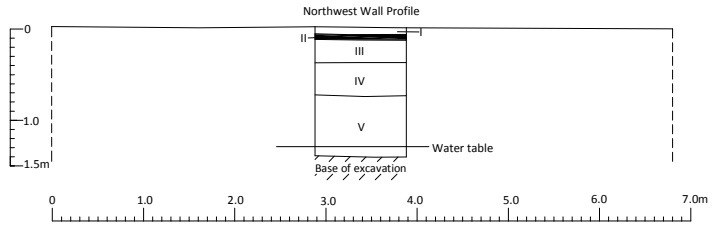
Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains
Layer II - Dark grayish brown (10YR 4/2) compact sandy loam; Aggregate present
Layer III - Brown (10YR 4/3) to pale brown (10YR 6/3) single graiin slighlty silty sand; No cultural remains
Layer IV - Very pale brown (10YR 8/2) lsingle grain sand; No cultural remains
Layer V - Very dark grayish brown (10YR 3/2) very fine friable clay loam buried A horizon; No cultural remains
Layer VI- Black (7.5YR 2.5/1) to very dark grayish brown (10YR 3/2) decomposing organics (peat); No cultural remains

Figure B-96. Profile of BT-D-8-2



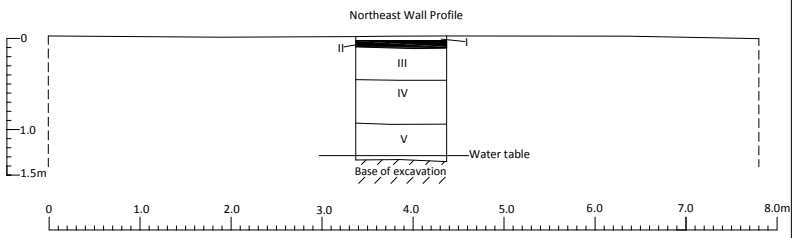
Layer I - Grayish brown (10YR 5/2) compact sandy loam; Marine shell, urchin, crab claw
Layer II - Light gray (10YR 7/2) coarse sand; Metal cable present
Layer III - Black (10YR 2/1) intact asphalt layer
Layer IV - Yellowish brown (10YR 5/4) very fine friable silty sand; Aggregate present
Layer V - Very dark gray (10YR 3/1) very fine friable sandy clay loam buried A horizon; No cultural remains
Layer VI - Light gray (10YR 7/2) weathered limestone; No cultural remains

Figure B-97. Profile of BT-D-8-3



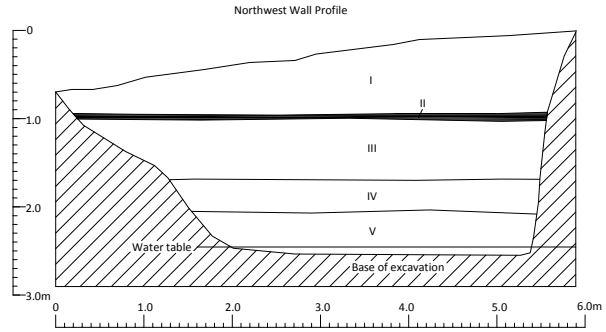
Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains
Layer II - Black (10YR 2/1) intact asphalt layer
Layer III - Light brownish gray (10YR 6/2) compact crushed limestone fill; Aggregate present
Layer IV - Brown (10YR 4/3) compact sandy clay loam fill; No cultural remains
Layer V - Very dark brown (10YR 8/2) compact crushed limestone fill; Aggregate present

Figure B-98. Profile of BT-D-9-1



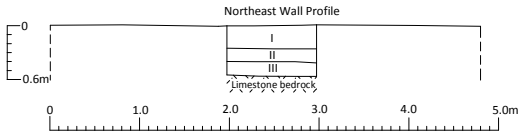
Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains
Layer II - Black (10YR 2/1) intact asphalt layer
Layer III - Light gray (10YR 7/2) compact crushed limestone fill; Aggregate present
Layer IV - Brown (10YR 4/2 and 7.5YR 4/3) very fine friable sandy clay loam; No cultural remains
Layer V - Dark yellowish brown (10YR 4/4) massive clay; No cultural remains

Figure B-99. Profile of BT-D-9-2



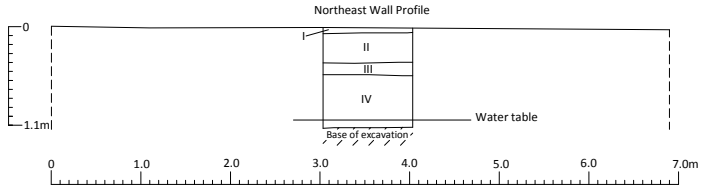
Layer I - Brown (10YR 4/3) unconsoliodated sandy loam; Sheet metal fragments present
Layer II - Black (10YR 2/1) intact asphalt layer
Layer III - Light gray (10YR 7/2) compact sandy clay loam fill; Aggregate present
Layer IV - Very dark grayish brown (10YR 3/2)very fine friable clay loam buried A horizon; Marine shell, crab claw, charcoal flecks
Layer V - Very pale brown (10YR 8/2) massive clay; No cultural remains

Figure B-100. Profile of BT-D-9-3



Layer I - Brown (10YR 4/3) very fine friable sandy clay loam; No cultural remains
Layer II - Yellowish brown (10YR 5/4) very fine friable sandy clay loam fill; No cultural remains
Layer III - Dark gray (10YR 4/1) massive clay; No cultural remains

Figure B-101. Profile of BT-D-10-1



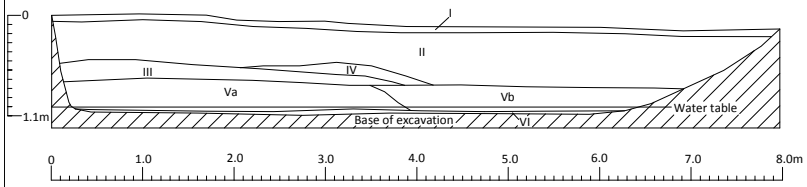
Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains

Layer II - Brown (7.5YR 5/4) to very pale brown (10YR 8/2) unconsolidated sandy clay loam; Aggregate present

Layer III - Very dark grayish brown (10YR 3/2) very fine friable clay loam buried A horizon; No cultural remains

Layer IV - Grayish brown (10YR 5/2) massive clay; No cultural remains

Figure B-102. Profile of BT-D-10-2



Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains

Layer II - Pinkish gray (7.5YR 7/2) coarse sand; No cultural remains

Layer III - Very dark gray (10YR 3/1) to dark gray (10YR 4/1) very fine friable sandy clay loam buried A horizon; No cultural remains

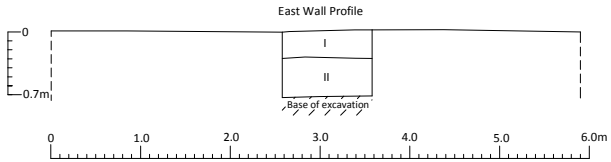
Layer IV - Dark brown (10YR 3/3) very fine friable clay loam alluvium; No cultural remains

Layer Va - Light brownish gray (10YR 6/2) massive clay; No cultural remains

Layer Vb - Black (2.5/N) to very dark grayish brown (10YR 3/2) massive clay; No cultural remains

Layer VI - Black (7.5YR 2.5/1) vegetal mat (peat); No cultural remains

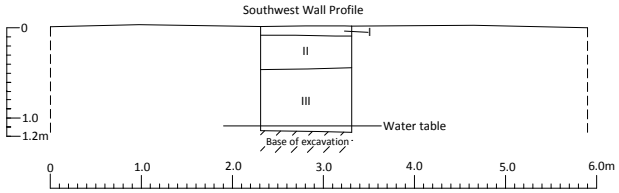
Figure B-103. Profile of BT-D-10-3



Layer I - Very pale brown (10YR 8/3) compact crushed limestone gravel fill; Aggregate present

Layer II - Brownish yellow (10YR 6/6) weathered limestone; No cultural remains

Figure B-104. Profile of BT-D-11-1

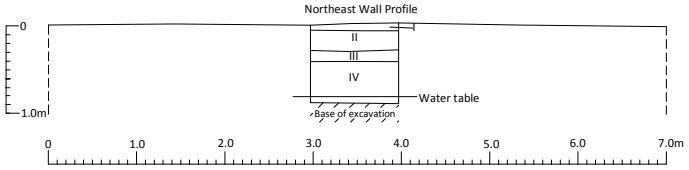


Layer I - Pale brown (10YR 6/2) to grayish brown (10YR 5/2) loose silty sand with humus; No cultural remains

Layer II - Yellowish brown (10YR 5/4) very fine friable sandy clay loam; Crushed limestone present

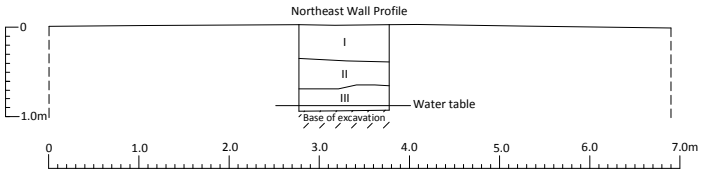
Layer III - Very pale brown (10YR 8/2) weathered limestone; No cultural remains

Figure B-105. Profile of BT-D-11-2



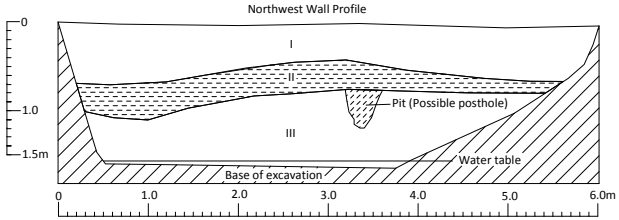
Layer I - Pale brown (10YR 6/2) unconsolidated silty sand with humus; No cultural remains
Layer II - Dark grayish brown (10YR 4/2) very fine friable sandy clay loam; No cultural remains
Layer III - Very dark grayish brown (10YR 3/2) to black (10YR 2/1) massive clay; No cultural remains
Layer IV - Pink (10YR 8/3) weathered limestone; No cultural remains

Figure B-106. Profile of BT-D-11-3



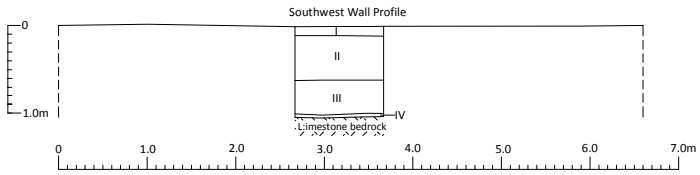
Layer I - Yellowish brown (10YR 5/4) unconsolidated sandy clay loam fill; Crushed limestone present
Layer II - Dark grayish brown (10YR 4/2) to very dark grayish brown very fine friable clay; No cultural remains
Layer III - Gray (10YR 6/1) massive clay; No cultural remains

Figure B-107. Profile of BT-D-12-1



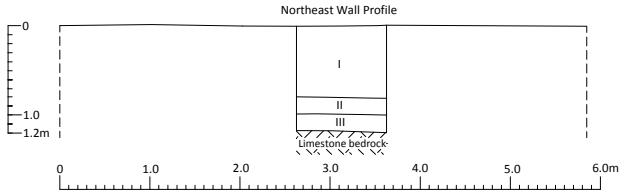
Layer I - Dark yellowish brown (10YR 3/4) loose sandy clay loam fill; 80-90% limestone aggregate
Layer II - Very dark gray (10YR 3/1) to black (10YR 2/1) very fine friable silt loam; Site 7291 cultural deposit (Marine shells, charcoal, kukui nutshells, coral)
Pit (Possible posthole) - Same soil matrix as Layer II (Marine shelsl and charcoal)
Layer III - Very pale brown (10YR 8/2) coarse limestone sand; No cultural remains

Figure B-108. Profile of BT-D-12-2



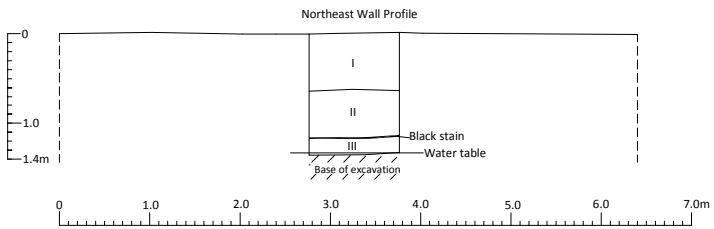
Layer I - Very dark brown (7.5YR 2.5/2) loose sandy loam with humus; No cultural remains
Layer II - Pale brown (10YR 6/3) to yellowish red (5YR 4/6) very fine friable sandy clay loam and clay clumps; No cultural remains
Layer III - Brown (7.5YR 3/4) very fine friable clay loam; No cultural remains
Layer IV - Brown (7.5YR 4/4) very fine friable clay; No cultural remains

Figure B-109. Profile of BT-D-12-3



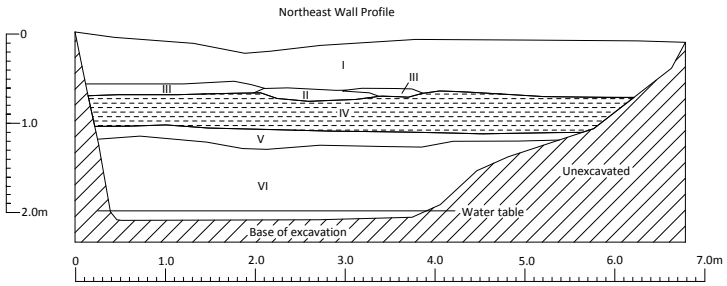
Layer I - Dark grayish brown (10YR 4/2) to grayish brown (10YR 5/2) moderately compact sandy clay loam fill; No cultural remains
Layer II - Dark grayish brown (10YR 4/2) very fine friable slightly sandy clay loam; No cultural remains
Layer III - Very dark grayish brown (10YR 3/2) to very dark gray (10YR 3/1)very fine friable clay; No cultural remains

Figure B-110. Profile of BT-D-13-1



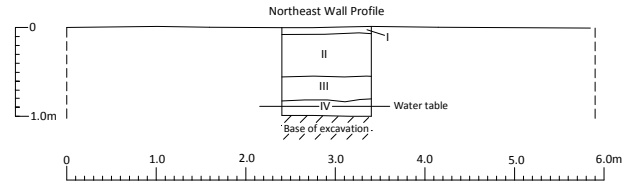
Layer I - Very pale brown (10YR 8/2) compact crushed limestone fill; Aggregate present
Layer II - Reddish brown (5YR 4/3) very fine friable clay fill; No cultural remains
Layer III - Weathered limestone; No cultural remains

Figure B-111. Profile of BT-D-13-2



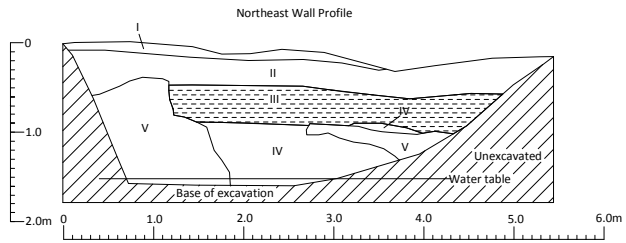
Layer I - Dark grayish brown (10YR 4/2) loose very sandy loam; Marston matting from runway
Layer II - Light gray (10YR 7/2) unconsolidated clean beach sand; No cultural remains
Layer III - Very pale brown (10YR 7/3) to pale brown (10YR 6/3) compact crushed limestone fill; 100% aggregate
Layer IV - Very dark grayish brown (10YR 3/2) very fine friable sandy clay loam; Site 7291 cultural deposit (Marine shells, urchin, crab, Canis bone, kukui nutshell, charcoal)
Layer V - Pinkish gray (7.5YR 6/2) very compacted alluvial silty clay; No cultural remains
Layer VI - White (10YR 8/1) weathered limestone; No cultural remains

Figure B-112. Profile of BT-D-13-3



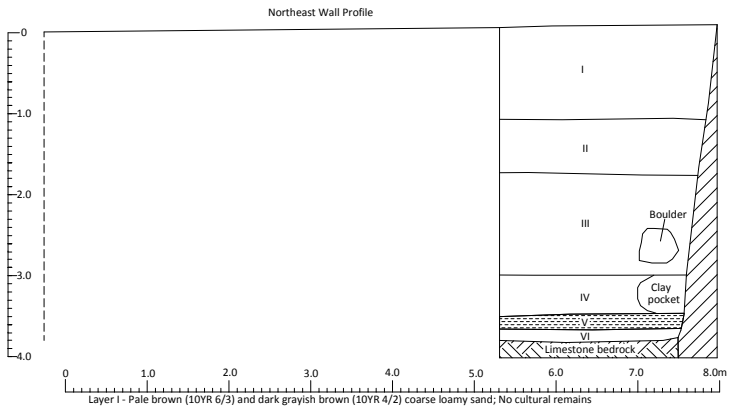
Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains
Layer II - Very dark grayish brown (10YR 3/2) fine friable sandy clay loam; No cultural remains
Layer III - Very dark grayish brown (10YR 3/2) fine friable sandy clay loam; No cultural remains
Layer IV - White (10YR 8/1) weathered limestone; No cultural remains

Figure B-113. Profile of BT-D-14-1



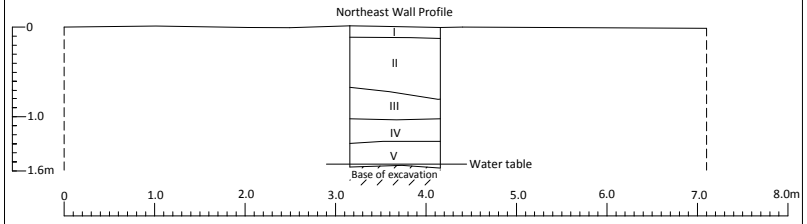
Layer I - Brown (10YR 5/3) loose sandy clay loam with humus; No cultural remains
Layer II - Strong brown (7.5YR 4/6) compacted clay fill; Limestone aggregate
Layer III - Black (7.5YR 2.5/1)very fine friable clay loam; Site 7291 cultural deposit (Marine shells, fishbone and charcoal)
Layer IV - Light brown (7.5YR 6/3) and grayish brown (10YR 5/2) massive clay; No cultural remains
Layer V - White (10YR 8/1) weathered limestone; No cultural remains

Figure B-114. Profile of BT-D-14-2



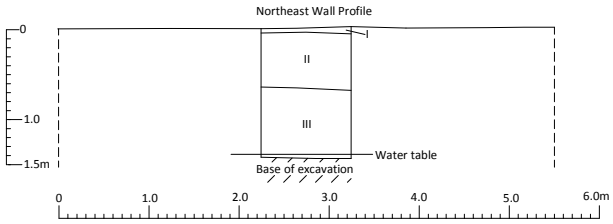
Layer I - Pale brown (10YR 6/3) and dark grayish brown (10YR 4/2) coarse loamy sand; No cultural remains
Layer II - Pale brown (10YR 6/3) and dark grayish brown (10YR 4/2) coarse banded, wavy interbedded loamy sand; No cultural remains
Layer III - Grayish brown (10YR 5/2) and dark grayish brown (10YR 4/2) very fine friable sandy clay loam; No cultural remains
Layer IV - Very pale brown (10YR 7/3) unconsolidated beach sand and dark grayish brown (10YR 4/2) clay pockets; No cultural remains
Layer V - Black (7.5YR 2.5/1) compacted carbon rich loam; Site 7291 cultural deposit (Marine shells, urchin, crab, charcoal, coral)
Layer VI - Dark grayish brown (10YR 4/2) very fine friable sandy clay loam; No cultural remains

Figure B-115. Profile of BT-D-14-3



Layer I - Grayish brown (10YR 5/2) to brown (10YR 5/3) single grain loamy sand; No cultural remains
Layer II - Dark grayish brown (10YR 4/2) fine friable sandy clay loam; No cultural remains
Layer III - Very dark gray (10YR 3/1) massive clay loam buried A; No cultural remains
Layer IV - Yellowish brown (10YR 5/4) massive clay ; No cultural remains
Layer V - Light gray (10YR 7/2) to very pale brown (10YR 7/3) weathered limestone; No cultural remains

Figure B-116. Profile of BT-D-15-1



Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains
Layer II - Yellowish brown (10YR 5/4) to very pale brown (10YR 8/2) loose silty sand fill; Crushed limestone present
Layer III - White (10YR 8/1) weathered limestone; No cultural remains

Figure B-117. Profile of BT-D-15-2

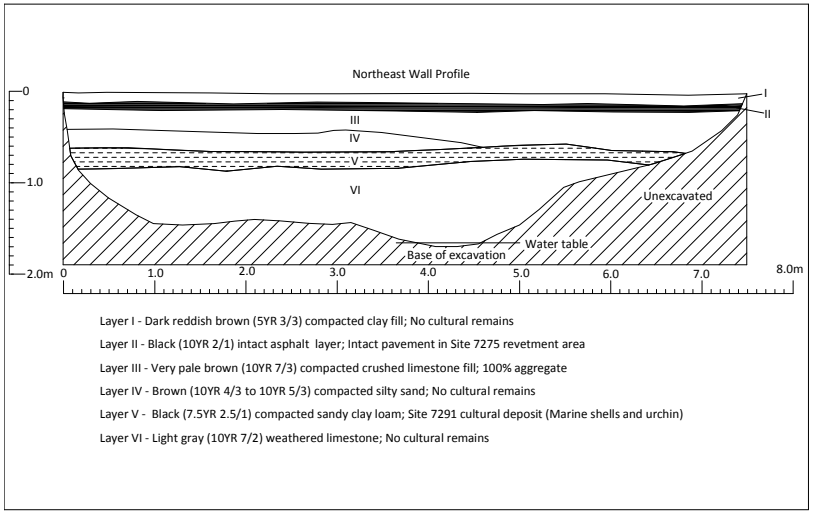
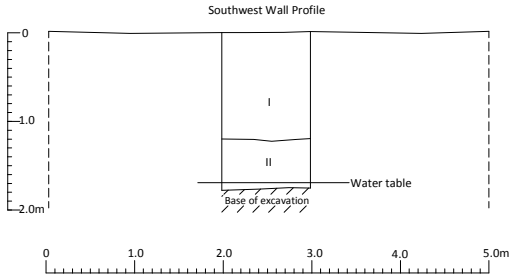


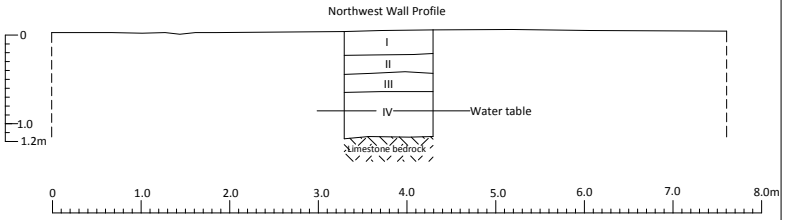
Figure B-118. Profile of BT-D-15-3

Area E Trenches



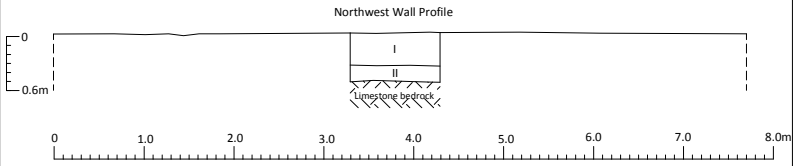
Layer I - Dark grayish brown (10YR 4/2) to brown (10YR 4/3) very fine friable sandy clay loam fill; Glass bottle and mesh cloth present
Layer II - Brownish yellow (10YR 6/6) weathered limestone; No cultural remains

Figure B-119. Profile of BT-E-1-1



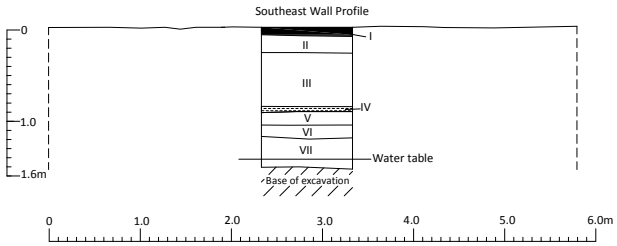
Layer I - Grayish brown (10YR 5/2) moderately compact sandy clay loam; Aggregate present
Layer II - Very dark gray (10YR 3/1) blocky friable clay loam; No cultural remains
Layer III - Yellowish brown (10YR 5/4) massive clay; No cultural remains
Layer IV - Very pale brown (10YR 7/3) massive sandy clay; No cultural remains

Figure B-120. Profile of BT-E-2-1



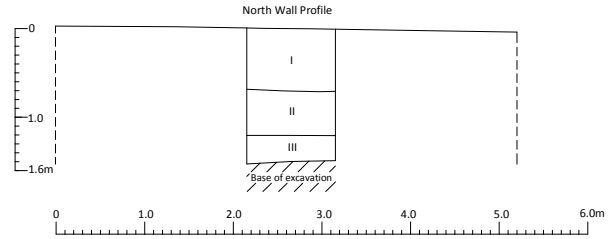
Layer I - Dark grayish brown (10YR 4/2) very fine friable sandy loam; 40% limestone aggregate
Layer II - Dark grayish brown (10YR 4/2) to brown (10YR 4/3) very fine friable sandy clay loam; No cultural remains

Figure B-121. Profile of BT-E-2-2



Layer I - Black (10YR 2/1) intact asphalt layer (Site 7275 runway pavement)
Layer II - Brown (10YR 5/3) compact clay loam fill; 95% limestone aggregate
Layer III - Very dark grayish brown (10YR 3/2) very fine friable sandy clay loam; Asphalt fragments, 60% limestone aggregate
Layer IV - Very dark gray (10YR 3/1) to black (10YR 2/1) massive clay; Site 7292 cultural layer
Layer V - Dark gray (10YR 4/1) massive clay; No cultural remains
Layer VI - Gray (10YR 6/1) massive clay; No cultural remains
Layer VII - Brownish yellow (10YR 6/6) weathered limestone; No cultural remains

Figure B-122. Profile of BT-E-2-3

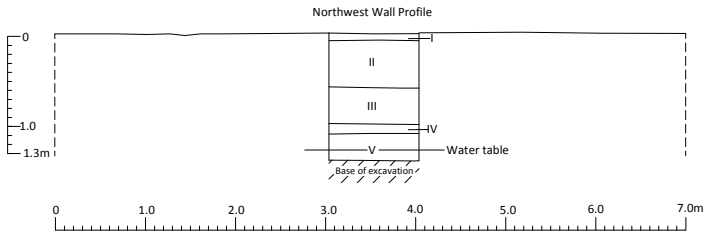


Layer I - Dusky red (2.5YR 3/3) compact clay fill; No cultural remains

Layer II - Brown (7.5YR 5/4) compact clay fill; No cultural remains

Layer III - Brownish yellow (10YR 6/6) weathered limestone; No cultural remains

Figure B-123. Profile of BT-E-2-3b



Layer I - Very dark brown (7.5YR 2.5/3) structureless organics (Humus); No cultural remains

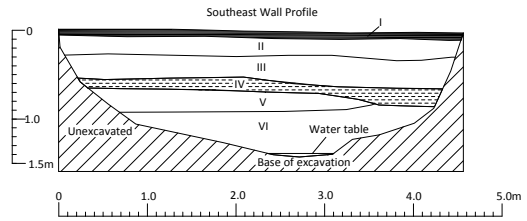
Layer II - Pale brown (10YR 6/3) very fine friable sandy clay loam; Aggregate present

Layer III - Dark grayish brown (10YR 4/2) very fine friable sandy clay loam; No cultural remains

Layer IV - Dark yellowish brown (10YR 4/4) massive clay; No cultural remainsd

Layer V - Bluish gray (G2 5/1) massive gley; No cultural remains

Figure B-124. Profile of BT-E-3-1



Layer I - Black (10YR 2/1) intact asphalt layer (Site 7275 runway pavement)

Layer II - Brown (7.5YR 4/4) to light yellowish brown (10YR 6/4) compact sandy clay loam; 60% limestone aggregate

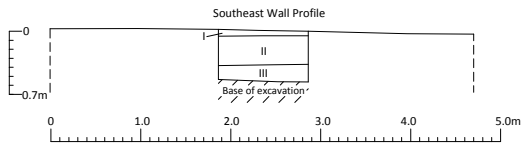
Layer III - Pale brown (10YR 6/3) compact silty sand; 90% limestone aggregate

Layer IV - Black (7.5YR 2.5/1) very fine friable sandy clay loam; Site 7292 cultural layer (Marine shells and basalt debitage)

Layer V - Light brownish gray (10YR 6/2) single grain sand; No cultural remains

Layer VI - Brownish yellow (10YR 6/6) weathered limestone; No cultural remains

Figure B-125. Profile of BT-E-3-2

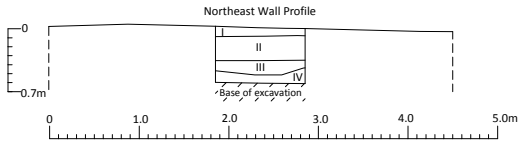


Layer I - Very dark brown (7.5YR 2.5/2) structureless organics (Humus); No cultural remains

Layer II - Very dark grayish brown (10YR 3/2)loose, fine friable silty loam; Basalt aggregate present

Layer III - White (10YR 8/1) weathered limestone; No cultural remains

Figure B-126. Profile of BT-E-3-2b



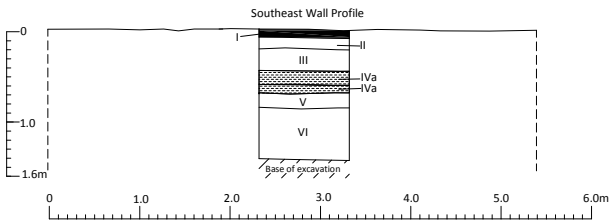
Layer I - Very dark brown (7.5YR 2.5/2) structureless organics (Humus); No cultural remains

Layer II - Pale brown (10YR 6/3) fine friable clay loam; 80% limestone aggregate

Layer III - Brown (10YR 4/3) fine friable clay loam; No cultural remains

Layer IV - Very pale brown (10YR 8/2) weathered limestone; No cultural remains

Figure B-127. Profile of BT-E-3-2c



Layer I - Black (10YR 2/1) intact asphalt layer (Site 7275 runway pavement)

Layer II - Brown (7.5YR 5/4) compact clay loam; 70% limestone aggregate

Layer III - Gray (10YR 6/1) to light brownish gray (10YR 6/2) compact limestone fill; 100% limestone aggregate

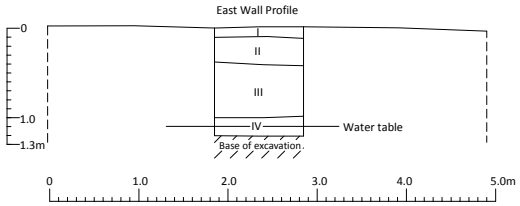
Layer IVa - Dark gray (7.5YR 4/1) to very dark gray (7.5R 3/1) moderately compact clay loam; Site 7292 cultural layer (Charcoal)

Layer IVb - Black (7.5YR 2.5/1) very compact carbon-rich clay; Site 7292 cultural layer

Layer V - Brown (10YR 4/3) massive clay; No cultural remains

Layer VI - Brownish yellow (10YR 6/6) weathered limestone; No cultural remains

Figure B-128. Profile of BT-E-3-3



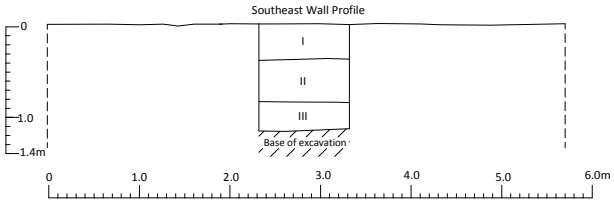
Layer I - Dark brown (10YR 3/3) fine friable clay loam; No cultural remains

Layer II - White (10YR 8/1) compact limestone; Aggregate present

Layer III - Brown (10YR 4/3) to dark yellowish brown (10YR 4/4) fine friable clay loam; No cultural remains

Layer IV - Dark gray (10YR 4/1) massive clay; No cultural remains

Figure B-129. Profile of BT-E-3-3b

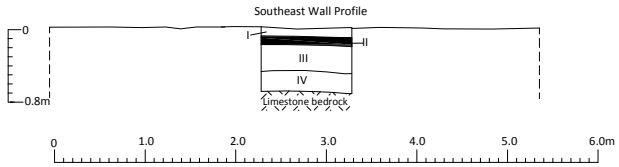


Layer I - Dark brown (7.5YR 3/3) very fine friable clay loam; No cultural remains

Layer II - Light brownish gray (10YR 6/2) compact clay loam; Aggregate present

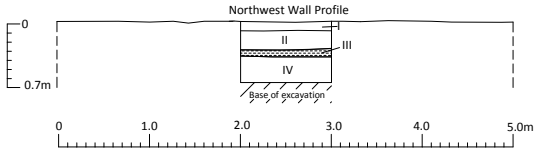
Layer III - Very pale brown (10YR 7/3) weathered limestone; No cultural remains

Figure B-130. Profile of BT-E-3-4



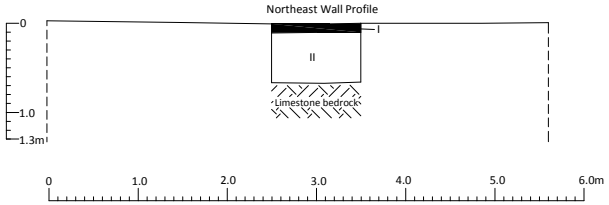
Layer I - Brown (7.5YR 4/3) very fine friable clay loam; No cultural remains
Layer II - Black (10YR 2/1) intact asphalt layer (Site 7275 runway pavement)
Layer III - Gray (10YR 5/1) very fine friable sandy clay loam; 85% limestone aggregate
Layer IV - Grayish brown (10YR 5/2) massive clay; No cultural remians

Figure B-131. Profile of BT-E-3-5



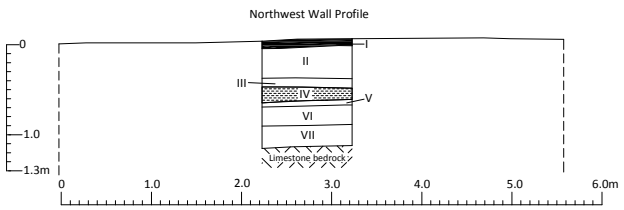
Layer I - Black (10YR 2/1) structureless humus; No cultural remains
Layer II - Very dark grayish brown (10YR 3/2) loose sandy clay loam; No cultural remains
Layer III - Very dark grayish brown (10YR 3/2) and dark brown (7.5YR 3/4) compacted clay loam; Site 7292 cultural layer (charcoal flecks)
Layer IV - Very pale brown (10YR 8/2) weathered limestone; No cultural remains

Figure B-132. Profile of BT-E-4-1



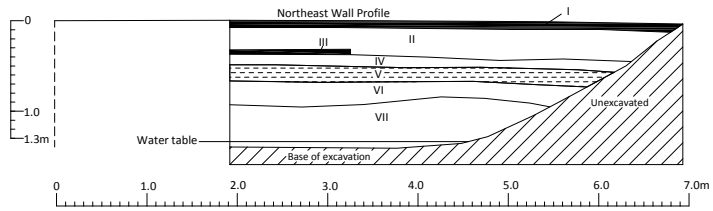
Layer I - Black (10YR 2/1) intact asphalt layer (Site 7275 runway pavement)
Layer II - Pale brown (10YR 6/3) compact sandy clay loam; Bottle glass, 70% limestone aggregate

Figure B-133. Profile of BT-E-4-1b



Layer I - Black (10YR 2/1) intact asphalt layer (Site 7275 runway pavement)
Layer II - Brown (10YR 5/3) very fine friable sandy clay loam; 60% limestone aggregate
Layer III - Brown (7.5YR 4/4) very fine friable sandy clay loam; 60% limestone aggregate
Layer IV - Very dark gray (7.5YR 3/1) very fine friable sandy clay loam; Site 7292 cultural deposit(Marine shell, charcoal)
Layer V - Dark grayish brown (10YR 4/2) very fine friable sandy clay loam; No cultural remains
Layer VI - Very pale brown (10YR 8/4) weathered limestone; No cultural remains
Layer VII - Yellowish brown (10YR 5/4) massive clay; No cultural remains

Figure B-134. Profile of BT-E-4-2



Layer I - Black (10YR 2/1) intact asphalt layer (Site 7275 runway pavement)

Layer II - Dark yellowish brown (10YR 4/4) fine friable clay; 90% limestone aggregate

Layer III - Black (10YR 2/1) intact asphalt layer (Site 7275 runway)

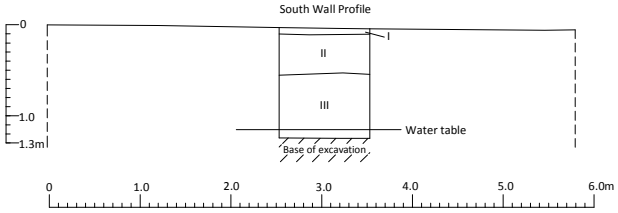
Layer IV - White (10YR 8/1) compacted limestone fill; 100% limestone aggregate

Layer V - Very dark gray (10YR 3/1) and black (10YR 2/1) fine friable clay loam; Site 7292 cultural deposit (charcoal)

Layer VI - White (10YR 8/1) weathered limestone; No cultural remains

Layer VII - Brown (10YR 4/3) massive clay; No cultural remains

Figure B-135. Profile of BT-E-4-2b

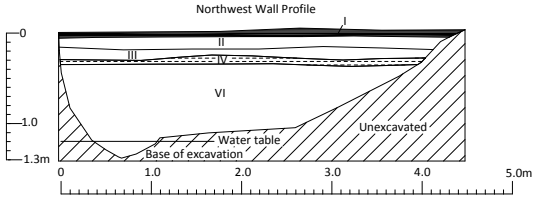


Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains

Layer II - Dark grayish brown (10YR 4/2) fine friable sandy clay loam; Asphalt fragments and limestone aggregate present

Layer III - White (10YR 8/1) weathered limestone; No cultural remains

Figure B-136. Profile of BT-E-4-2c



Layer I - Black (10YR 2/1) intact asphalt layer (Site 7275 runway pavement)

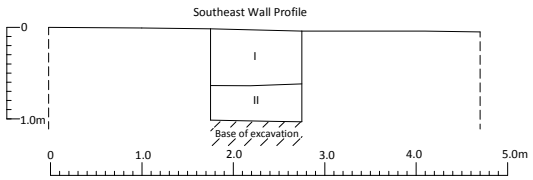
Layer II - Very pale brown (10YR 7/3) compact imestone fill; 10% limestone aggregate

Layer III - Brown (7.5YR 4/4) very fine friable sandy clay loam; 70% limestone aggregate

Layer IV - Dark grayish brown (10YR 4/2) very fine friable sandy clay loam; Site 7292 cultural deposit (Marine shells and charcoal)

Layer V - Dark brown (7.5YR 3/4) very fine friable sandy clay loam; No cultural remains

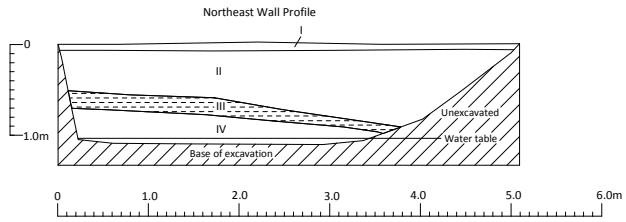
Figure B-137. Profile of BT-E-4-3



Layer I - Pale brown (10YR 6/3) compact sandy clay loam; No cultural remains

Layer II - White (10YR 8/1) weathered limestone; No cultural remains

Figure B-138. Profile of BT-E-4-3b



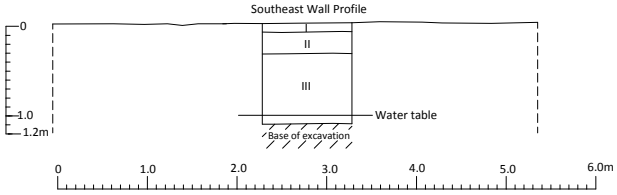
Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains

Layer II - Very pale brown (10YR 8/2 to 10YR 7/3) compact limestone fill; Aggregate fill of Site 7275

Layer III - Very dark gray (10YR 3/1) to dark gray (10YR 4/1) fine friable clay loam; Site 7292 cultural deposit

Layer IV - Dark yellowish brown (10YR 4/4) to gray (10YR 5/1) massive clay; No cultural remains

Figure B-139. Profile of BT-E-4-3c

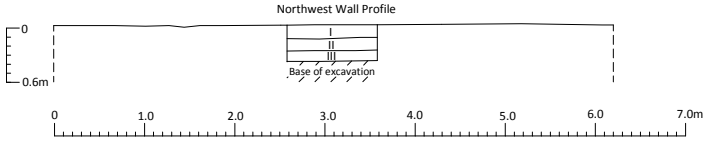


Layer I - Very dark brown (10YR 2/2) fine friable clay loam with humus; No cultural remains

Layer II - Brown (10YR 4/3) compact sandy clay loam; No cultural remains

Layer III - Gray (7.5YR 5/1) to dark gray (7.5YR 4/1) compact sandy clay loam; No cultural remains

Figure B-140. Profile of BT-E-4-4

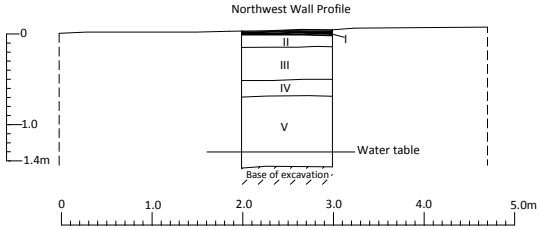


Layer I - Very dark brown (7.5YR 2.5/2) very fine friable clay loam with humus; No cultural remains

Layer II - Yellowish brown (10YR 5/4) compact clayey sand; No cultural remains

Layer III - Very pale brown (10YR 7/3) weathered bedrock; No cultural remains

Figure B-141. Profile of BT-E-5-1



Layer I - Black (10YR 2/1) intact asphalt layer; No cultural remains

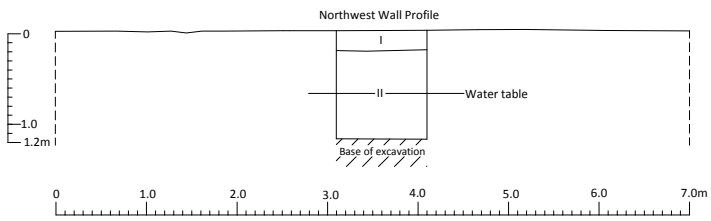
Layer II - Light gray (10YR 7/1) compact limestone fill; Aggregate present

Layer III - Dark gray (10YR 4/1) compact sandy clay loam; No cultural remains

Layer IV - White (10YR 8/1) weathered limestone; No cultural remains

Layer V - Yellowish brown (10YR 5/4) massive clay; No cultural remains

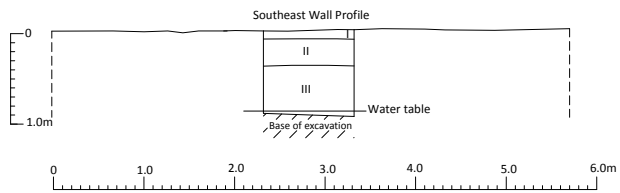
Figure B-142. Profile of BT-E-5-2



Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains

Layer III - Very pale brown (10YR 8/2) weathered limestone; No cultural remains

Figure B-143. Profile of BT-E-5-3

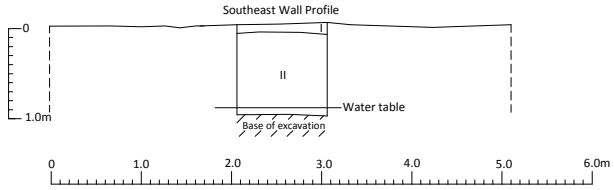


Layer I - Very dark grayish brown (10YR 3/2) fine fraible clay with humus; No cultural remains

Layer II - Light yellowish brown (10YR 6/4) to yellowish brown (10YR 5/4)) unconsolidated sandy loam; Aggregate present

Layer III - Grayish brown (10YR 5/2) fine friable sandy clay loam; Fire brick and metal pipe present

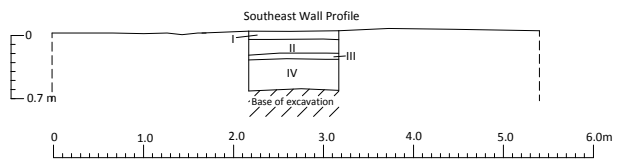
Figure B-144. Profile of BT-E-5-4



Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains

Layer II - Brown (7.5YR 2.5/2) compact sandy clay loam; No cultural remains

Figure B-145. Profile of BT-E-5-5



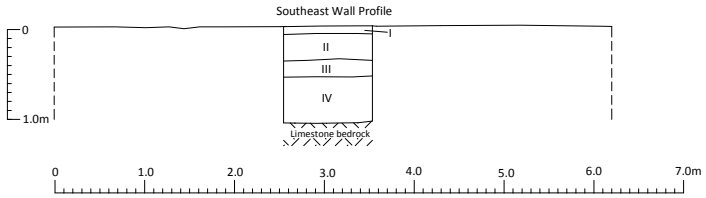
Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains

Layer II - Very pale brown (10YR 8/2) compact limestone fill; Aggregate present

Layer III - Yellowish brown (10YR 5/4) very fine friable sandy clay loam; No cultural remains

Layer IV - Very pale brown (10YR 7/3 and 8/2) weathered limestone; No cultural remains

Figure B-146. Profile of BT-E-6-1



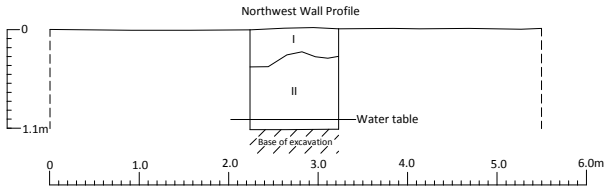
Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains

Layer II - Grayish brown (10YR 5/2) to dark grayish brown (10YR 4/2)very fine friable sandy clay loam; No cultural remains

Layer III - Dark yellowish brown (10YR 4/4) massive clay; No cultural remains

Layer IV - Very pale brown (10YR 7/3) massive sandy clay; No cultural remains

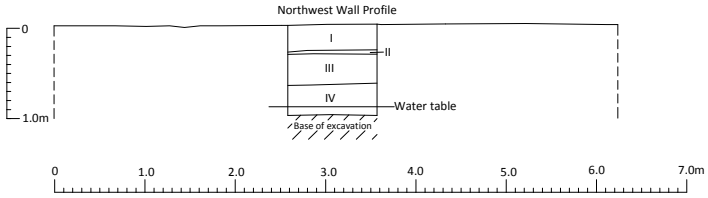
Figure B-147. Profile of BT-E-6-2



Layer I - Very dark brown (10YR 2/2) very fine friable clay loam; No cultural remains

Layer II - Very pale brown (10YR 7/3) weathered limestone; No cultural remains

Figure B-148. Profile of BT-E-6-3



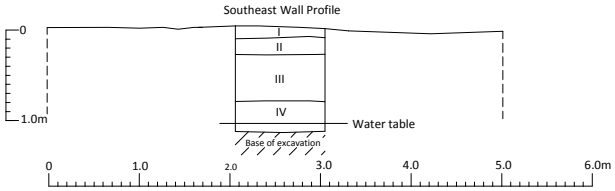
Layer I - Dark brown (10YR 3/3) very fine friable clay loam; Plastic fragment present

Layer II - Very dark brown (10YR 2/2) very fine friable sandy clay loam; No cultural remains

Layer III - Brown (10YR 5/3) very fine friable sandy clay loam; No cultural remains

Layer IV - Very pale brown (10YR 7/3) weathered limestone sand; No cultural remains

Figure B-149. Profile of BT-6-4



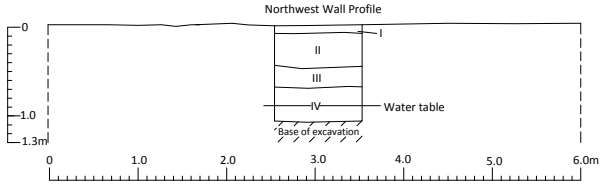
Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains

Layer II - Very pale brown (10YR 8/2) compact limestone fill; Aggregate present

Layer III - Brown (7.5YR 4/3) very fine friable clay; No cultural remains

Layer IV - Brown (10YR 4/3) massive clay; No cultural remains

Figure B-150. Profile of BT-E-6-5



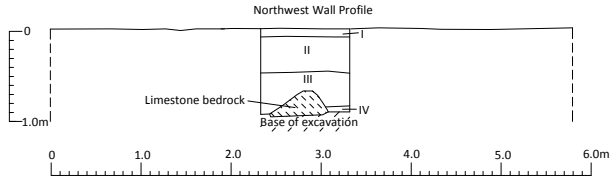
Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains

Layer II - Brown (10YR 5/3) very fine friable sandy clay loam; No cultural remains

Layer III - Pale brown (10YR 6/3) very fine friable sandy clay loam; No cultural remains

Layer IV - Dark yellowish brown (10YR 4/4) massive clay; No cultural remains

Figure B-151. Profile of BT-E-7-1



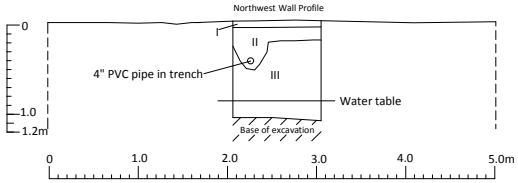
Layer I - Very dark brown (7.5YR 2.5/2) very fine friable clay loam with humus; No cultural remains

Layer II - Pale brown (10YR 6/3) very fine friable sandy clay loam; No cultural remains

Layer III - Yellowish brown (10YR 5/4) massive clay; No cultural remains

Layer IV - Very pale brown (10YR 7/3) sticky, plastic sandy clay/gley; No cultural remains

Figure B-152. Profile of BT-E-7-2

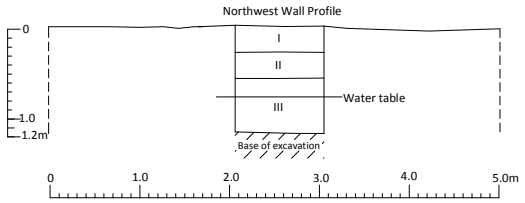


Layer I - Dark brown (7.5YR 3/2) very fine friable sandy clay loam with humus; No cultural remains

Layer II - Dark brown (7.5YR 3/3) to brown (7.5YR 4/3) very fine friable sandy clay loam fill; PVC pipe present

Layer III - Very pale brown (10YR 7/3 to 10YR 8/2) weathered limestone; No cultural remains

Figure B-153. Profile of BT-E-7-3

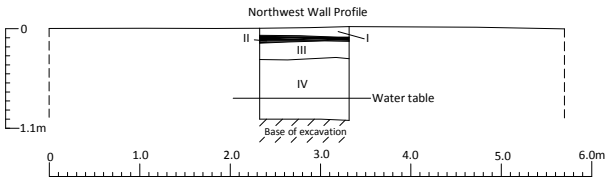


Layer I - Dark brown (10YR 3/3) very fine friable sandy clay loam; No cultural remains

Layer II - Pale brown (10YR 6/3) very fine friable sandy clay loam alluvium; No cultural remains

Layer III - Very pale brown (10YR 8/2) very fine friable sandy clay loam; No cultural remains

Figure B-154. Profile of BT-E-7-4



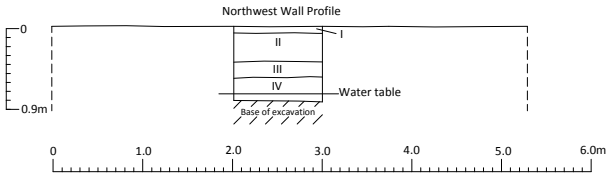
Layer I - Dark brown (7.5YR 3/4) structureless humus; No cultural remains

Layer II - Black (10YR 2/1) intact asphalt layer

Layer III - Brown (10YR 4/3) very fine friable sandy clay loam; No cultural remains

Layer IV - Very pale brown (10YR 8/2) weathered limestone; No cultural remains

Figure B-155. Profile of BT-E-7-5



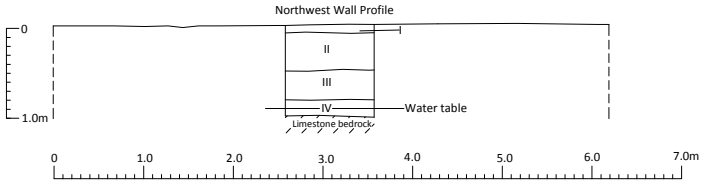
Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains

Layer II - Very pale brown (10YR 8/2) weathered limestone ; No cultural remains

Layer III - Yellowish brown (10YR 5/4) massive clay; No cultural remains

Layer IV - White (10YR 8/1) weathered limestone; No cultural remains

Figure B-156. Profile of BT-E-8-1



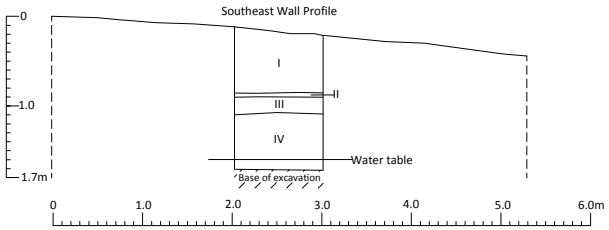
Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains

Layer II - Very pale brown (10YR 8/2) weathered limestone; No cultural remains

Layer III - Yellowish brown (10YR 5/4) massive clay; No cultural remains

Layer IV - White (10YR 8/1) massive clay; No cultural remains

Figure B-157. Profile of BT-E-8-2



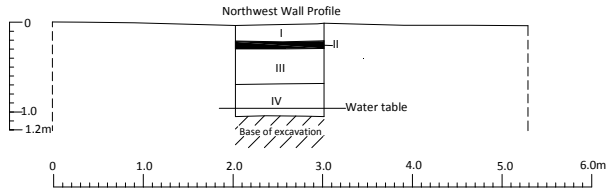
Layer I - Dark brown (7.5YR 3/3) very fine friable sandy clay loam; Asphalt fragments present

Layer II - Very dark gray (10YR 3/1) very fine friable sandy clay loam alluvium; No cultural remains

Layer III - Very pale brown (10YR 8/2) weathered limestone; No cultural remains

Layer IV - Pale brown (10YR 6/3) to dark yellowish brown (10YR 4/4) massive clay; No cultural remains

Figure B-158. Profile of BT-E-8-3



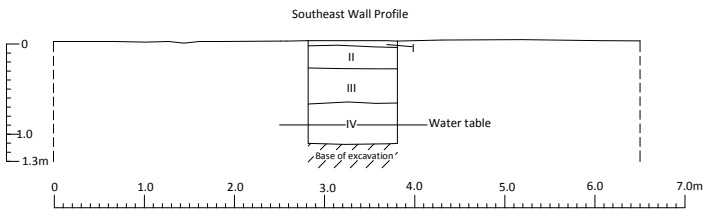
Layer I - Dark brown (7.5YR 3/3) very fine friable sandy clay loam; No cultural remains

Layer II - Black (10YR 2/1) intact asphalt layer

Layer III - Dark yellowish brown (10YR 4/4) loose sandy clay loam; No cultural remains

Layer IV - Brown (10YR 5/2 to 7.5YR 5/4) weathered limestone; No cultural remains

Figure B-159. Profile of BT-E-8-4



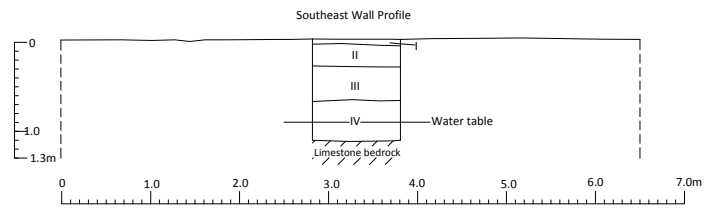
Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains

Layer II - Dark grayish brown (10YR 4/2) very fine friable clay loam; No cultural remains

Layer III - Dark grayish brown (10YR 4/2) very fine friable sandy clay loam; No cultural remains

Layer IV - Grayish brown (10YR 5/2) weathered limestone sand; No cultural remains

Figure B-160. Profile of BT-E-9-1



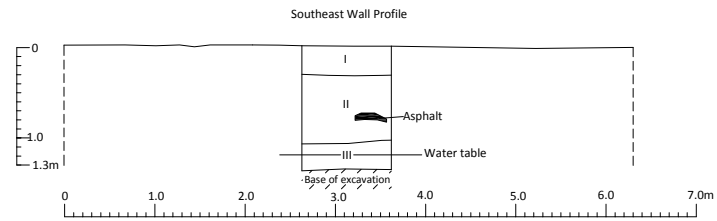
Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains

Layer II - Dark grayish brown (10YR 4/2) loose sandy clay loam; No cultural remains

Layer III - Dark grayish brown (10YR 4/2) very compact sandy clay loam; No cultural remains

Layer IV - Grayish brown (10YR 5/2) massive clay clay; No cultural remains

Figure B-161. Profile of BT-E-9-2

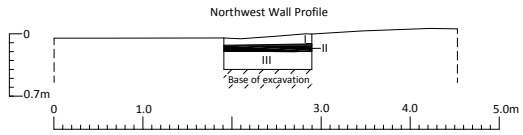


Layer I - Very dark brown (7.5YR 2.5/2) structureless greenwaste; No cultural remains

Layer II - Brown (10YR 5/3) very fine friable sandy clay loam; Asphalt present

Layer III - Very pale brown (10YR 8/2) weathered limestone; No cultural remains

Figure B-162. Profile of BT-E-9-3

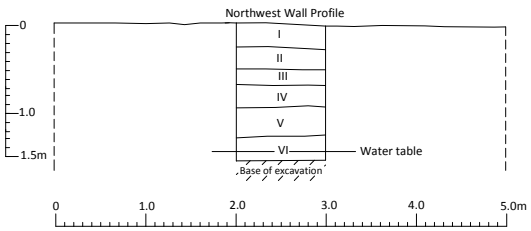


Layer I - Very dark brown (7.5YR 2.5/2) structureless organics (Humus); No cultural remains

Layer II - Black (10YR 2/1) intact asphalt layer

Layer III - Yellowish brown (10YR 5/4) weathered limestone; No cultural remains

Figure B-163. Profile of BT-E-9-4



Layer I - Dusky red (2.5YR 3/2) very fine friable clay loam; No cultural remains

Layer II - Grayish brown (10YR 5/2) compact clay loam; No cultural remains

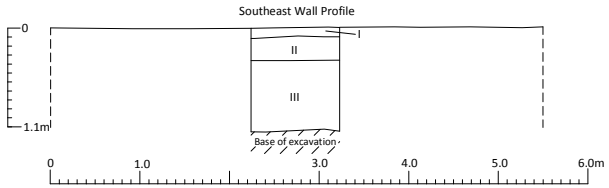
Layer III - Pale brown (10YR 6/3) very fine friable sandy clay loam; No cultural remains

Layer IV - Dark grayish brown (10YR 4/2) very fine crumb sandy clay; No cultural remains

Layer V - Very pale brown (10YR 8/2) weathered limestone; No cultural remains

Layer VI - Dark gray (10YR 4/1) massive clay; No cultural remains

Figure B-164. Profile of BT-E-9-5

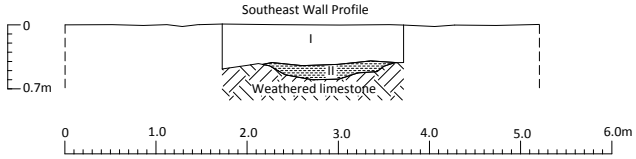


Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains

Layer II - Brown (10YR 4/2) very fine friable clay loam; No cultural remains

Layer III - Very pale brown (10YR 8/2) weathered limestone; No cultural remains

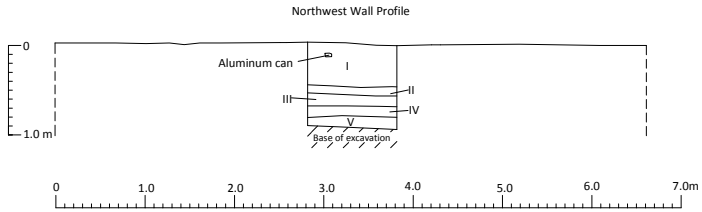
Figure B-165. Profile of BT-E-10-1



Layer I - Brown (10YR 4/3) loose, very fine friable clay loam; Plastic sheeting present

Layer II -Black (7.5YR 2.5/1) to brown (10YR 5/3) very fine friable clay loam and clayey sand;
Site 7293 cultural deposit (urchin, charcoal, fire-altered rock)

Figure B-166. Profile of BT-E-10-2



Layer I - Very dark brown (10YR 2/2) loose, very fine fraiable loam; Aluminum can present

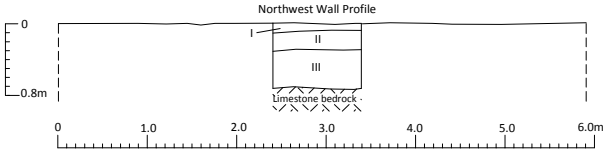
Layer II - Dark yellowish brown (10YR 4/4) very fine friable sandy clay loam; No cultural remains

Layer III - Pale brown (10YR 6/3) loose sand; No cultural remains

Layer IV - Dark gray (10YR 4/1) massive clay; No cultural remains

Layer V - White (10YR 8/1) weathered limestone; No cultural remains

Figure B-167. Profile of BT-E-10-3

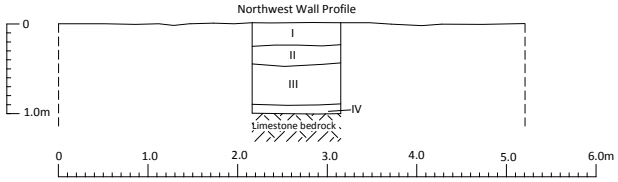


Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains

Layer II - Very dark grayish brown (10YR 3/2) compact clay loam; Aggregate present

Layer II - Grayish brown (10YR 5/2) compact clay loam; Asphalt fragments and aggregate present

Figure B-168. Profile of BT-E-10-4



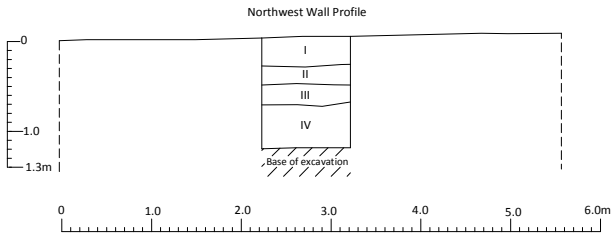
Layer I - Very dusky red (2.5YR 2.5/2) very fine friable clay loam; No cultural remains

Layer II - Pale brown (10YR 6/3) very fine friable sandy clay loam; No cultural remains

Layer III - Very pale brown (10YR 8/2) coarse sand; No cultural remains

Layer IV - Yellowish brown (10YR 5/4) sticky, plastic clay; No cultural remains

Figure B-169. Profile of BT-E-10-5



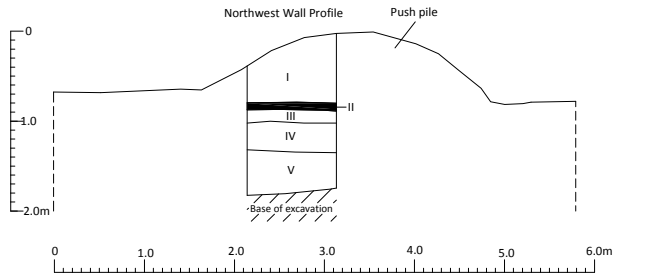
Layer I - Very dusky red (2.5YR 2.5/2) coarse clay loam; No cultural remains

Layer II - Very dark grayish brown (10YR 3/2) very fine friable sandy clay loam; Asphalt fragments present

Layer III - Very dark grayish brown (10YR 3/2) very fine friable sandy clay loam; No cultural remains

Layer IV -Very pale brown (10YR 8/2) weathered limestone; No cultural remains

Figure B-170. Profile of BT-E-10-6



Layer I - Dark reddish brown (5YR 3/3) very fine friable sandy clay loam bulldozer push; Glass and plastic present

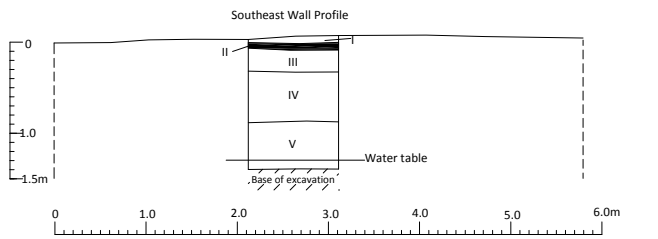
Layer II - Black (10YR 2/1) intact asphalt layer

Layer III - Light gray (10YR 7/2) compact limestone fill; Aggregate present

Layer IV - Yellowish brown (10YR 5/4) very fine friable sandy clay loam; No cultural remains

Layer V- Light gray (10YR 7/2) weathered limestone; No cultural remains

Figure B-171. Profile of BT-E-11-1



Layer I - Black (7.5YR 2.5/1) structureless clay loam with humus; Asphalt fragments present

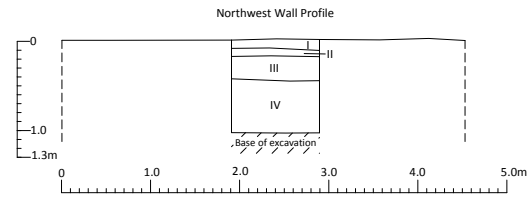
Layer II - Black (10YR 2/1) intact asphalt layer

Layer III - Light gray (10YR 7/2) compact limestone fill; Aggregate present

Layer IV - Dark grayish brown (10YR 4/2) very fine friable sandy clay loam; No cultural remains

Layer V- Light gray (10YR 7/2) weathered limestone; No cultural remains

Figure B-172. Profile of BT-E-11-2



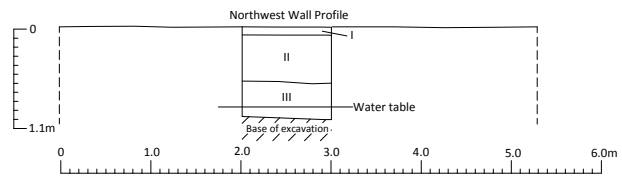
Layer I - Black (7.5YR 2.5/1) structureless clay loam with humus; Asphalt fragments present

Layer II - Brown (10YR 4/3) very fine friable sandy clay loam; No cultural remains

Layer III - Brown (10YR 4/3) friable sandy clay loam alluvium; No cultural remains

Layer III - Yellowish brown (10YR 5/4) weathered limestone; No cultural remains

Figure B-173. Profile of BT-E-11-3

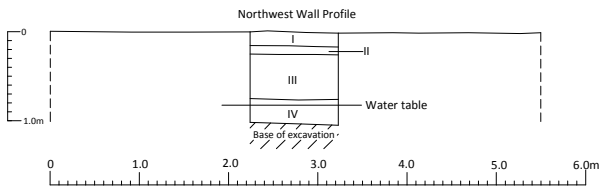


Layer I - Black (7.5YR 2.5/1) structureless clay loam with humus; Asphalt fragments present

Layer II - Brown (10YR 5/3) very fine friable loamy sand; No cultural remains

Layer III - Light brownish gray (10YR 6/2) single grain sand; No cultural remains

Figure B-174. Profile of BT-E-11-4



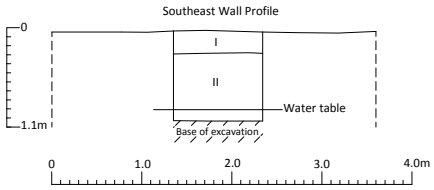
Layer I - Black (7.5YR 2.5/1) structureless clay loam with humus; Asphalt fragments present

Layer II - Very pale brown (10YR 7/4) compact limestone fill; Aggregate present

Layer III - Brown (10YR 4/3) very fine friable sandy clay loam; No cultural remains

Layer IV - White (10YR 8/1) weathered limestone; No cultural remains

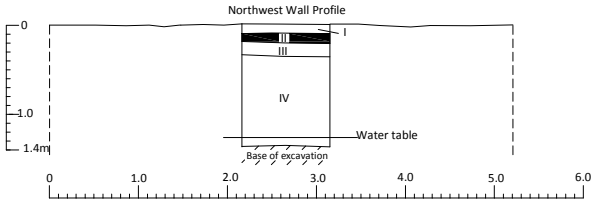
Figure B-175. Profile of BT-E-11-5



Layer I - Dark brown (10YR 3/3) structureless humus; No cultural remains

Layer II - Brown (7.5YR 4/4) to pinkish white (7.5YR 8/2) weathered limestone sand; No cultural remains

Figure B-176. Profile of BT-E-11-6



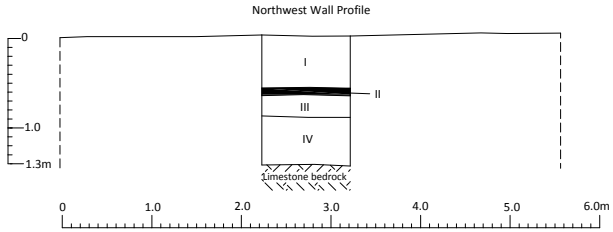
Layer I - Very dusky red (2.5YR 2.5/2) very fine friable clay loam; No cultural remains

Layer II - Black (10YR 2/1) intact asphalt layer

Layer III - Brown (10YR 5/3) compact sandy clay loam; No cultural remains

Layer IV - Very pale brown (10YR 8/2) weathered limestone sand; No cultural remains

Figure B-177. Profile of BT-E-11-7



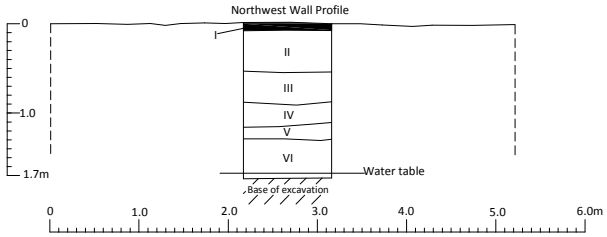
Layer I - Brown (10YR 4/3) fine friable sandy clay loam; Glazed ceramic fragment present

Layer II - Black (10YR 2/1) intact asphalt layer

Layer III - Brown (10YR 5/3) to light gray (10YR 7/2) fine friable clay loam; No cultural remains

Layer IV -Brown (10YR 4/3) fine friable clay loam; No cultural remains

Figure B-178. Profile of BT-E-12-1



Layer I - Black (10YR 2/1) intact asphalt layer

Layer II - Dark grayish brown (10YR 4/2) fine friable sandy clay loam; No cultural remains

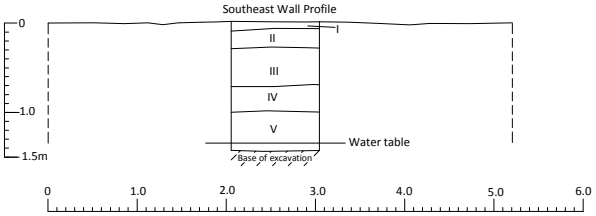
Layer III - Dark brown (10YR 3/3) to brown (10YR 4/3) compact clay loam; No cultural remains

Layer IV - Light brownish gray (10YR 6/2) weathered limestone; No cultural remains

Layer V - Brown (10YR 4/2) to dark reddish brown (5YR 3/4) massive clay; No cultural remains

Layer VI - Gray (10YR 5/1) massive clay; No cultural remains

Figure B-179. Profile of BT-E-12-2



Layer I - Very dark brown (7.5YR 2.5/2) structureless clay loam with humus; No cultural remains

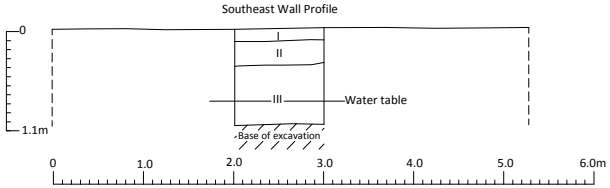
Layer II -Dark yellowish brown (10YR 4/4) fine friable sandy clay loam; No cultural remains

Layer III - Brown (10YR 5/3) fine friable sandy clay loam; No cultural remains

Layer IV -Dark grayish brown (10YR 4/2) massive clay; No cultural remains

Layer V - Very pale brown (10YR 7/3) weathered limestone; No cultural remains

Figure B-180. Profile of BT-E-12-3

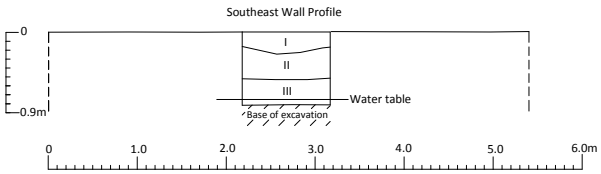


Layer I - Very dark brown (7.5YR 2.5/2) structureless clay loam with humus; No cultural remains

Layer II - Yellowish brown (10YR 5/4) fine friable sandy clay loam; No cultural remains

Layer III - Very pale brown (10YR 7/3) weathered limestone; No cultural remains

Figure B-181 Profile of BT-E-12-4

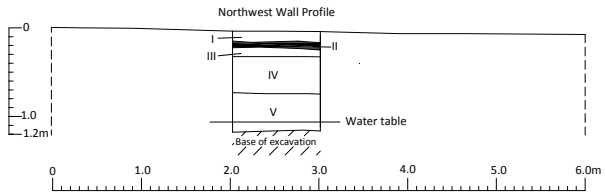


Layer I - Dark brown (7.5YR 3/2) structureless clay loam with humus; No cultural remains

Layer II - Brown (10YR 4/3) fine friable sandy clay loam; No cultural remains

Layer III - Light greenish gray (G 7/10GY)non-sticky, slightly plastic gley; No cultural remains

Figure B-182. Profile of BT-E-12-5



Layer I - Very dark brown (7.5YR 2.5/2) structureless clay loam with humus; No cultural remains

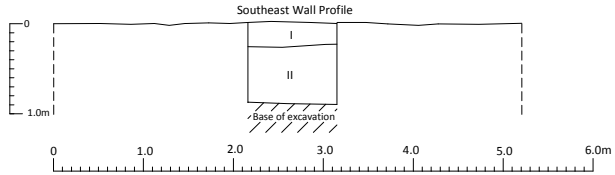
Layer II - Black (10YR 2/1) intact asphalt deposit

Layer III - Very pale brown (10YR 7/4) compact limestone fill; Aggregate present

Layer IV - Brown (10YR 4/3) fine friable sandy clay loam; No cultural remains

Layer V - Very pale brown (10YR 8/2) weathered limestone; No cultural remains

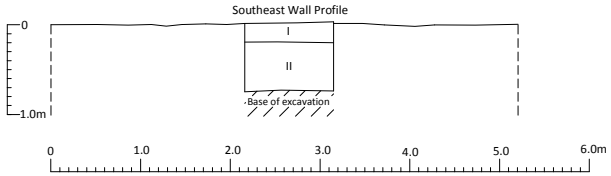
Figure B-183. Profile of BT-E-12-6



Layer I - Dark reddish brown (5YR 3/4) sticky, fine friable clay fill; No cultural remains

Layer II - Light gray (10YR 7/2) weathered limestone; No cultural remains

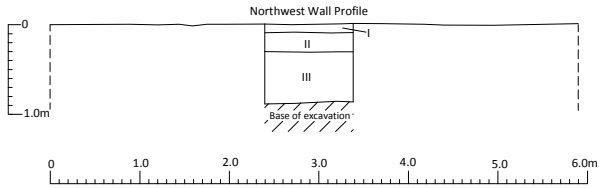
Figure B-184. Profile of BT-E-12-7



Layer I - Dark reddish brown (5YR 3/4) sticky, fine friable clay fill; No cultural remains

Layer II - Light gray (10YR 7/2) weathered limestone; No cultural remains

Figure B-185. Profile of BT-E-12-8

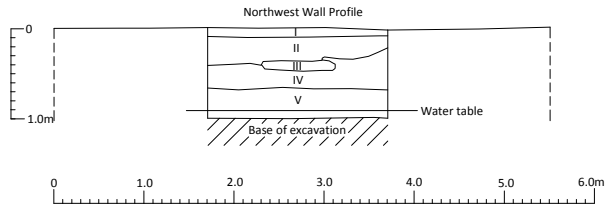


Layer I - Black (7.5YR 2.5/1) structureless humus; No cultural remains

Layer II - Brown (10YR 5/3) fine friable clay loam; No cultural remains

Layer III - Very pale brown (10YR 8/2) weathered limestone; No cultural remains

Figure B-186. Profile of BT-E-13-1



Layer I - Very dark brown (7.5YR 2.5/2) structureless clay loam with humus; No cultural remains

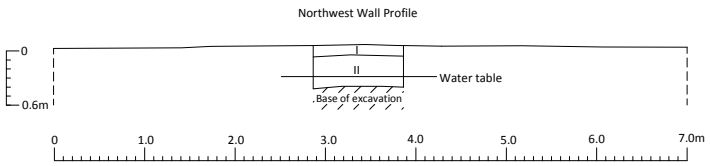
Layer II - Dark grayish brown (10YR 4/2) very fine friable clay loam; Asphalt fragments present

Layer III - Black (10YR 2/1) very fine friable clay loam buried A horizon; Charcoal flecks present

Layer IV - Very pale brown (10YR 8/2) weathered limestone; No cultural remains

Layer V - Dark yellowish brown (10YR 4/4) massive clay; No cultural remains

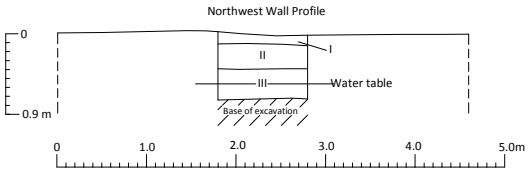
Figure B-187. Profile of BT-E-13-2



Layer I - Black (10YR 2/1) very fine friable clay loam with humus; No cultural remains

Layer II - Brown (10YR 5/3) very fine friable clay; No cultural remains

Figure B-188. Profile of BT-E-13-3

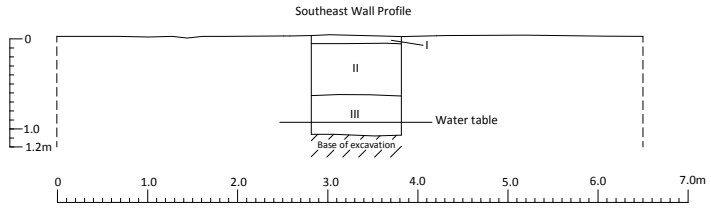


Layer I - Very dark brown (7.5YR 2.5/2) structureless clay loam with humus; No cultural remains

Layer II - Brown (10YR 4/3) very fine friable sandy clay loam; No cultural remains

Layer III - Dark grayish brown (10YR 4/2) very fine friable clay; No cultural remains

Figure B-189. Profile of BT-E-13-4

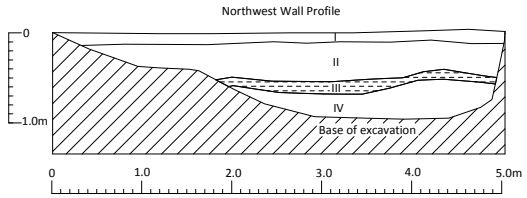


Layer I - Very dark brown (7.5YR 2.5/2) structureless clay loam with humus; No cultural remains

Layer II - Dark grayish brown (10YR 4/2) fine friable sandy clay loam alluvium; No cultural remains

Layer III - Dark grayish brown (10YR 4/2) fine friable clay; No cultural remains

Figure B-190. Profile of BT-E-13-5



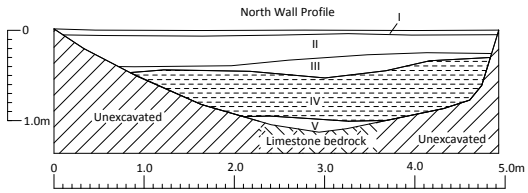
Layer I - Very dark brown (7.5YR 2.5/2) structureless clay loam with humic duff; No cultural remains

Layer II - Brown (10YR 4/3) fine friable sandy clay loam; No cultural remains

Layer III - Black (10YR 2/1) fine friable loam; 7294 cultural deposit (Basalt flake, crustacean, charcoal, fire-altered rock)

Layer IV - Dark gray (10YR 4/1) to light gray (10YR 7/2) weathered limestone with clay pockets; No cultural remains

Figure B-191. Profile of BT-E-13-6



Layer I - Very dark brown (7.5YR 2.5/2) structureless humic duff; No cultural remains

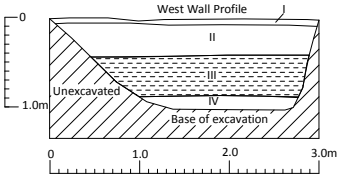
Layer II - Brown (10YR 4/3) very fine friable clay loam; 50% limestone aggregate fill for Site 7275

Layer III - Yellowish brown (10YR 5/4) very fine friable clay loam; 60% limestone aggregate fill for Site 7275

Layer IV - Brown (10YR 4/3)very fine friable clay loam; Site 7294 cultural deposit (Marine shell and charcoal)

Layer V - Dark gray (10YR 4/1) to dark grayish brown (10YR 4/2) very fine friable clay; No cultural remains

Figure B-192. Profile of BT-E-13-6b



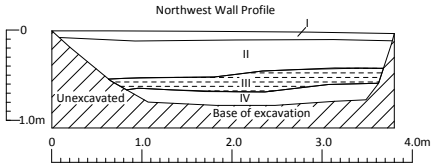
Layer I - Very dark brown (7.5YR 2.5/2) structureles humus; No cultural remains

Layer II - Brown (10YR 4/3) very fine friable clay loam; No cultural remains

Layer III - Dark grayish brown (10YR 4/2) very fine friable clay loam; Site 7294 cultural deposit (Charcoal)

Layer IV - Light gray (10YR 7/2) to very pale brown (10YR 7/3) weathered limestone; No cultural remains

Figure B-193. Profile of BT-E-13-6c



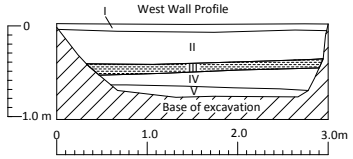
Layer I - Very dark brown (7.5YR 2.5/2) structureless organics (Humus); No cultural remains

Layer II - Brown (10YR 4/3) very fine friable clay loam; No cultural remains

Layer III - Dark grayish brown (10YR 4/2) very fine friable clay loam; Site 7294 cultural deposit (Marine shell and charocal)

Layer IV - Very pale brown (10YR 7/2) weathered limestone; No cultrual remains

Figure B-194. Profile of BT-E-13-6d



Layer I - Very dark brown (7.5YR 2.5/2) structureless humic duff; No cultural remains

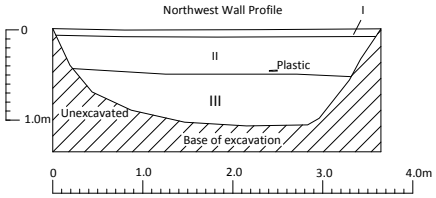
Layer II - Brown (10YR 4/3) very fine friable clay loam alluvium; No cultural remains

Layer III - Very dark grayish brown (10YR 3/2) to dark grayish brown (10YR 4/2) very fine friable clay loam;Site 7294 cultural deposit (Charcoal flecks)

Layer IV - Brown (10YR 5/3) very fine friable clay; No cultural remains

Layer V - Weathered limestone; No cultural remains

Figure B-195. Profile of BT-E-13-6e

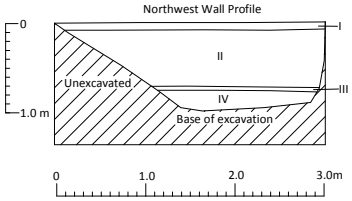


Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains

Layer II - Dark grayish brown (10YR 4/2) very fine friable clay loam; Plastic fragment present

Layer III - Very pale brown (10YR 8/2) weathered limestone; No cultural remains

Figure B-196. Profile of BT-E-13-6f



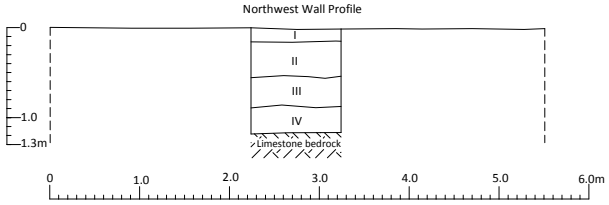
Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains

Layer II - Dark yellowish brown (10YR 4/4) to light yellowish brown (10YR 6/4) very fine friable clay loam; No cultural remains

Layer III - Pale brown (10YR 6/3) fine, single grain sand; No cultural remains

Layer IV - Very pale brown (10YR 7/4) weathered limestone; No cultural remains

Figure B-197. Profile of BT-E-13-6g



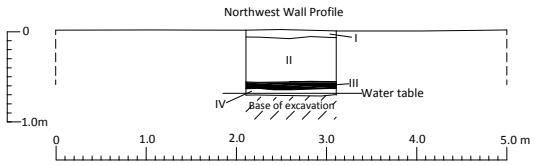
Layer I - Very dark grayish brown (10YR 3/2) fine friable clay loam with humus; No cultural remains

Layer II - Brown (10YR 4/3) unconsolidated loamy sand; No cultural remains

Layer III - Pale brown (10YR 6/3) to light brownish gray (10YR 6/2)coarse, single grain sand; Asphalt fragment present

Layer IV - Dark grayish brown (10YR 4/2) fine friable sandy clay; No cultural remains

Figure B-198. Profile of BT-E-13-7



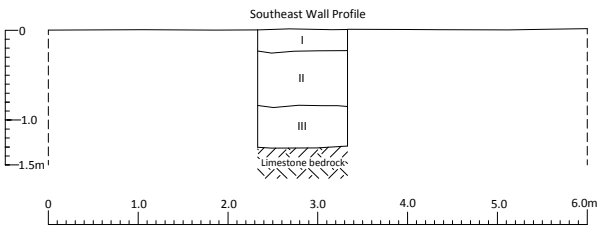
Layer I - Very dark brown (7.5YR 2.5/2) friable clay loam with humus; No cultural remains

Layer II - Dark grayish brown (10YR 4/2) friable clay loam; Asphalt and plastic present

Layer III - Black (10YR 2/1) intact asphalt layer

Layer IV - Very pale brown (10YR 7/4) structreless, pulverized limestone; No cultural remains

Figure B-199. Profile of BT-E-13-8

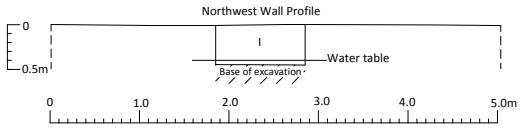


Layer I - Dark reddish brown (5YR 3/2) fine friable clay loam; No cultural remains

Layer II - Dark grayish brown (10YR 4/2) fine crumb sandy clay loam; Asphalt present

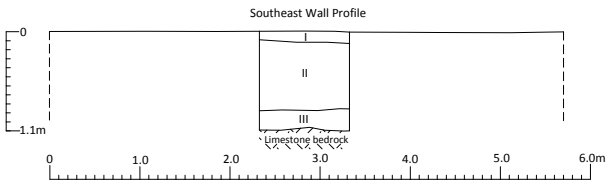
Layer III - Dark grayish brown (10YR 4/2) very fine friable clay; No cultural remains

Figure B-200. Profile of BT-E-13-9



Layer I - Very dark gray (10YR 3/1) very fine friable clay loam muck; No cultural remains

Figure B-201. Profile of BT-E-14-1

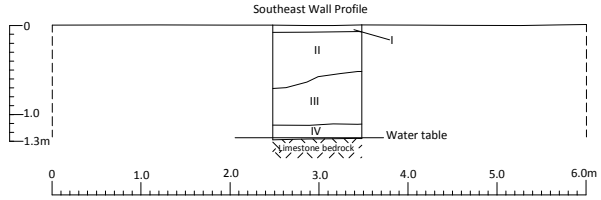


Layer I - Dark brown (7.5YR 3/2) structureless clay loam with humus; No cultural remains

Layer II - Brown (10YR 4/3) fine friable sandy clay loam; Asphalt and glass bottle present

Layer III - Gray (10YR 5/1)non-sticky, super plastic clay; No cultural remains

Figure B-202. Profile of BT-E-14-2



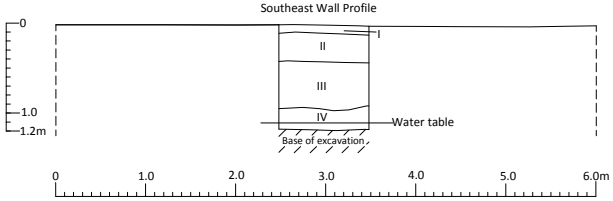
Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains

Layer II - Brown (10YR 4/3) fine friable sandy clay loam; No cultural remains

Layer III - Yellowish brown (10YR 5/4) to dark reddish brown (5YR 3/3) fine friable sandy clay; No cultural remains

Layer IV - Dark gray (10YR 4/1) sticky, plastic clay; No cultural remains

Figure B-203. Profile of BT-E-14-3



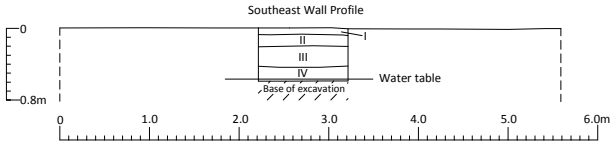
Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains

Layer II - Brown (10YR 4/3) fine friable sandy clay loam; No cultural remains

Layer III - Dark grayish brown (10YR 4/2) fine friable sandy clay loam; Asphalt fragments present

Layer IV - Dark gray (10YR 4/1) sticky, plastic compact clay; No cultural remains

Figure B-204. Profile of BT-E-14-4



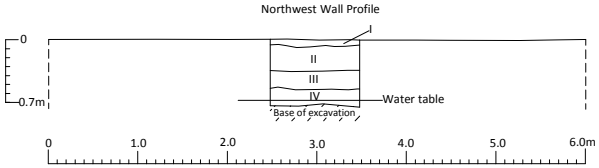
Layer I - Dark brown (7.5YR 3/2) very fine firable clay loam with humus; No cultural remains

Layer II - Brown (10YR 4/3) fine friable sandy clay loam; No cultural remains

Layer III - Dark grayish brown (10YR 4/2) non-sticky, plastic clay; No cultural remains

Layer IV - Light yellowish brown (10YR 6/4) to light gray (10YR 7/1) weathered limestone; No cultural remains

Figure B-205. Profile of BT-E-14-5



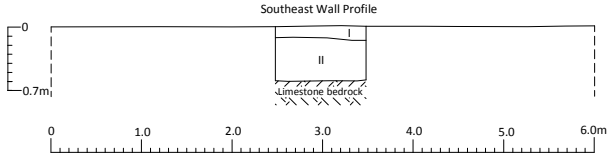
Layer I - Very dark brown (7.5YR 2.5/2) structureless clay loam with humus; No cultural remains

Layer II - Brown (10YR 4/3) fine friable sandy clay loam; No cultural remains

Layer III - Pale brown (10YR 6/3) fine friable clay; No cultural remains

Layer IV - Dark gray (10YR 4/1) non-sticky, plastic clay; No cultural remains

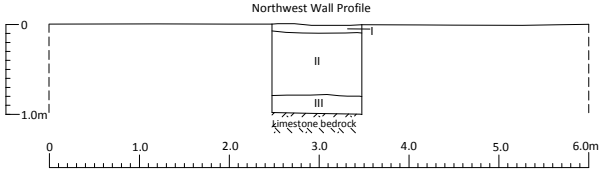
Figure B-206. Profile of BT-E-14-6



Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains

Layer II - Brown (10YR 5/3) fine friable sandy clay loam; No cultural remains

Figure B-207. Profile of BT-E-14-7

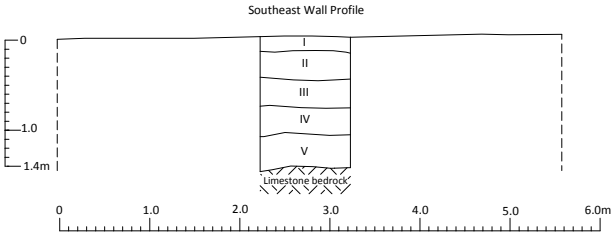


Layer I - Very dark grayish brown (10YR 3/2) fine friable clay loam with organics (Humus); No cultural remains

Layer II - Brown (10YR 4/3) fine friable sandy clay loam; Asphalt fragments present

Layer III - Brown (10YR 5/3) non-sticky, plastic clay; No cultural remains

Figure B-208. Profile of BT-E-15-1



Layer I - Dark grayish brown (10YR 4/2) loose clay loam; No cultural remains

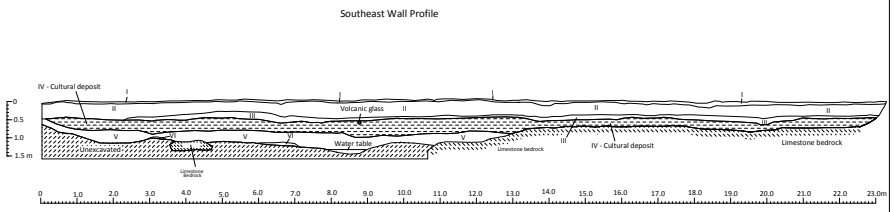
Layer II - Brown (10YR 4/3) moderately compact clay loam; No cultural remains

Layer III - Dark grayish brown (10YR 4/2) compact clay loam; 20% limestone aggregate

Layer IV -Very dark grayish brown (10YR 3/2) to dark grayish brown (10YR 4/2) compact clay loam; 25% limestone aggregate

Layer V - Brown (10YR 4/3) massive clay; No cultural remains

Figure B-209. Profile of BT-E-15-2



Layer I - Very dark brown (10YR 2/2) structureless humic duff; No cultural remains

Layer II - Brown (10YR 4/3) very fine friable sandy clay loam; 20% limestone aggregate for Site 7275

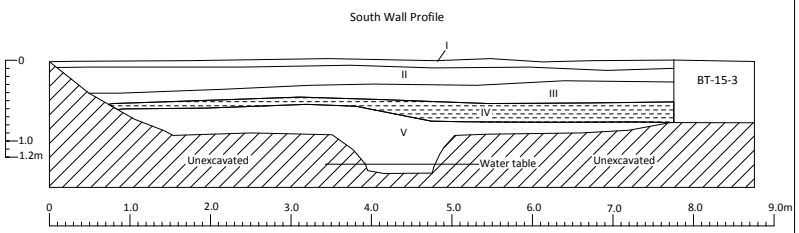
Layer III - Yellowish brown (10YR 5/4) moderately compacted silty sand; 75% limestone aggregate for Site 7275

Layer IV - Very dark grayish brown (10YR 3/2) fine friable slightly sandy clay loam; Site 7295 cultural deposit (Marine shell, volcanic glass core and charcoal)

Layer V - Brown (10YR 4/3) massive clay; No cultural remains

Layer VI - Dark grayish brown (10YR 4/2) and black (10YR 2/1) compacted saturated clay/gley; No cultural remains

Figure B-210. Profile of BT-E-15-3



Layer I - Very dark brown (7.5YR 2.5/2) structureless humic duff; No cultural remains

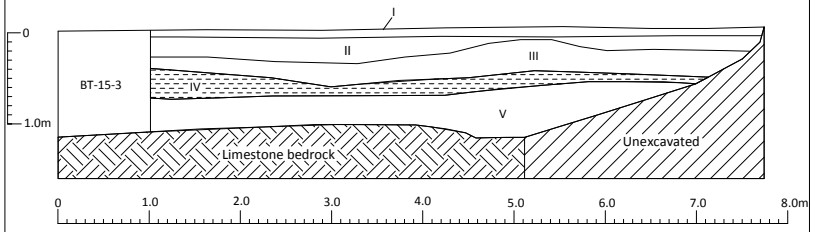
Layer II - Brown (10YR 5/3) very fine friable clay loam; 30% limestone aggregate for Site 7275

Layer III - Brown (10YR 5/3) to yellowish brown (10YR 5/4) very fine friable clay loam alluvium; 50% limestone aggregate for Site 7275

Layer IV - Dark gray (7.5YR 4/1) to very dark gray (7.5YR 3/1) very fine friable clay loam; Site 72945 cultural deposit

Layer V - Dark yellowish brown (10YR 3/4) massive clay; No cultural remains

Figure B-211. Profile of BT-E-15-3a



Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains

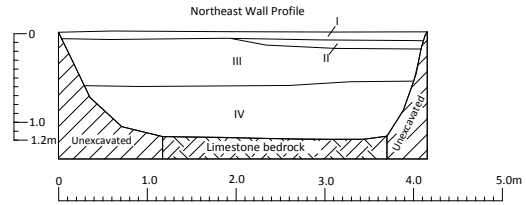
Layer II - Brown (10YR 5/3) very fine friable clay loam; 30% limestone aggregate for Site 7275

Layer III - Brown (10YR 5/3) to yellowish brown (10YR 5/4) very fine friable clay loam alluvium; 50% limestone aggregate for Site 7275

Layer IV - Dark gray (7.5YR 4/1) to very dark gray (7.5YR 3/1) very fine friable clay loam;Site 7295 cultural deposit (Charcoal flecks)

Layer V - Dark yellowish brown (10YR 3/4) massive clay; No cultural remains

Figure B-212. Profile of BT-E-15-3b



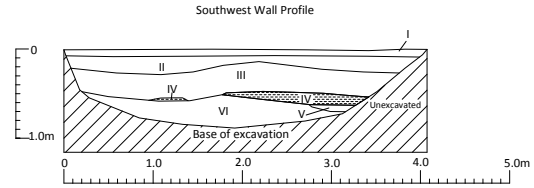
Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains

Layer II - Brown (10YR 5/3) very fine friable clay loam; 30% limestone aggregate

Layer III - Brown (10YR 5/3) to yellowish brown (10YR 5/4) very fine friable clay loam; 50% limestone aggregate

Layer IV - Very dark grayish brown (10YR 3/2) massive clay; No cultural remains

Figure B-213. Profile of BT-E-15-3c



Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains

Layer II - Brown (10YR 5/3) very fine friable clay loam; 30% limestone aggregate for Site 7275

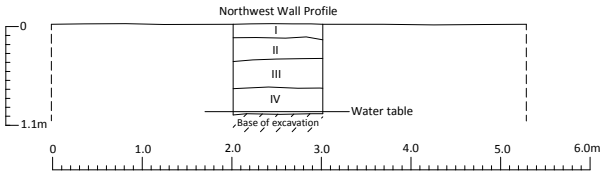
Layer III - Brown (10YR 5/3) to yellowish brown (10YR 5/4) very fine friable clay loam; 50% limestone aggregate for Site 7275

Layer IV - Dark gray (7.5YR 4/1) to very dark gray (7.5YR 3/1) very fine friable clay loam; Site 7295 cultural deposit

Layer V - Dark yellowish brown (10YR 3/4) massive clay; No cultural remains

Layer VI - Very pale brown (10YR 7/2) weathered limestone; No cultural remains

Figure B-214. Profile of BT-E-15-3d



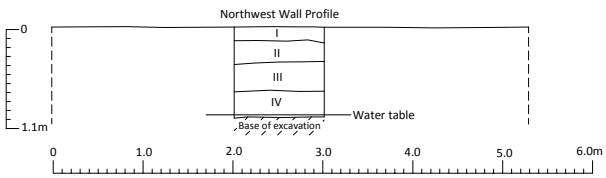
Layer I - Very dark brown (10YR 2/2) loose clay loam with humus; No cultural remains

Layer II - Brown (10YR 5/3) loose sandy clay loam alluvium; No cultural remains

Layer III - Dark gray (10YR 4/1) moderately compact sandy clay loam; No cultural remains

Layer IV - Light gray (10YR 7/2) weathered limestone; No cultural remains

Figure B-215. Profile of BT-E-15-4



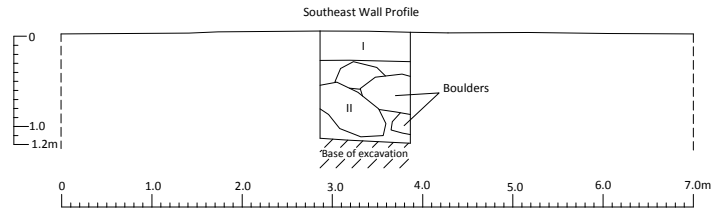
Layer I - Very dark brown (10YR 2/2) loose clay loam with humus; No cultural remains

Layer II - Brown (10YR 5/3) loose sandy clay loam alluvium; No cultural remains

Layer III - Dark gray (10YR 4/1) moderately compact sandy clay loam; No cultural remains

Layer IV - Light gray (10YR 7/2) weathered limestone; No cultural remains

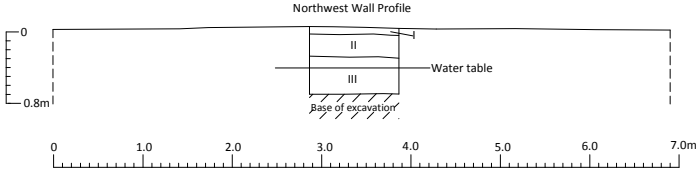
Figure B-216. Profile of BT-E-15-5



Layer I - Dark brown (7.5YR 3/3) fine friable clay loam; Electrical wires and pvc pipe present

Layer II - Brown (10YR 5/3) fine friable sandy clay loam and boulders; No cultural remains

Figure B-217. Profile of BT-E-15-6

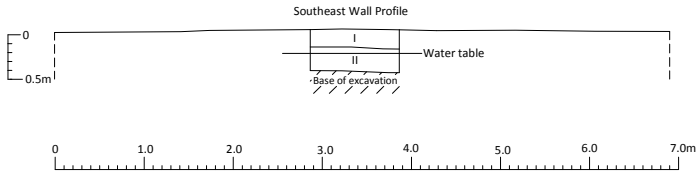


Layer I - Very dark grayish brown (10YR 3/2) loose clay loam with humus ; No cultural remains

Layer II - Brown (10YR 5/3) very fine friable clay residual deposit; No cultural remains

Layer III - Weathered limestone; No cultural remains

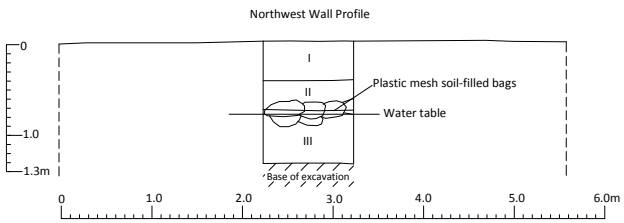
Figure B-218. Profile of BT-E-15-7



Layer I - Black (10YR 2/1) very fine friable clay loam with humus; No cultural remains

Layer II - Very pale brown (10YR 8/2) weathered limestone; No cultural remains

Figure B-219. Profile of BT-E-15-8

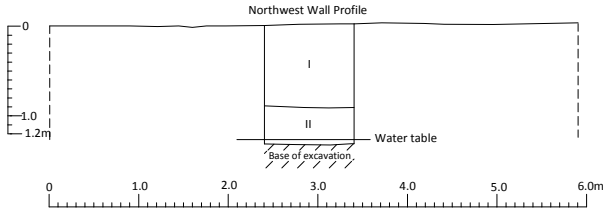


Layer I - Dark brown (7.5YR 3/2) lvery fine friable clay loam; No cultural remains

Layer II - Very dark gray (10YR 3/1) compact limestone fill; Plastic mesh bags and aggregate present

Layer III - Gray (10YR 5/1) compact, saturated gley; No cultural remains

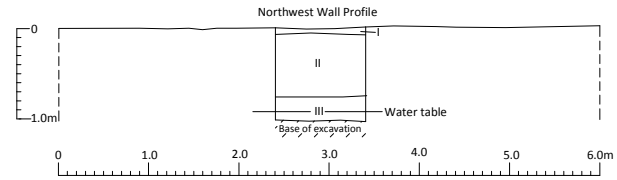
Figure B-220. Profile of BT-E-16-1



Layer I - Very dark brown (10YR 2/2) very fine friable clay loam; Concrete, rusted metal fragment and aluminum can

Layer II - Gray (10YR 5/1) to white (10YR 8/1) compact, saturated gley; No cultural remains

Figure B-221. Profile of BT-E-16-2



Layer I - Black (10YR 2/1) to very dark brown (10YR 2/2) structureless humus; No cultural remains

Layer II - Brown (10YR 4/3) friable sandy loam; Asphalt fragments present

Layer III - Pink (7.5YR 8/3) sticky, non-plastic weathered limestone goo; No cultural remains

Figure B-222. Profile of BT-E-16-3

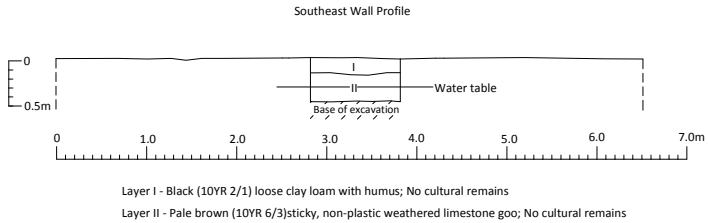


Figure B-223. Profile of BT-E-16-4

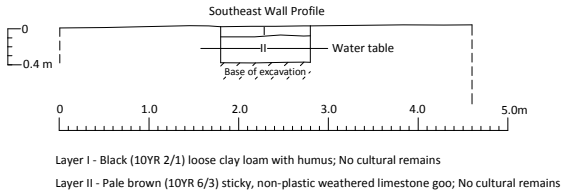


Figure B-224. Profile of BT-E-16-5

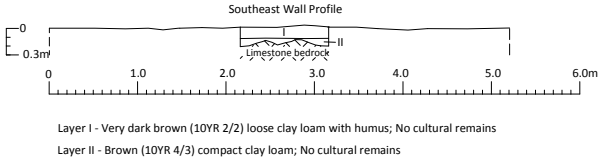


Figure B-225. Profile of BT-E-16-6

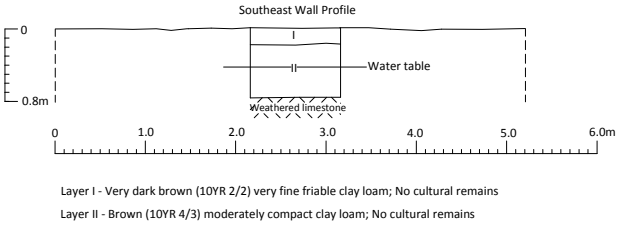
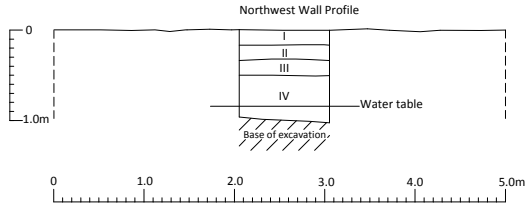


Figure B-226. Profile of BT-E-16-7



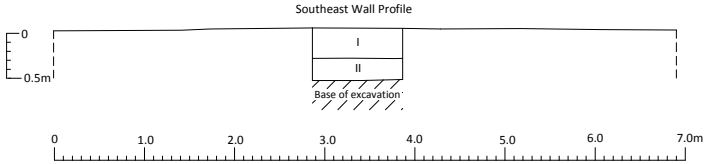
Layer I - Very dusky red (2.5YR 2.5/2) loose silt loam; No cultural remains

Layer II - Dark grayish brown (10YR 4/2) very fine friable sandy loam; No cultural remains

Layer III - Very dark grayish brown (10YR 3/2) very fine friable clay loam; No cultural remains

Layer IV - Pale brown (10YR 6/3) weathered limestone; No cultural remains

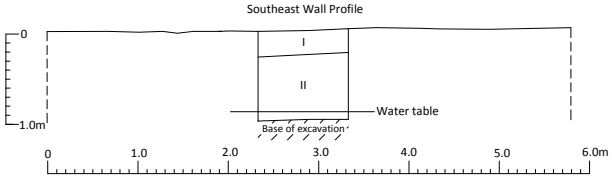
Figure B-227. Profile of BT-E-16-8



Layer I - Very dark brown (7.5YR 2.5/2) fine fraiable clay; No cultural remains

Layer II - Very pale brown (10YR 8/2) weathered limestone; No cultural remains

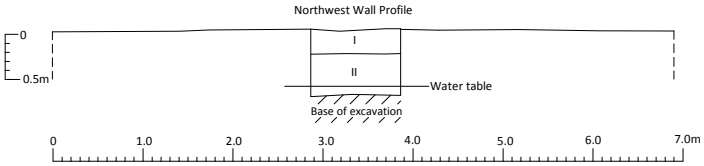
Figure B-228. Profile of BT-E-16-9



Layer I - Dark brown (7.5YR 3/3) structureless humus; No cultural remains

Layer II - Light gray (10YR 7/2) weathered limestone; No cultural remains

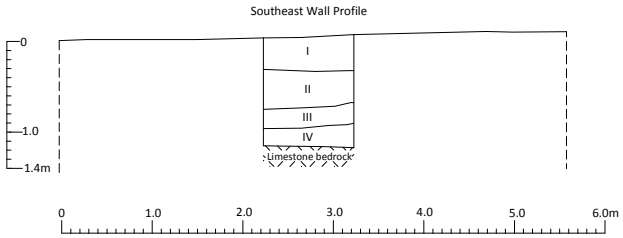
Figure B-229. Profile of BT-E-16-10



Layer I - Black (10YR 2/1) fine friable clay loam with humus; No cultural remains

Layer II - Brown (10YR 4/3) fine friable clay; No cultural remains

Figure B-230. Profile of BT-E-16-11



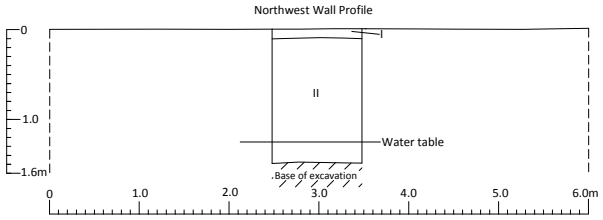
Layer I - Dark brown (7.5YR 3/2) fine friable clay loam; Asphalt and fabric present

Layer II - Brown (10YR 5/3) fine friable sandy clay loam; Aggregate present

Layer III - Dark grayish brown (10YR 4/2) massive clay; No cultural remains

Layer IV -Very dark gray (10YR 3/1) non-plastic, sticky gley; No cultural remains

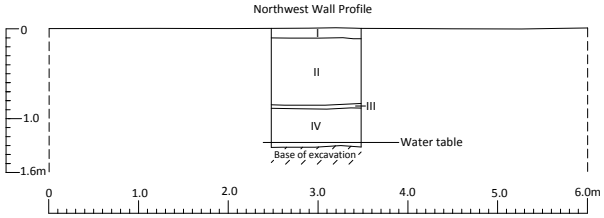
Figure B-231. Profile of BT-E-17-1



Layer I - Very dark gray (7.5YR 3/1) to dark brown (7.5YR 3/2) fine fraiable clay loam; No cultural remains

Layer II - Brown (10YR 5/3) fine friable sandy clay loam; No cultural remains

Figure B-232. Profile of BT-E-17-2



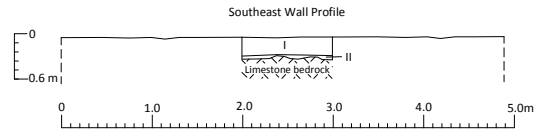
Layer I - Very dark gray (7.5YR 3/1) to dark brown (7.5YR 3/2) lfine friable clay loam; No cultural remains

Layer II - Brown (10YR 5/3) fine friable sandy clay loam; No cultural remains

Layer III - Black (7.5YR 2.5/1) loose decomposing organic material (peat); No cultural remains

Layer IV - Yellowish brown (10YR 5/4) weathered limestone; No cultural remains

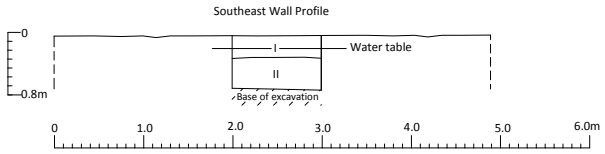
Figure B-233. Profile of BT-E-17-3



Layer I - Very dark brown (10YR 2/2) to black (10YR 2/1) fine friable clay loam with humus; No cultural remains

Layer II - Dark brown (7.5YR 3/3) fine friable clay loam; No cultural remains

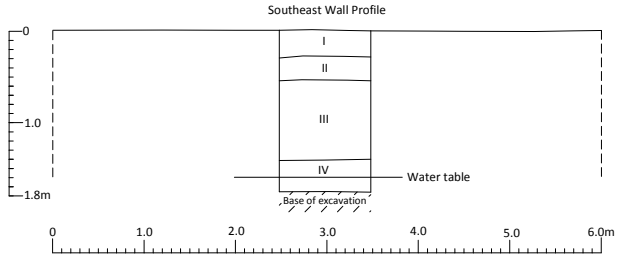
Figure B-234. Profile of BT-E-17-4



Layer I - Black (10YR 2/1) lfine friable clay loam with humus; No cultural remains

Layer II - Gray (10YR 6/1) sticky, plastic gley; No cultural remains

Figure B-235. Profile of BT-E-17-5



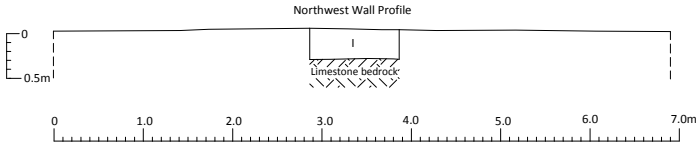
Layer I - Very dark grayish brown (10YR 3/2) fine friable slightly sandy clay loam; No cultural remains

Layer II - Light brownish gray (10YR 6/2) single grain sand; No cultural remains

Layer III - Very dark grayish brown (10YR 3/2) fine friable sandy clay loam; No cultural remains

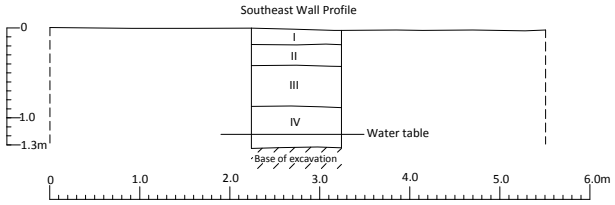
Layer IV - Weathered limestone; No cultural remains

Figure B-236. Profile of BT-E-17-6



Layer I - Very dark brown (7.5YR 2.5/2) fine friable sandy clay loam; No cultural remains

Figure B-237. Profile of BT-E-17-7



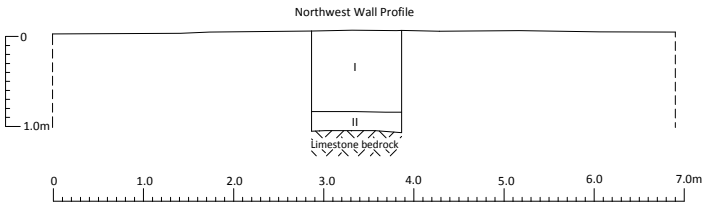
Layer I - Very dark grayish brown (10YR 3/2) fine friable clay loam with humus; No cultural remains

Layer II - Light gray (10YR 7/2) compact limestone fill; Aggregate present

Layer III - Very dark grayish brown (10YR 3/2) compact sandy clay loam; Asphalt fragments present

Layer IV - Pale brown (10YR 6/3) massive clay; No cultural remains

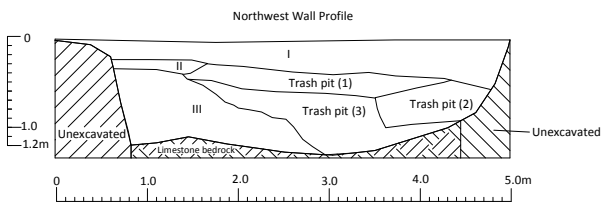
Figure B-238. Profile of BT-E-17-8



Layer I - Dark brown (10YR 3/3) to dark yellowish brown (10YR 4/4) fine friable clay loam; Metal wire present

Layer II - Dark grayish brown (10YR 4/2) massive clay; No cultural remains

Figure B-239. Profile of BT-E-17-9



Layer I - Dark brown (7.5YR 3/2) fvery fine friable clay loam; No cultural remains

Layer II - Brown (10YR 4/3) very fine friable sandy loam; No cultural remains

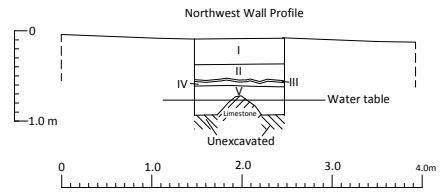
Layer III - Brownish yellow (10YR 6/6) weathered limestone sand; No cultural remains

Trash pit (Layer 1) - Yellowish brown (10YR 5/4) fine friable sandy clay loam pit fill; Glass bottle and charcoal present

Trash pit (Layer 2) - Dark brown (7.5YR 3/4) fine friable sandy loam pit fill; No cultural remains

Trash pit (Layer 3) - Brown (10YR 4/3) fine friable clay loam pit fill; Ceramics, nails, burned wood and charcoal present

Figure B-240. Profile of BT-E-18-1



Layer I - Very dark brown (7.5YR 2.5/2) fine friable clay loam; No cultural remains

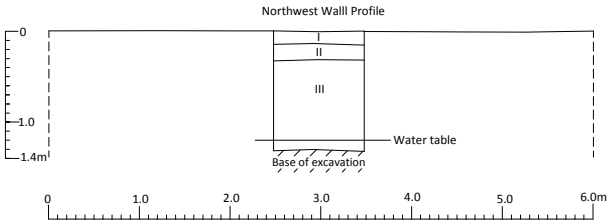
Layer II - Brown (10YR 4/3) fine friable clay loam; No cultural remains

Layer III - Black (10YR 2/1) loose decomposing organic material; No cultural remains

Layer IV - Dark brown (7.5YR 3/3) fine friable clay loam alluvium; No cultural remains

Layer V - Dark gray (7.5YR 4/1) non-plastic, sticky gley; No cultural remains

Figure B-241. Profile of BT-E-18-2

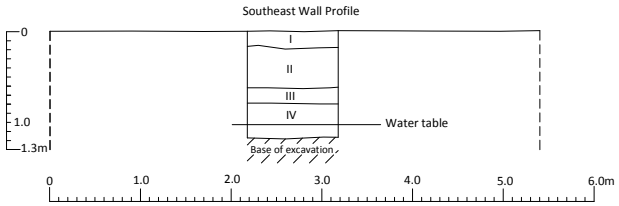


Layer I - Very dark gray (7.5YR 3/1) fine friable clay loam; No cultural remains

Layer II - Brown (10YR 4/3) fine friable clay loam; No cultural remains

Layer III - Brownish yellow (10YR 6/6) weathered conglomerate; No cultural remains

Figure B-242. Profile of BT-E-18-3



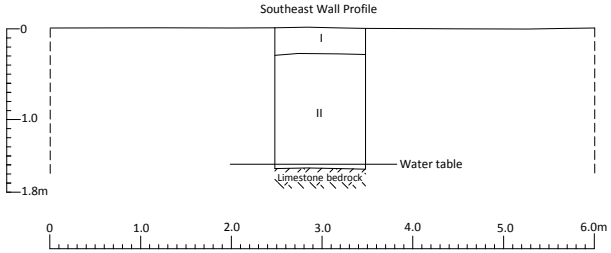
Layer I - Dark brown (7.5YR 3/2) fine friable clay loam; No cultural remains

Layer II - Brown (10YR 4/3) fine friable clay loam alluvium; No cultural remains

Layer III - Dark yellowish brown (10YR 4/4) fine friable clay loam alluvium; No cultural remains

Layer IV - Very pale brown (10YR 8/2) weathered conglomerate; No cultural remains

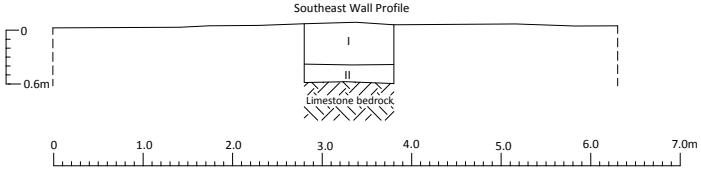
Figure B-243. Profile of BT-E-18-4



Layer I - Dark brown (7.5YR 3/2) fine friable clay loam; No cultural remains

Layer II - Brown (10YR 4/3) loose sandy loam; No cultural remains

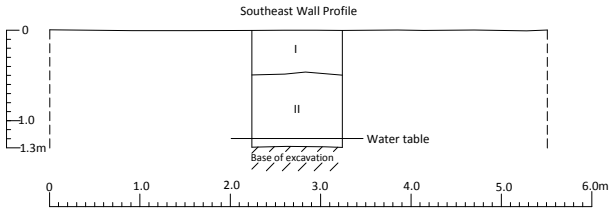
Figure B-244. Profile of BT-E-18-5



Layer I - Very dark grayish brown (10YR 3/2) fine friable clay loam; Metal wire present

Layer II - Dark grayish brown (10YR 4/2) fine friable clay loam; No cultural remains

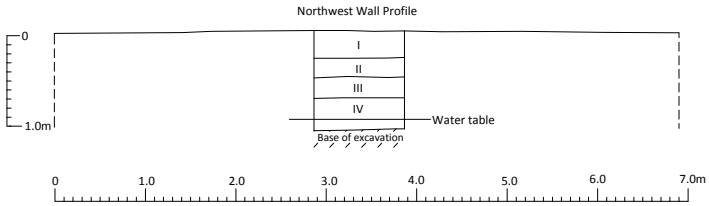
Figure B-245. Profile of BT-E-18-6



Layer I - Very dark grayish brown (10YR 3/2) loose sandy clay loam; Plastic fragments present

Layer II - Very pale brown (10YR 8/2) weathered limestone with pockets of brown (10YR 5/3) clay; No cultural remains

Figure B-246. Profile of BT-E-18-7



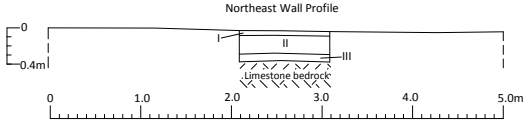
Layer I - Very dark grayish brown (10YR 3/2) loose sandy clay loam; Plastic fragments and bottle glass present

Layer II - Dark brown (10YR 3/3) compact sandy clay loam; No cultural remains

Layer III - Brown (10YR 4/3) massive clay; No cultural remains

Layer IV - Light gray (10YR 7/2) weathered limestone; No cultural remains

Figure B-247. Profile of BT-E-18-8

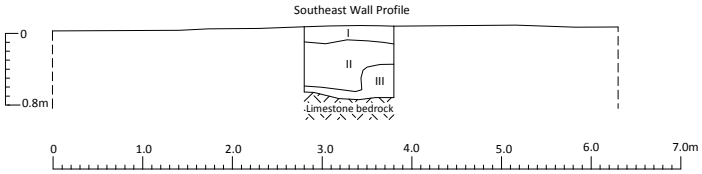


Layer I - Dark brown (10YR 3/3) structureless clay loam with humus; No cultural remains

Layer II - Dark grayish brown (10YR 4/2) fine friable clay loam; No cultural remains

Layer III - Dark yellowish brown (10YR 3/4) fine friable clay loam; No cultural remains

Figure B-248. Profile of BT-E-18-9

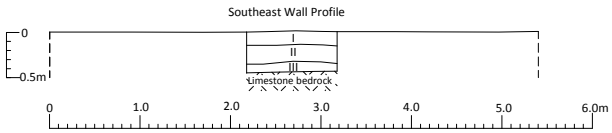


Layer I - Dark brown (7.5YR 3/2) very fine friable clay loam; No cultural remains

Layer II - Brown (10YR 5/3) very fine friable sandy loam; No cultural remains

Layer II - Dark brown (7.5YR 3/4) moderately compact clay loam; No cultural remains

Figure B-249. Profile of BT-E-19-1

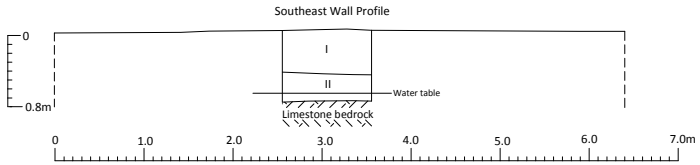


Layer I - Very dark grayish brown (10YR 3/2)very fine friable clay loam; No cultural remains

Layer II - Very dark grayish brown (10YR 3/2) to dark grayish brown (10YR 4/2) very fine friable clay loam; No cultural remains

Layer III - Dark brown (10YR 3/3) moderately compact clay; No cultural remains

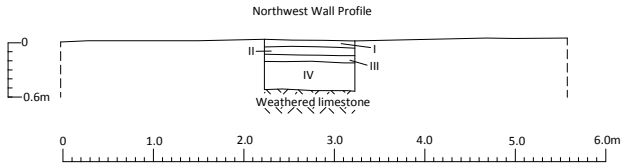
Figure B-250. Profile of BT-E-19-2



Layer I - Very dark grayish brown (10YR 3/2) loose silty clay loam; No cultural remains

Layer II - Dark gray (10YR 4/1) to dark grayish brown (10YR 4/2) compact, saturated gley; No cultural remains

Figure B-251. Profile of BT-E-19-3



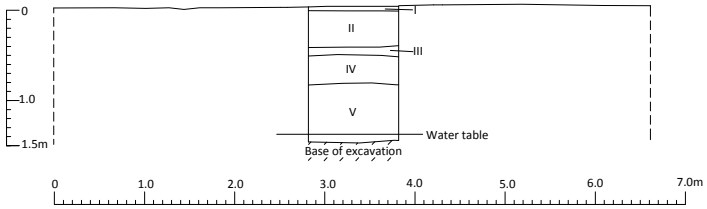
Layer I - Black (7.5YR 2.5/1) to very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains

Layer II - Brown (10YR 5/3) loose sand; No cultural remains

Layer III - Very dark grayish brown (10YR 3/2) crushed basalt; Aggregate present

Layer IV - Dark grayish brown (10YR 4/2) very fine friable sandy clay loam; No cultural remains

Figure B-252. Profile of BT-E-19-4



Layer I - Black (10YR 2/1) structureless humus; No cultural remains

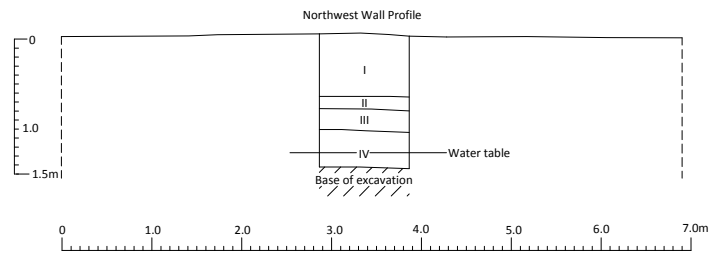
Layer II - Brown (10YR 4/3) loose silty sand fill; PVC pipe present

Layer III - Black (10YR 2/1) compact limestone fill; Aggregate present

Layer IV - Very dark grayish brown (10YR 3/2) very fine friable sandy clay loam; No cultural remains

Layer V - Dark grayish brown (10YR 4/2) massive clay; No cultural remains

Figure B-253. Profile of BT-E-19-5



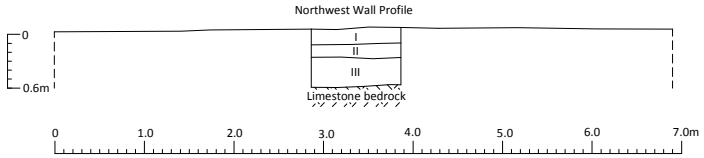
Layer I - Very dark grayish brown (10YR 3/2) to dark brown (10YR 3/3) very fine friable sandy clay loam; No cultural remains

Layer II - Very dark grayish brown (10YR 3/2) very fine friable clay loam; No cultural remains

Layer III - Brown (10YR 5/3) to grayish brown (10YR 5/2) massive clay; No cultural remains

Layer IV - Dark yellowish brown (10YR 4/4) massive clay; No cultural remains

Figure B-254. Profile of BT-E-19-6

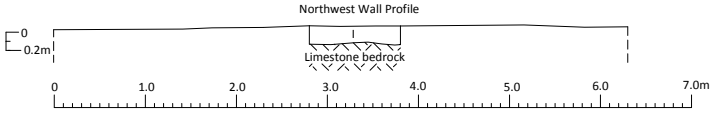


Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains

Layer II - Brown (10YR 4/3) very fine friable clay; No cultural remains

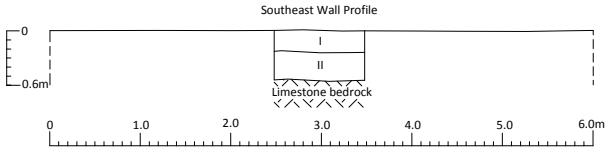
Layer III - Dark grayish brown (10YR 4/2) to dark gray (10YR 4/1)massive clay; No cultural remains

Figure B-255. Profile of BT-E-19-7



Layer I - Very dark brown (7.5YR 2.5/2) lstructureless humus; No cultural remains

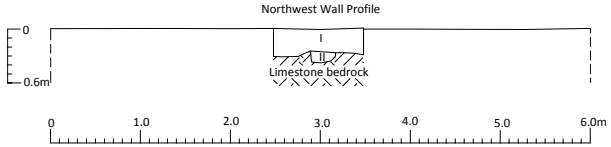
Figure B-256. Profile of BT-E-19-8



Layer I - Dark reddish brown (5YR 3/3) fine friable clay loam; No cultural remains

Layer II - Brown (10YR 4/3) loose sandy loam; No cultural remains

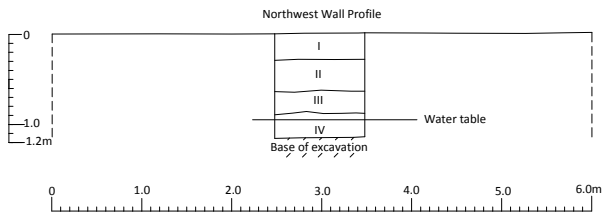
Figure B-257. Profile of BT-E-20-1



Layer I - Dark brown (7.5YR 3/2) fine friable clay loam; No cultural remains

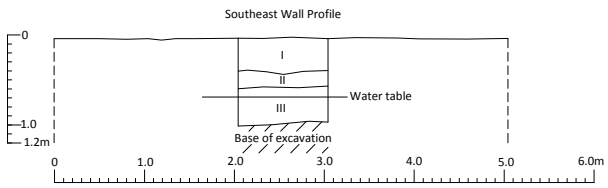
Layer II - Dark brown (7.5YR 3/3) compact clay loam; No cultural remains

Figure B-258. Profile of BT-E-20-2



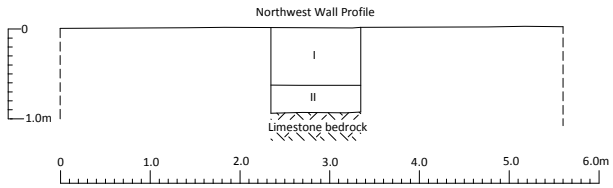
Layer I - Dark grayish brown (10YR 4/2)fine friable clay loam; No cultural remains
Layer II - Very dark grayish brown (10YR 3/2) fine friable clay loam; Aggregate present
Layer III - Brown (10YR 4/3) non-sticky, plastic clay; No cultural remains
Layer IV - Weathered limestone; No cultural remains

Figure B-259. Profile of BT-E-20-3



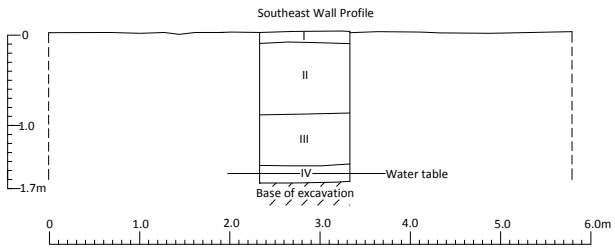
Layer I - Dark grayish brown (10YR 4/2) loose clay loam; Aggregate present
Layer II - Brown (10YR 4/3) compact clay alluvium; No cultural remains
Layer III - Dark gray (10YR 4/1) sticky, plastic gley; No cultural remains

Figure B-260. Profile of BT-E-20-4



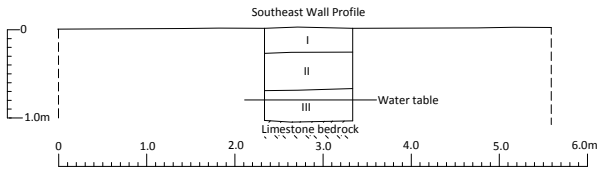
Layer I - Brown (10YR 4/3)single grain sand; Aggregate present
Layer II - Dark grayish brown (10YR 4/2) fine friable sandy clay loam; No cultural remains

Figure B-261. Profile of BT-E-20-5



Layer I - Dark brown (7.5YR 3/2) fine friable clay loam; No cultural remains
Layer II - Dark brown (7.5YR 3/3) fine friable clay loam; No cultural remains
Layer III - Pinkish white (7.5YR 8/2) weathered limestone; No cultural remains
Layer IV - Dark gray (10YR 4/1) non-sticky, non-plastic gley; No cultural remains

Figure B-262. Profile of BT-E-20-6

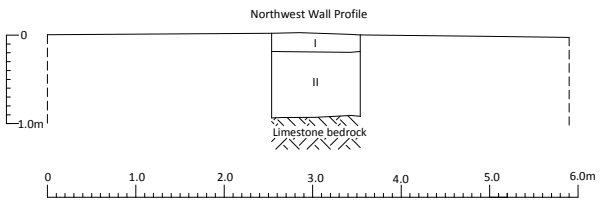


Layer I - Very dark grayish brown (10YR 3/2) fine friable silty loam; No cultural remains

Layer II - Light brownish gray (10YR 6/2) fine friable clay loam; No cultural remains

Layer III - Dark gray (10YR 4/1) non-sticky, plastic gley; No cultural remains

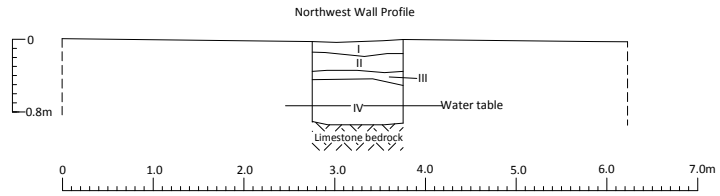
Figure B-263. Profile of BT-E-20-7



Layer I - Dark brown (7.5YR 3/2) fine friable clay loam; No cultural remains

Layer II - Dark grayish brown (10YR 4/2) to very dark grayish brown (10YR 3/2) fine friable silty clay loam; Plastic, glass, metal, fabric, milled lumber and aluminum cans present

Figure B-264. Profile of BT-E-21-1



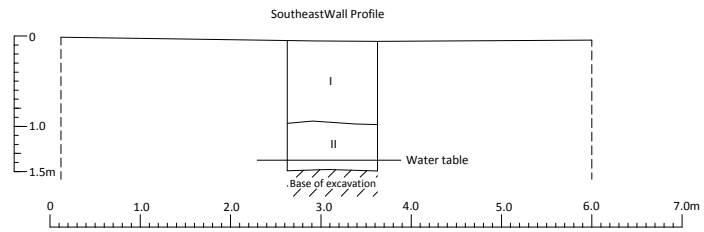
Layer I - Dark brown (7.5YR 3/2) fine friable clay loam; No cultural remains

Layer II - Light gray (10YR 7/2) compact limestone and clay; No cultural remains

Layer III - Brown (10YR 5/3) non-sticky, plastic clay; No cultural remains

Layer IV - Dark greenish gray (Gley 10Y 4/1) sticky, plastic gley; No cultural remains

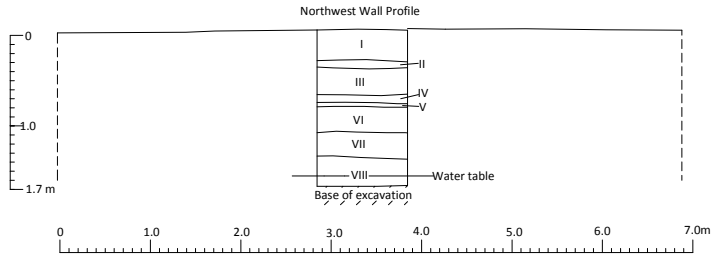
Figure B-265. Profile of BT-E-21-2



Layer I - Brown (10YR 4/3) to dark grayish brown (10YR 4/2) loose silty loam; Plastic pipe present

Layer II - Light brownish gray (10YR 6/2) to pale brown (10YR 6/3) weathered limestone; No cultural remains

Figure B-266. Profile of BT-E-21-3



Layer I - Dark reddish brown (5YR 3/4) very fine friable clay; No cultural remains

Layer II - Brown (10YR 4/3) to yellowish brown (10YR 5/4) fine slighlty clayey silt; Aggregate present

Layer III - Dark brown (7.5YR 3/3) massive clay; No cultural remains

Layer IV - Very dark brown (10YR 2/2) very fine friable sandy clay; Aggregate present

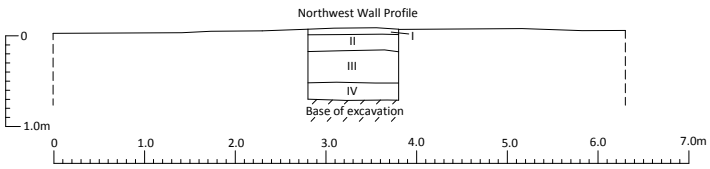
Layer V - Dark brown (10YR 3/3) very fine friable clay; No cultural remains

Layer VI - Light gray (10YR 7/2) weathered limestone; No cultural remains

Layer VII - Brown (10YR 4/3) massive clay; No cultural remains

Layer VIII - Pale brown (10YR 6/3) weathered limestone; No cultural remains

Figure B-267. Profile of BT-E-21-4



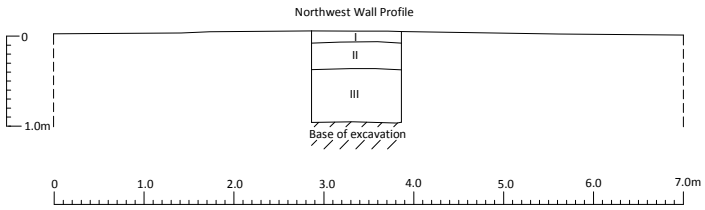
Layer I - Very dark grayish brown (10YR 3/2) very fine friable sandy loam recent duff and fill; No cultural remains

Layer II - Very pale brown (10YR 7/3) compact limestone; Aggregate present

Layer III - Dark yellowish brown (10YR 3/4) very fine friable sandy clay loam; No cultural remains

Layer IV - Very pale brown (10YR 8/3) weathered limestone; No cultural remains

Figure B-268. Profile of BT-E-21-5

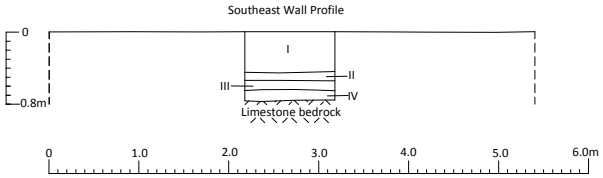


Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains

Layer II - Brown (10YR 5/3) loose sandy clay loam fill; No cultural remains

Layer III - Brownish yellow (10YR 6/6) weathered limestone; No cultural remains

Figure B-269. Profile of BT-E-21-6



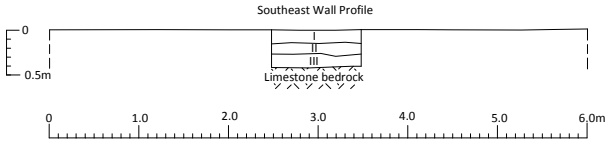
Layer I - Very dusky red (2.5YR 2.5/2) friable clay loam; Plastic bags and pipes present

Layer II - Brown (10YR 4/3) loose sandy loam; No cultural remains

Layer III - Dark brown (10YR 3/3) moderately compact sandy loam; No cultural remains

Layer IV - Brown (10YR 4/3) compact silty clay loam alluvium; No cultural remains

Figure B-270. Profile of BT-E-22-1

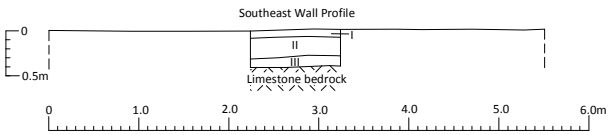


Layer I - Dark brown (7.5YR 3/2) loose clay loam; Aggregate present

Layer II - Brown (10YR 4/3) loose sandy loam; No cultural remains

Layer III - Very dark brown (7.5YR 2.5/2) loose clay loam; No cultural remains

Figure B-271. Profile of BT-E-22-2

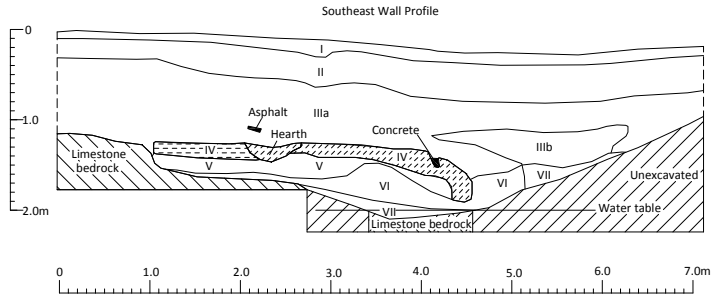


Layer I - Dark reddish brown (5YR 3/2) loose clay loam recent duff; No cultural remains

Layer II - Brown (10YR 5/3) loose sandy loam; Marine shell and metal nail

Layer III - Very dark grayish brown (10YR 3/2) fine friable clay loam; No cultural remains

Figure B-272. Profile of BT-E-22-3



Layer I - Dark brown (7.5YR 3/2) fine friable clay loam; No cultural remains

Layer II - Dark grayish brown (10YR 4/2) to dark brown (10YR 3/3) loose clay loam; Copper wire and 20% limestone aggregate for Site 7275

Layer IIIa - Dark grayish brown (10YR 4/2) to dark brown (10YR 3/3) moderately compacted clay loam; Copper wire, asphalt, concrete and 70% limestone aggregatefor Site 7275

Hearth - Black (10YR 2/1) fine friable clay loam hearth; Charcoal

Layer IIIb - Light yellowish brown (10YR 6/4) loose sand; 80% limestone aggregate for Site 7275

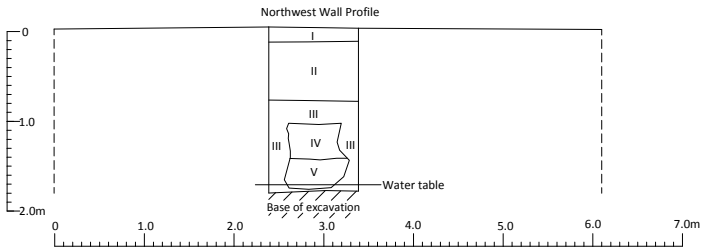
Layer IV - Black (7.5YR 2.5/1) fine friable clay loam; 7296 cultural deposit (Basalt flakes, marine shells, urchin, kukui nutshells and charcoal)

Layer V - Brown (7.5YR 4/4) very fine friable oxidized clay loam; No cultural remains

Layer VI - Very pale brown (10YR 7/3) weathered limestone; No cultural remains

Layer VII - Brown (10YR 5/3) non-sticky, plastic clay; No cultural remains

Figure B-273. Profile of BT-E-22-4



Layer I - Dark brown (7.5YR 3/2) fine friable clay loam ; No cultural remains

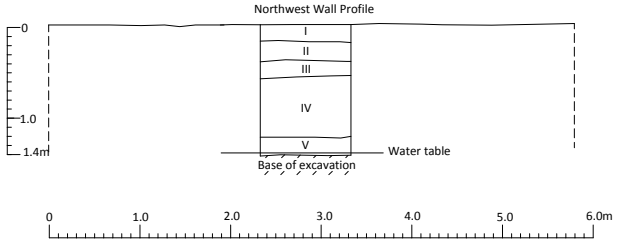
Layer II - Dark grayish brown (10YR 4/2) moderately compact sandy loam; No cultural remains

Layer III - Light brownish gray (10YR 6/2) weathered limestone; No cultural remains

Layer IV - Very dark grayish brown (10YR 3/2) fine friable clay loam; No cultural remains

Layer V - Dark grayish brown (10YR 4/2) sticky, pastic clay; No cultural remains

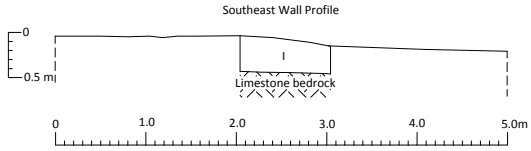
Figure B-274. Profile of BT-E-22-4b



Layer I - Dark grayish brown (10YR 4/2) loose clay loam; Aggregate present
Layer II - Light yellowish brown (10YR 6/4) loose clay loam; Aggregate present
Layer III - Dark grayish brown (10YR 4/2) fine friable clay loam alluvium: No cultural remains
Layer IV - Brown (7.5YR 4/3) massive clay loam; No cultural remains
Layer V - Weathered limestone; No cultural remains

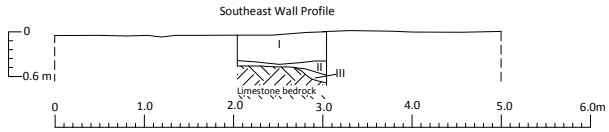
Figure B-275. Profile of BT-E-22-5

Area F Trenches



Layer I - Very dark brown (7.5YR 2.5/2) loose clay loam alluvium; No cultural remains

Figure B-276. Profile of BT-F-1-1

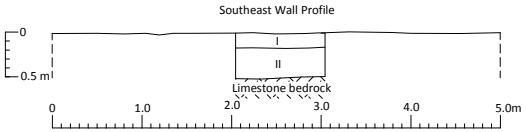


Layer I - Dark brown (7.5YR 3/3) loose clay loam with humus; Glass bottles present

Layer II - Black (5YR 2.5/1) loose clay loam buried A horizon; No cultural remains

Layer III - Brown (7.5YR 4/4) clay loam; No cultural remains

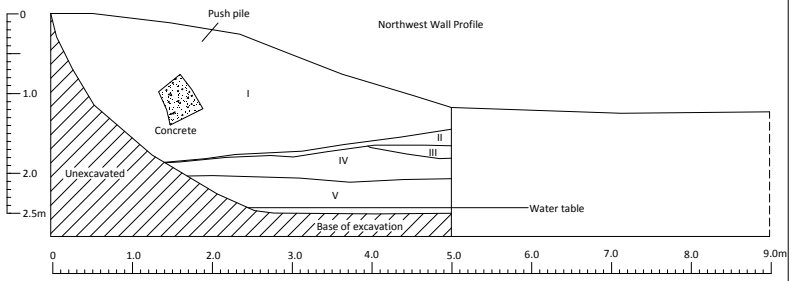
Figure B-277. Profile of BT-F-1-2



Layer I - Dark brown (7.5YR 3/3) loose clay loam with humus; Crusher rock present

Layer II - Dark brown (7.5YR 3/2) blocky clay; No cultural remains

Figure B-278. Profile of BT-F-1-3



Layer I - Dark brown (7.5YR 3/2) loose redeposited clay loam;Concrete present

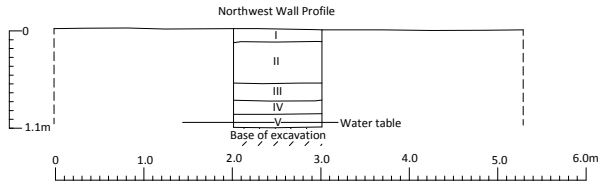
Layer II - Black (7.5YR 2/1) friable clay loam and decomposing organic layer; No cultural remains

Layer III - Dark brown (7.5YR 3/3) friable clay alluvium; No cultural remains

Layer IV - Very dark grayish brown (10YR 3/2) compact clay; No cultural remains

Layer V - Dark gray (10YR 4/1) saturated gley; No cultural remains

Figure B-279. Profile of BT-F-2-1



Layer I - Very dark gray (7.5YR 3/1) loose clay loam with humus; No cultural remains

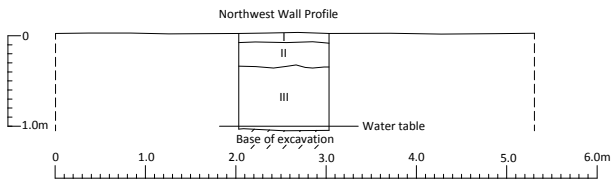
Layer II - Brown (7.5YR 4/3) friable clay alluvium; No cultural remains

Layer III - Very dark gray (10YR 3/1) compact clay alluvium; No cultural remains

Layer IV - Gray (10YR 5/1) `saturated gley; No cultural remains

Layer V - Very dark brown (10YR 2/2) to very dark grayish brown (10YR 3/2) peat; No cultural remains

Figure B-280. Profile of BT-F-2-2

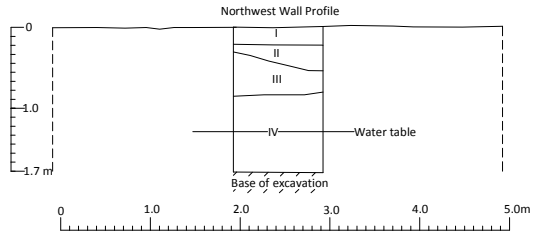


Layer I - Very dark gray (7.5YR 3/1) loose clay loam with humus; No cultural remains

Layer II - Brown (7.5YR 4/3) friable clay alluvium; No cultural remains

Layer III - Very dark gray (10YR 3/1) saturated gley; No cultural remains

Figure B-281. Profile of BT-F-2-3



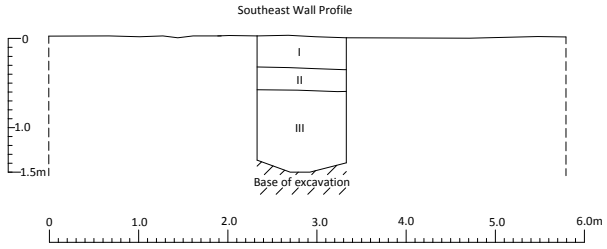
Layer I - Very dark gray (7.5YR 3/1) loose clay loam with humus; No cultural remains

Layer II - Brown (7.5YR 4/4) loose clayey sand; No cultural remains

Layer III - Brown (7.5YR 4/3) friable clay alluvium; No cultural remains

Layer IV - Dark gray (10YR 4/1) saturated gley; No cultural remains

Figure B-282. Profile of BT-F-2-4

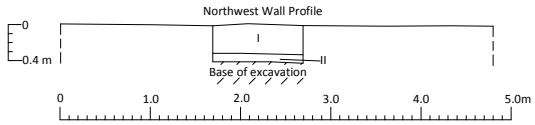


Layer I - Very dark grayish brown (10YR 3/2) friable clay loam; No cultural remains

Layer II - Dark brown (7.5YR 3/2) blocky clay; No cultural remains

Layer III - Very pale brown (10YR 8/3 to 10YR 7/3) weathered limestone; No cultural remains

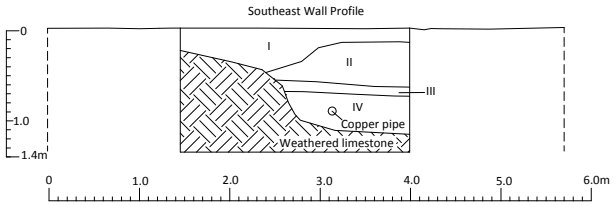
Figure B-283. Profile of BT-F-2-5



Layer I - Pale brown (10YR 6/3) compact sand fill; No cultural remains

Layer II - Yellowish brown (10YR 5/4) weathered limestone; No cultural remains

Figure B-284. Profile of BT-F-2-6



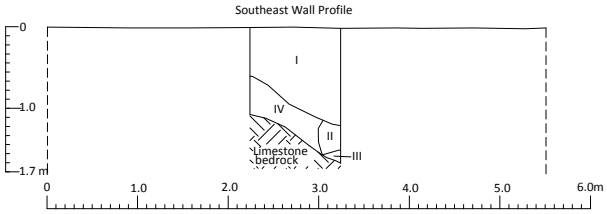
Layer I - Dark brown (7.5YR 3/3) friable clay; No cultural remains

Layer II - Light brownish gray (10YR 6/2) loose sand fill; No cultural remains

Layer III - Light brownish gray (10YR 6/2) friable clay and sand fill; No cultural remains

Layer IV - Pale brown (10YR 6/3) compact sand fill; Copper pipe present

Figure B-285. Profile of BT-F-2-7



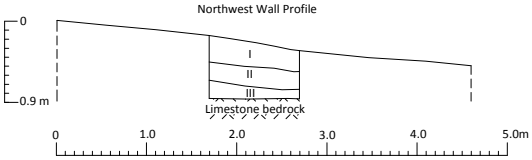
Layer I - Very dark brown (7.5YR 2.5/2) loose clay loam; Barbed wire present

Layer II - Dark brown (7.5YR 3/2) to dark gray (10YR 4/1) friable clay alluvium; No cultural remains

Layer III - Dark gray (10YR 4/1) saturated gley; No cultural remains

Layer IV - Yellowish brown (10YR 5/4) loose sand; No cultural remains

Figure B-286. Profile of BT-F-3-1

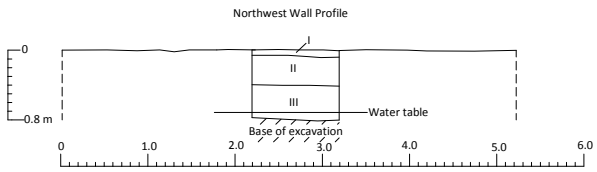


Layer I - Dark brown (7.5YR 3/2) friable silty clay alluvium; No cultural remains

Layer II - Reddish yellow (7.5YR 6/6) loose sand; No cultural remains

Layer III - Dark brown (7.5YR 3/2) friable clay loam; No cultural remains

Figure B-287. Profile of BT-F-3-2

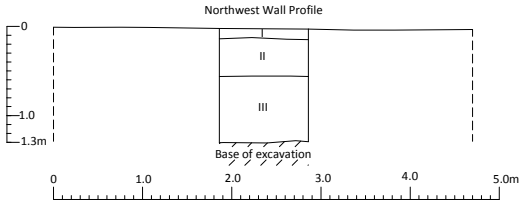


Layer I - Very dark gray (7.5YR 3/1) loose clay loam with humus; Bottle glass

Layer II - Dark brown (7.5YR 3/2 and 7.5YR 3/3) friable clay loam alluvium ; No cultural remains

Layer III - Dark gray (10YR 4/1) saturated gley; No cultural remains

Figure B-288. Profile of BT-F-3-3

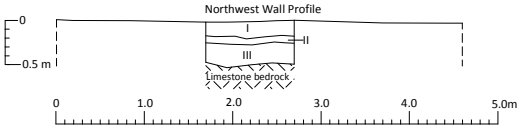


Layer I - Dark brown (7.5YR 3/2) loose clay loam with humus; No cultural remains

Layer II - Dark brown (7.5YR 3/3) loose clay; No cultural remains

Layer III - Dark gray (7.5YR 4/1) blockyclay; No cultural remains

Figure B-289. Profile of BT-F-3-4

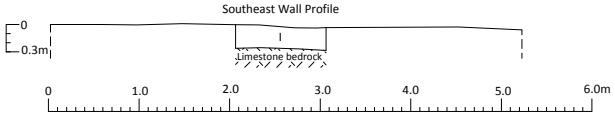


Layer I - Very dark gray (7.5YR 3/1) loose clay loam with humus; Aggregate present

Layer II - Gray (7.5YR 5/1) loose silty sand fill; Aggregate present

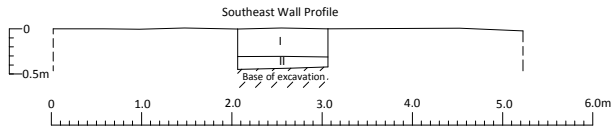
Layer III - Dark brown (7.5YR 3/2) friable clay loam ; No cultural remains

Figure B-290. Profile of BT-F-3-5



Layer I - Yellowish brown (10YR 5/4) to dark brown (10YR 3/3) loose sandy loam; No cultural remains

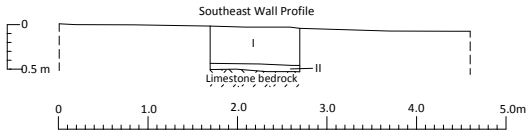
Figure B-291. Profile of BT-F-3-6



Layer I - Light yellowish brown (10YR 6/4) to dark brown (10YR 3/3) loose loamy sand; No cultural remains

Layer II Yellowish brown (10YR 5/4) weathered limestone; No cultural remains

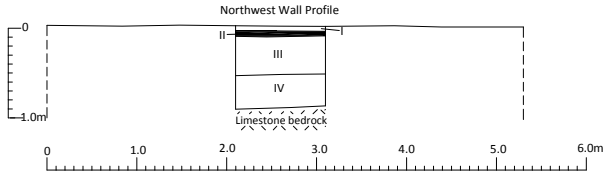
Figure B-292. Profile of BT-F-3-7



Layer I - Dark brown (10YR 3/3) loose sandy loam; Bottle glass and aggregate present

Layer II - Dark brown (7.5YR 3/3) block clay; No cultural remains

Figure B-293. Profile of BT-F-3-8



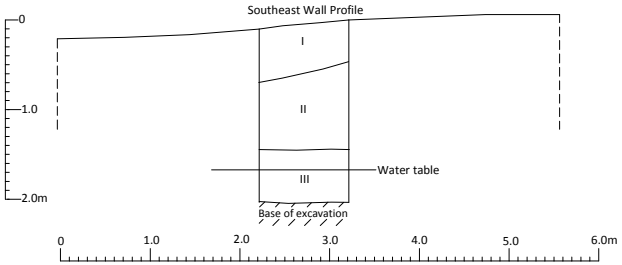
Layer I -Dusky red (2.5YR 3/4) friable sandy clay; Crusher rock present

Layer II - Black (10YR 2/1) intact asphalt layer

Layer III - Yellowish brown (10YR 5/4) to very pale brown (10YR 7/4) compact crushed limestone fill; Aggregate present

Layer IV - Brown (7.5YR 4/3) massive clay; No cultural remains

Figure B-294. Profile of BT-F-3-9

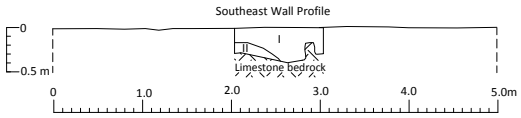


Layer I - Brown (7.5YR 4/2) to dark brown (7.5YR 3/2) loose clay loam; No cultural remains

Layer II - Brown (10YR 5/3) to light yellowish brown (10YR 6/4) sand; No cultural remains

Layer III - Dark gray (10YR 4/1) saturated gley; No cultural remains

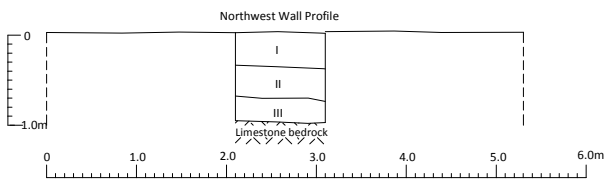
Figure B-295. Profile of BT-F-4-1



Layer I - Very dark gray (7.5YR 3/1) friable clay loam alluvium; No cultural remains

Layer II - Brown (7.5YR 4/4) blocky clay; No cultural remains

Figure B-296. Profile of BT-F-4-2

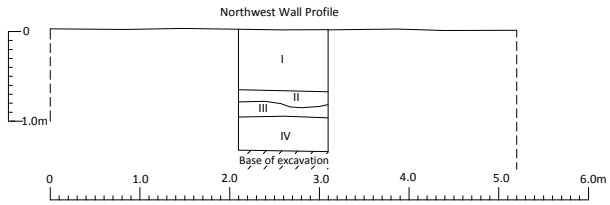


Layer I -Dark brown (7.5YR 3/2) loose clay loam; No cultural remains

Layer II - Brown (7.5YR 4/2) moderately compact clay loam alluvium; No cultural remains

Layer III - Yellowish brown (10YR 5/4) compact clay; No cultural remains

Figure B-297. Profile of BT-F-4-3



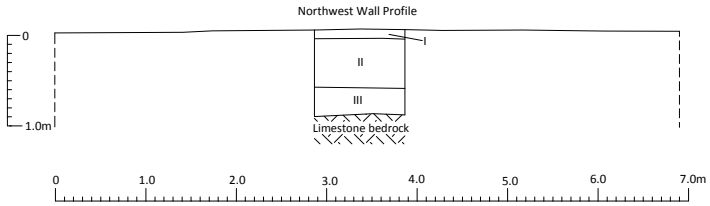
Layer I - Very dark grayish brown (10YR 3/2) friable clay loam; No cultural remains

Layer II - Very pale brown (10YR 8/2) weathered limestone; No cultural remains

Layer III - Dark brown (7.5YR 3/3) massive clay; No cultural remains

Layer IV - Very pale brown (10YR 7/3) decomposing limestone; No cultural remains

Figure B-298. Profile of BT-F-4-4

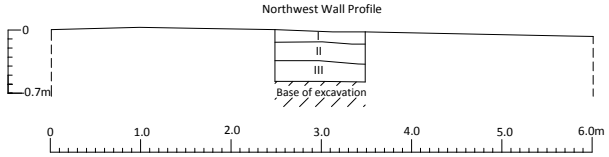


Layer I - Very dark brown (10YR 2/2) structureless humus; No cultural remains

Layer II - Very dark grayish brown (10YR 3/2) to very pale brown (10YR 7/3) beach sand with clay loam pockets; Fiberglass and fabric present

Layer III - Dark yellowish brown (10YR 3/4) massive clay; No cultrual remains

Figure B-299. Profile of BT-F-4-5

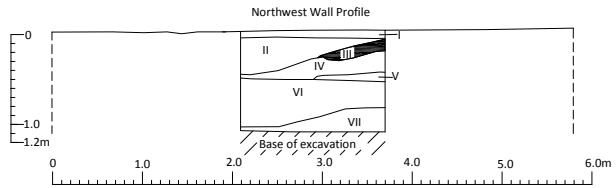


Layer I - Dark reddish brown (5YR 3/3) to brown (10YR 4/3) loose sandy clay loam; No cultural remains

Layer II - Dark brown (10YR 3/3) compact clay alluvium; No cultural remains

Layer III - Yellowish brown (10YR 5/4) weathered limestone; No cultural remains

Figure B-300. Profile of BT-F-4-6



Layer I - Dark brown (10YR 3/3) structureless humus; No cultural remains

Layer II - Very dark grayish brown (10YR 3/2) to very pale brown (10YR 7/3) loose sandy clay loam; Ashpalt fragments present

Layer III - Black (10YR 2/1) intact asphalt layer

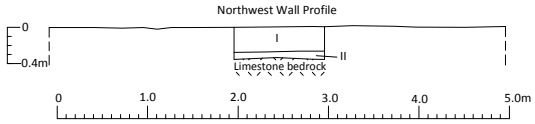
Layer IV - Pale brown (10YR 6/3) to very pale brown (10YR 8/3) compact crushed limestone fill; Aggregate present

Layer V - Grayish brown (10YR 5/2) compact basalt gravel fill; Aggregate present

Layer VI - Dark brown (7.5YR 3/3) massive clay; No cultural remains

Layer VII - Yellowish brown (10YR 5/4) weathered limestone; No cultural remains

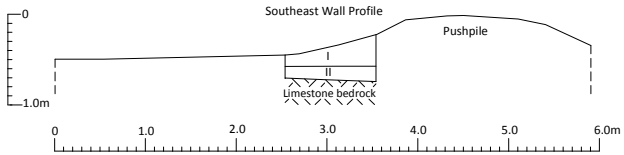
Figure B-301. Profile of BT-F-4-7



Layer I - Brown (10YR 4/3) friable sandy loam; Plastic garbage present

Layer II - Dark yellowish brown (10YR 3/4) friable clay; No cultural remains

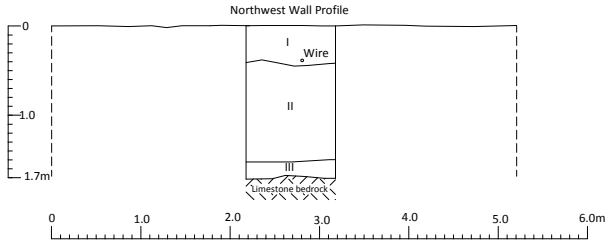
Figure B-302. Profile of BT-F-4-8



Layer I - Dark grayish brown (10YR 4/2) friable sandy clay loam; Black plastic fragments

Layer II - Dark yellowish brown (10YR 4/4) massive clay; No cultural remains

Figure B-303. Profile of BT-F-4-9

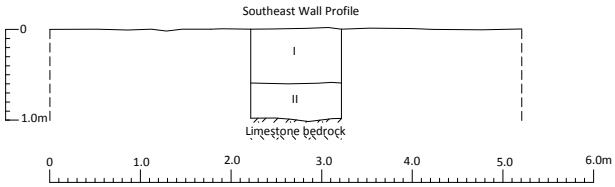


Layer I - Dark brown (7.5YR 3/2) loose clay loam with humus; Plastic-coated wire present

Layer II - Dark brown (7.5YR 3/2) to very dark brown (7.5YR 2.5/2) loose clay loam; No cultural remains

Layer III - Dark brown (7.5YR 3/2) compact clay; No cultural remains

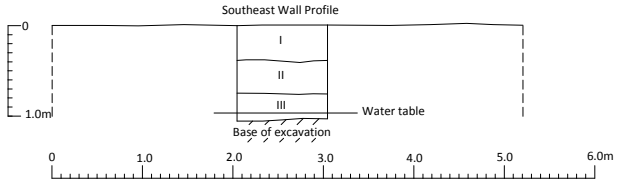
Figure B-304. Profile of BT-F-5-1



Layer I - Dark brown (7.5YR 3/2) friable clay loam alluvium; No cultural remains

Layer II - Brown (7.5YR 4/2) compact clay; No cultural remains

Figure B-305. Profile of BT-F-5-2

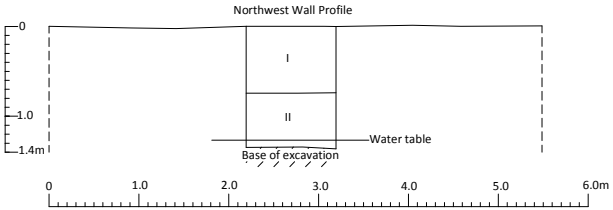


Layer I - Very dark gray (7.5YR 3/1) friable clay loam alluvium; No cultural remains

Layer II - Brown (7.5YR 4/3) compact clay loam alluvium; No cultural remains

Layer III - Brown (10YR 5/3) saturated gley; No cultural remains

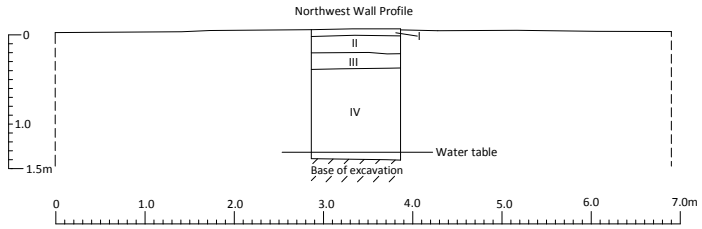
Figure B-306. Profile of BT-F-5-3



Layer I - Very dark grayish brown (10YR 3/2) to dark reddish brown (5YR 3/3) friable clay loam; No cultural remains

Layer II - Brown (10YR 5/3) weathered limestone; No cultural remains

Figure B-307. Profile of BT-F-5-4



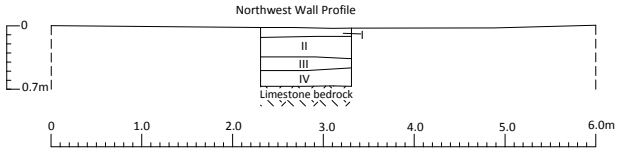
Layer I - Very dark brown (7.5YR 2.5/2) structureless humus; No cultural remains

Layer II - Very pale brown (10YR 7/4 to 10YR 8/4) loose sand fill; No cultural remains

Layer III - Very dark grayish brown (10YR 3/2) friable clay loam; No cultural remains

Layer II - Very pale brown (10YR 7/4) to white (10YR 8/1) weathered limestone; No cultural remains

Figure B-308. Profile of BT-F-5-5



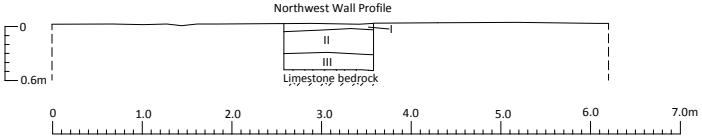
Layer I - Concrete slab

Layer II - Pale brown (10YR 6/3) compact crushed limestone fill; Aggregate present

Layer III - White (10YR 8/1) weathered limestone; No cultural remains

Layer IV - Dark yellowish brown (10YR 3/4) compact clay; No cultural remains

Figure B-309. Profile of BT-F-5-6

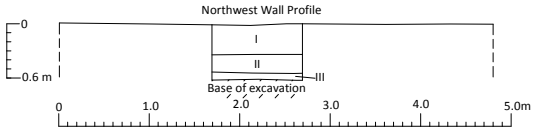


Layer I - Very dark brown (7.5YR 2.5/2) loose humus; No cultural remains

Layer II - Dark brown (10YR 3/3) friable clay loam allluvium; No cultural remains

Layer III - Dark yellowish brown (10YR 4/4) compact clay; No cultural remains

Figure B-310. Profile of BT-F-5-7

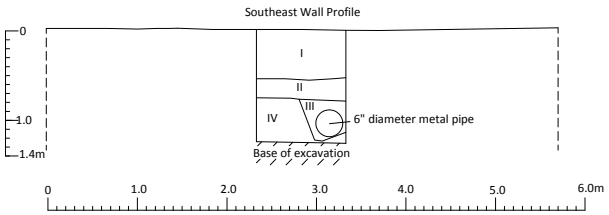


Layer I - Dark grayish brown (10YR 4/2) loose sandy clay loam; No cultural remains

Layer II - Dark brown 7.5YR 3/3) massive sandy clay loam; No cultural remains

Layer III - Yellowish brown (10YR 5/6) weathered limestone; No cultural remains

Figure B-311. Profile of BT-F-5-8



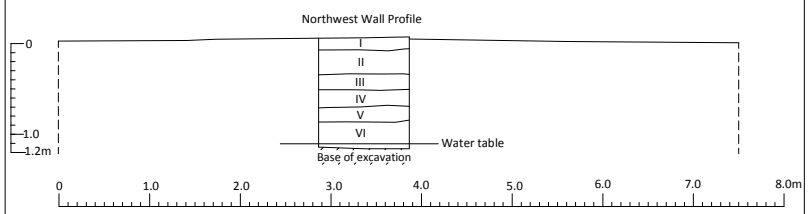
Layer I - Dark grayish brown (10YR 4/2) loose sandy loam; No cultural remains

Layer II - Brown (10YR 4/3) friable sandy clay loam; Bottle glass and aggregate present

Layer III - Brown (10YR 4/3) to dark grayish brown (10YR 4/2) friable sandy loam and sandy clay loam fill; Metal pipe

Layer IV - Yellowish brown (10YR 5/4) weathered limestone; No cultural remains

Figure B-312. Profile of BT-F-5-9



Layer I - Very dark gray (10YR 3/1) loose humus; Modern trash and basalt aggregate present

Layer II - Brown (10YR 5/3) to dark yellowish brown (10YR 4/4) compact crushed limestone fill; Wire and aggregate present

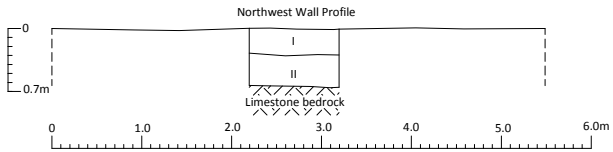
Layer III - Very dark grayish brown (10YR 3/2) to dark grayish brown (10YR 4/2) friable clay loam alluvium; No cultural remains

Layer IV - Light gray (10YR 7/2) to grayish brown (10YR 5/2) weathered limestone; No cultural remains

Layer V - Gray (10YR 5/1) massive clay; No cultural remains

Layer VI - Brown (10YR 4/3) massive clay; No cultural remains

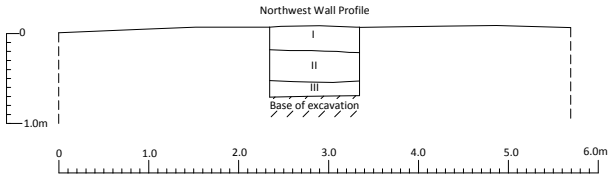
Figure B-313. Profile of BT-F-5-10



Layer I - Brown (7.5YR 4/2) loose clay loam; No cultural remains

Layer II - Brown (10YR 5/3) sand; No cultural remains

Figure B-314. Profile of BT-F-6-1

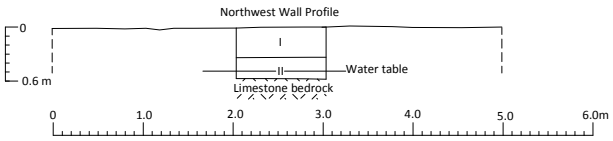


Layer I - Dark reddish brown (5YR 3/3) to dark brown (7.5YR 3/2) loose clay loam; Aggregate present

Layer II - Dark gray (7.5YR 4/1) compact clay; No cultural remains

Layer III - Brown (10YR 5/3) to light yellowish brown (10YR 6/6) weathered limestone; No cultural remains

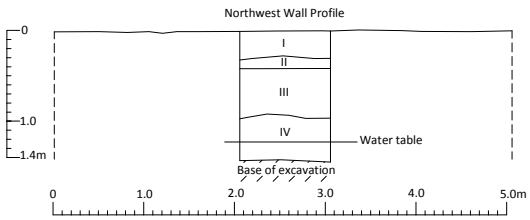
Figure B-315. Profile of BT-F-6-2



Layer I - Dark brown (7.5YR 3/2) friable clay loam alluvium; No cultural remains

Layer II - Gray (7.5YR 5/1) saturated gley; No cultural remains

Figure B-316. Profile of BT-F-7-1



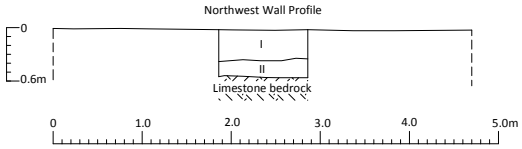
Layer I - Brown (7.5YR 4/4) loose clay loam; No cultural remains

Layer II - Very dark gray (7.5YR 3/1) friable clay loam alluvium; No cultural remains

Layer III - Brown (7.5YR 4/2) compact clay alluvium; No cultural remains

Layer IV - Light gray (7.5YR 7/1) saturated gley; No cultural remains

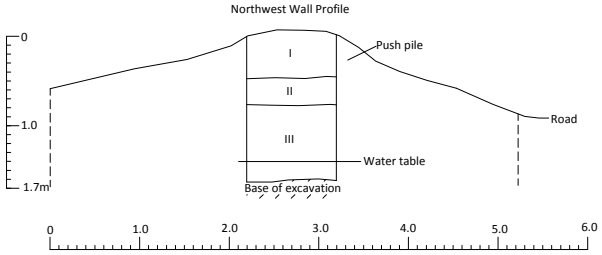
Figure B-317. Profile of BT-F-7-2



Layer I - Very dark gray (7.5YR 3/1) loose clay loam with humus; No cultural remains

Layer II - Dark brown (7.5YR 3/3) compact clay; No cultural remains

Figure B-318. Profile of BT-F-8-1

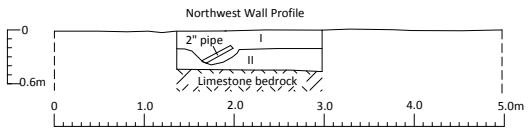


Layer I - Dark brown (7.5YR 3/2) loose clay loam; No cultural remains

Layer II - Yellowish brown (10YR 5/4) loose sandy loam; No cultural remains

Layer III - Brown (7.5YR 4/3) clay loam with pockets of gley; No cultural remains

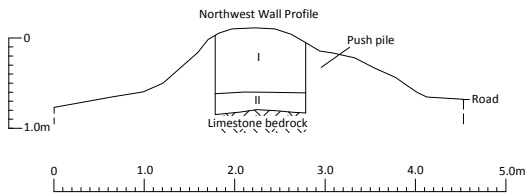
Figure B-319. Profile of BT-F-8-2



Layer I - Very dark gray (7.5YR 3/1) to brown (7.5YR 4/4) compact clay loam fill; Metal pipe

Layer II - Dark brown (7.5YR 3/2) loose sandy clay loam fill; Aggregate present

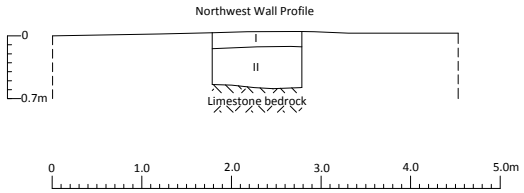
Figure B-320. Profile of BT-F-9-1



Layer I - Dark brown (7.5YR 3/2) to dark reddish brown (5YR 3/2) loose clay loam; Aggregate present

Layer II - Dark brown (7.5YR 3/2) compact clay alluvium; No cultural remains

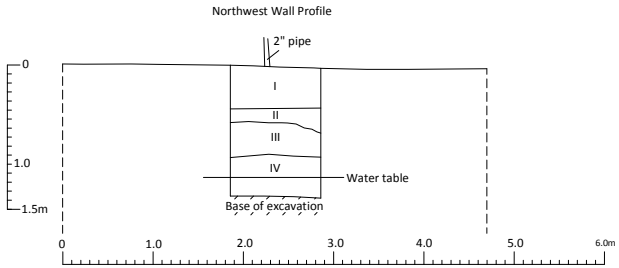
Figure B-321. Profile of BT-F-9-2



Layer I - Very dark gray (7.5YR 3/1) moderately compact clay loam with humus; Plastic and glass present

Layer II - Brown (10YR 5/3) loose sandy clay loam; No cultural remains

Figure B-322. Profile of BT-F-10-1



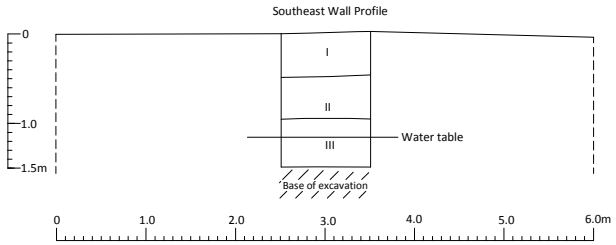
Layer I - Dark brown (7.5YR 3/2) to dark reddish brown (5YR 3/3) loose sandy clay loam; 2" metal pipe

Layer II - Yellowish brown (10YR 5/4) to light yellowish brown (10YR 6/4) loose sand fill; 6" metal sewer pipe

Layer IIII - Dark brown (7.5YR 3/2) compact clay alluvium; No cultural remains

Layer IV - Gray (10YR 5/1) saturated gley; No cultural remains

Figure B-323. Profile of BT-F-10-2

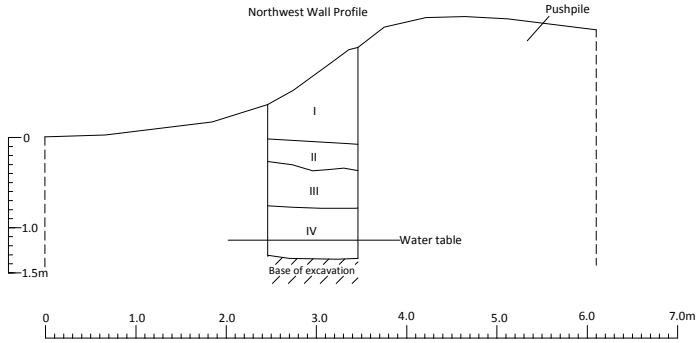


Layer I - Dark brown (7.5YR 3/4) loose clay loam; No cultural remains

Layer II - Dark brown (7.5YR 3/4) friable clay loam fill; Metal pipes present

Layer III - Light yellowish brown (10YR 6/4) weathered limestone; No cultural remains

Figure B-324. Profile of BT-F-11-1



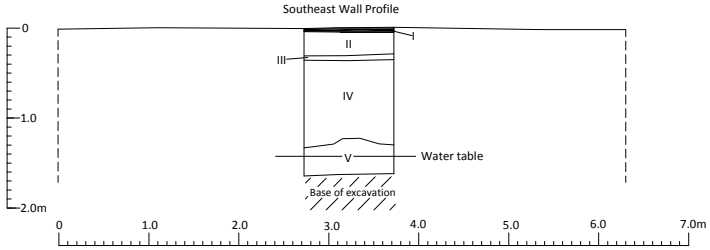
Layer I - Dark reddish brown (5YR 3/3) friable clay loam; No cultural remains

Layer II - Brown (7.5YR 4/3) to very dark grayish brown (10YR 3/2) loose sandy clay loam; Steel cable, plastic hose, tire present

Layer III - Very dark brown (10YR 2/2) compact sandy clay loam alluvium; No cultural remains

Layer IV - Dark gray (10YR 4/1) to gray (10YR 5/1) saturated gley; No cultural remains

Figure B-325. Profile of BT-F-11-2



Layer I - Black (10YR 2/1) intact asphalt layer

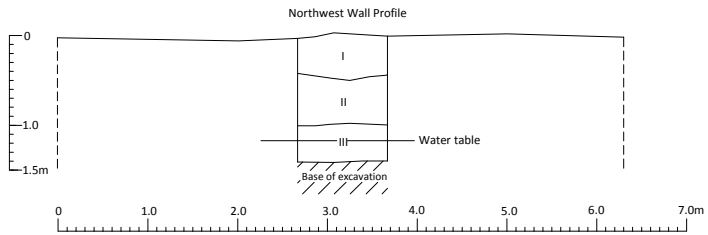
Layer II - Very pale brown (10YR 7/4) to light yellowish brown (10YR 6/4) compact limestone gravel fill; Aggregate present

Layer III - Dark grayish brown (10YR 4/2) compact clay loam alluvium; No cultural remains

Layer IV - Very pale brown (10YR 7/4) weathered limestone; No cultural remains

Layer V - Dark gray (10YR 4/1) saturated gley; No cultural remains

Figure B-326. Profile of BT-F-12-1



Layer I - Dark brown (7.5YR 3/3) friable clay loam; No cultural remains

Layer II - Dark brown (7.5YR 3/3) friable clay loam alluvium; No cultural remains

Layer III - Dark gray (7.5YR 4/1) saturated gley; No cultural remains

Figure B-327. Profile of BT-F-12-2

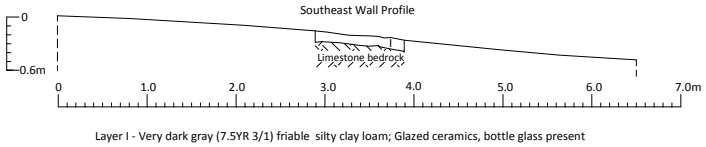


Figure B-328. Profile of BT-F-13-1

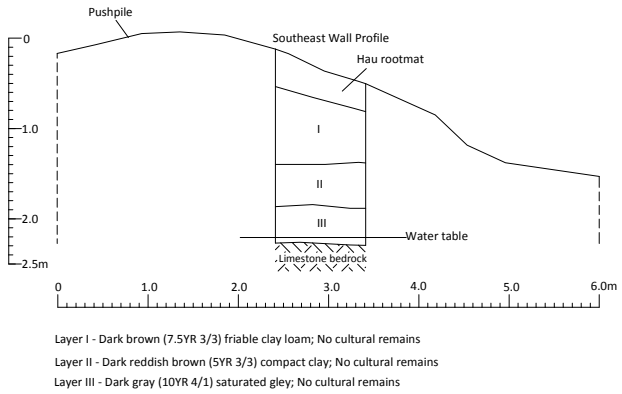


Figure B-329. Profile of BT-F-13-2

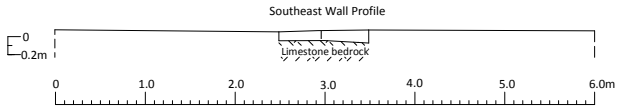


Figure B-330. Profile of BT-F-14-1

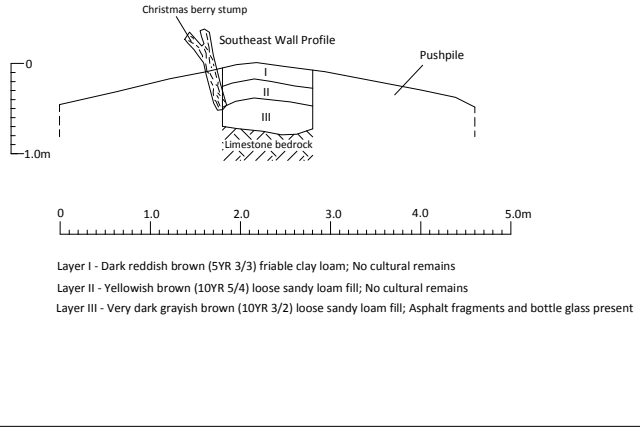
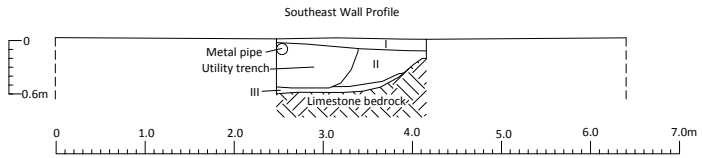


Figure B-331. Profile of BT-F-14-2



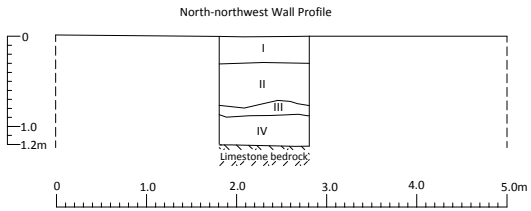
Layer I - Black (7.5YR 2.5/1) loose clay loam with humus; No cultural remains

Layer II - Dark grayish brown (10YR 4/2) friable clay loam; No cultural remains

Utility trench - Very pale brown (10YR 7/3) loose fine sand fill; 8" metal pipe present

Layer III - Dark gray (10YR 4/1) saturated gley; No cultural remains

Figure B-332. Profile of BT-F-15-1



Layer I - Dark brown (7.5YR 3/3) friable silt loam; No cultural remains

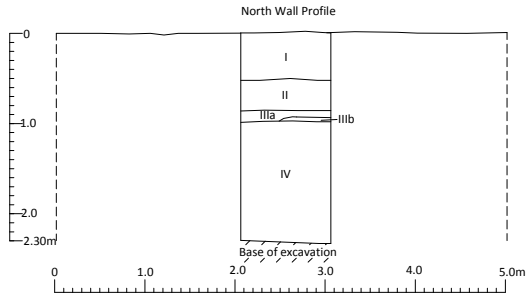
Layer II - Pale brown (10YR 6/3) to brown (10YR 4/3) compact crushed limestone fill; Aggregate and concrete fragments

Layer III - Yellowish brown (10YR 5/4) loose silty sand fill; No cultural remains

Layer IV - Dark reddish brown (5YR 3/3) compact clay; No cultural remains

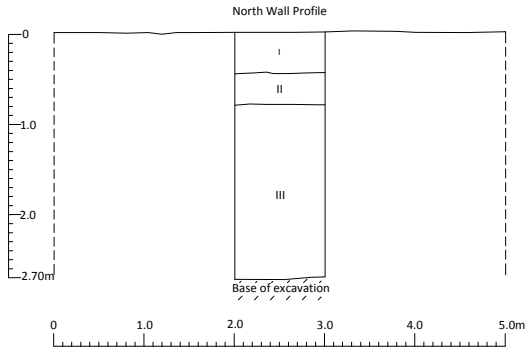
Figure B-333. Profile of BT-F-15-2

Area G Trenches



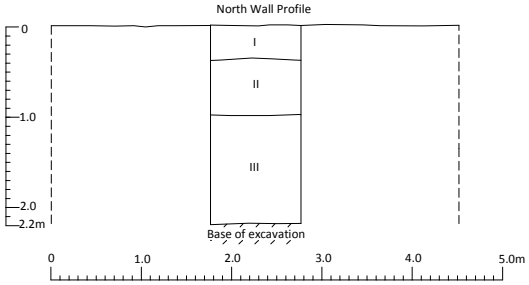
Layer I - Dark brown (7.5YR 3/2) loose clay loam; plow zone; No cultural remains
Layer II - Dark brown (7.5YR 3/3) blocky clay alluvium; No cultural remains
Layer IIIa - Dark brown (7.5YR 3/2) compact clay loam alluvium; No cultural remains
Layer IIIb - Lens of dark brown (7.5YR 3/3) compact clay loam alluvium; No cultural remains
Layer IV - Dark brown (7.5YR 3/4) compact clay alluvium; No cultural remains

Figure B-334. Profile of BT-G-2-1



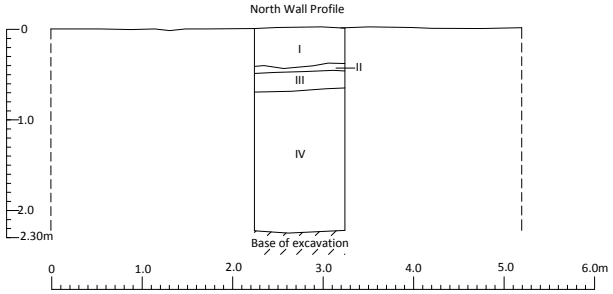
Layer I - Very dark brown (7.5YR 2.5/2) loose clay loam; plow zone; No cultural remains
Layer II - Dark brown (7.5YR 3/2) blocky clay alluvium; No cultural remains
Layer III - Dark brown (7.5YR 3/4) compact clay alluvium; No cultural remains

Figure B-335. Profile of BT-G-2-2



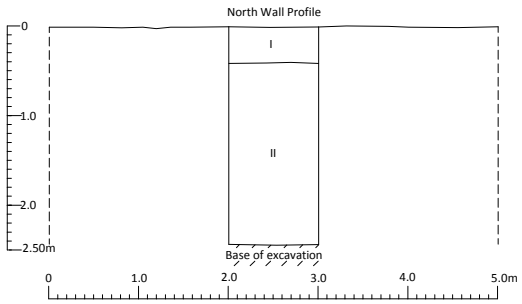
Layer I - Very dark brown (7.5YR 2.5/2) loose clay loam; plow zone; Modern trash present
Layer II - Dark brown (7.5YR 3/4) blocky clay alluvium; No cultural remains
Layer III - Dark brown (7.5YR 3/4) compact clay alluvium; No cultural remains

Figure B-336. Profile of BT-G-2-3



Layer I - Dark brown (7.5YR 3/3) loose clay loam; plow zone; No cultural remains
Layer II - Dark brown (7.5YR 3/4) compact clay alluvium; No cultural remains
Layer III - Dark brown (7.5YR 3/3) loose clay loam alluvium; No cultural remains
Layer IV - Dark brown (7.5YR 3/4) compact clay alluvium; No cultural remains

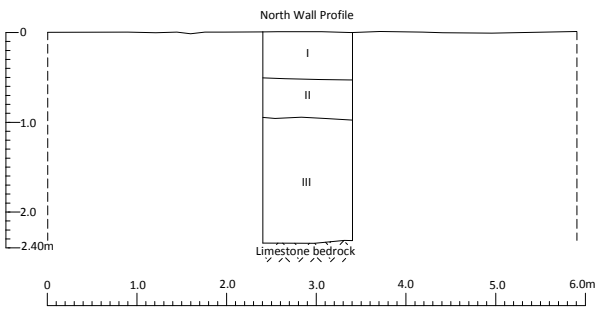
Figure B-337. Profile of BT-G-3-1



Layer I - Very dark brown (7.5YR 2.5/2) loose clay loam; plow zone; No cultural remains

Layer II - Dark brown (7.5YR 3/4) massive clay alluvium; No cultural remains

Figure B-338. Profile of BT-G-3-2

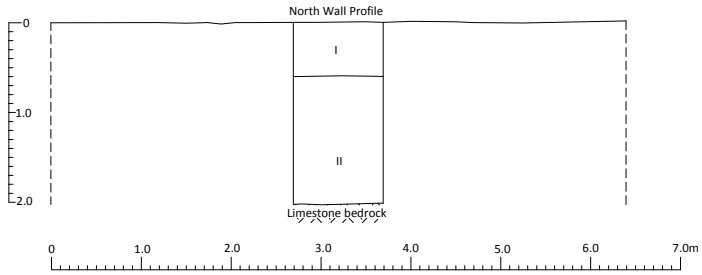


Layer I - Dark brown (7.5YR 3/3) loose clay loam; plow zone; No cultural remains

Layer II - Mottled dark brown (7.5YR 3/3 and 7.5YR 3/4) blocky clay loam; No cultural remains

Layer II - Dark brown (7.5YR 3/3) clay alluvium; No cultural remains

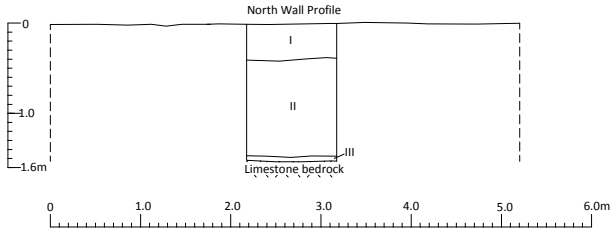
Figure B-339. Profile of BT-G-4-1



Layer I - Dark brown (7.5YR 3/4) to dark reddish brown (5YR 3/3) loose clay loam; plow zone; No cultural remains

Layer II - Dark brown (7.5YR 3/4) compact clay alluvium; No cultural remains

Figure B-340. Profile of BT-G-4-2

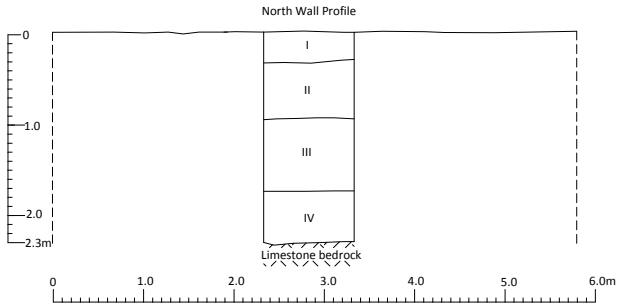


Layer I -Dark brown (7.5YR 3/3) loose clay loam; plow zone; Modern trash present

Layer II - Dark brown (7.5YR 3/4) massive clay alluvium; No cultural remains

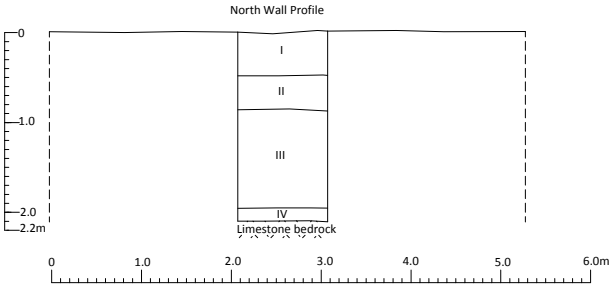
Layer III - Yellowish red (5YR 4/6) weathered limestone; No cultural remains

Figure B-341. Profile of BT-G-4-3



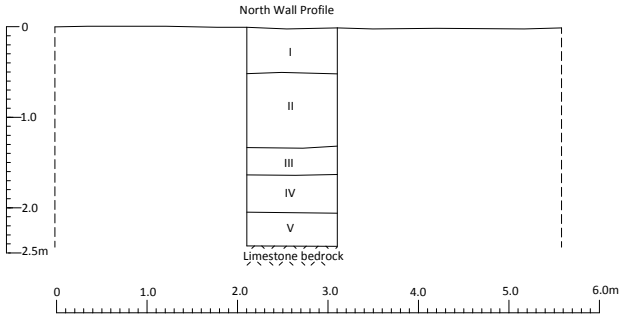
Layer I - Dark brown (7.5YR 3/3) loose silty clay loam; plow zone; No cultural remains
Layer II - Dark brown (7.5YR 3/4) compact clay alluvium; No cultural remains
Layer III - Brown (7.5YR 4/4) compact clay loam alluvium; No cultural remains
Layer IV - Dark brown (7.5YR 3/3) compact clay silt alluvium; No cultural remains
Layer V - Reddish yellow (7.5YR 6/6) loose clay; No cultural remains

Figure B-342. Profile of BT-G-5-1



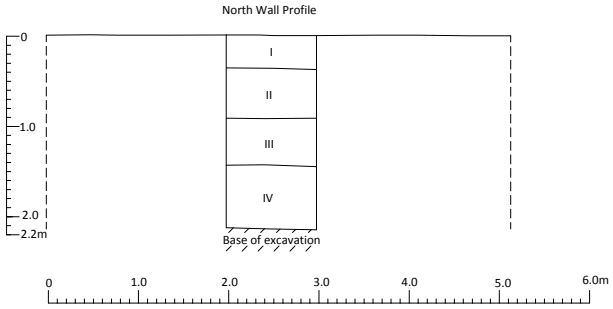
Layer I -Dark brown (7.5YR 3/3) loose clay loam; plow zone; No cultural remains
Layer II - Very dark brown (7.5YR 2.5/2) blocky clay loam alluvium; No cultural remains
Layer III - Reddish brown (5YR 4/3) compact clay alluvium; No cultural remains
Layer IV - Mottled brown (7.5YR 4/4 and 7.5YR 5/4) compact clay; No cultural remains

Figure B-343. Profile of BT-G-5-2



Layer I -Dark brown (7.5YR 3/3) loose clay loam; plow zone; No cultural remains
Layer II - Very dark brown (7.5YR 3/4) compact clay loam alluvium; No cultural remains
Layer III - Brown (7.5YR 4/4) compact silty clay loam alluvium; No cultural remains
Layer IV - Dark brown (7.5YR 3/3) moderately clayey silt; No cultural remains
Layer V - Reddish yellow (7.5YR 6/6) loose clay; No cultural remains

Figure B-344. Profile of BT-G-5-3



Layer I - Dark reddish brown (5YR 3/3) loose silty clay loam; plow zone; No cultural remains
Layer II - Dark reddish brown (5YR 3/3) and reddish brown (5YR 4/4) moderately compact silty clay loam alluvium; No cultural remains
Layer III - Dark reddish brown (5YR 3/3) compact clay alluvium; No cultural remains
Layer IV - Brown (7.5YR 4/4) to dark brown (7.5YR 4/3) coarse clay; No cultural remains

Figure B-345. Profile of BT-G-6-1

APPENDIX C- Trench Stratigraphy

Test Area A Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
A-1-1	7.50	2.05	Decomposing limestone bedrock	I	0.0-0.5	0.50	Very dark brown	7.5YR 2.5/3	Sandy clay loam	Fine, Friable	10% limestone gravel	Distinct/irregular	Reworked	Plow zone	Basalt
				II	0.5-0.95	0.45	Yellowish red	5YR 5/8	Sand	Coarse	sparse reef rubble	Distinct/wavy	Marine deposited	Intact	-
				III	0.95-1.05	0.10	Very pale brown	10YR 8/4	Sand	Coarse	10% reef rubble	Distinct/wavy	Marine deposited	Intact	-
				IV	1.05-2.05	1.00	White & very pale brown	Mottled 10YR 8/1 & 10YR 8/2	Sand	Very Coarse	100% weathered decomposing limestone	-	Residual	Intact	-
A-1-2	6.60	2.60	Decomposing limestone bedrock	I	0.0-0.8	0.80	Very dark brown	10YR 2/2	Sandy clay loam	Fine, Friable	10% limestone and basalt gravel & pebbles	Distinct/wavy	Fill- push pile	Redeposited	Plastic hose, basalt
				II	0.8-1.25	0.45	Dark brown	7.5YR 3/3	Sandy clay loam	Fine, Friable	10% limestone gravel & pebbles	Distinct/irregular	Reworked alluvium	Plow zone	Volcanic glass core
				III	1.25-1.6	0.35	Strong brown	7.5YR 5/6	Sand	Coarse	sparse reef rubble	Abrupt/wavy	Marine deposited	Intact	-
				IV	1.6-1.64	0.04	Brown	7.5YR 5/2	Calcium	Cemented	-	Abrupt/wavy	Precipitate	Intact	-
				V	1.64-2.0	0.36	Very pale brown	Mottled 10YR 8/3 & 10YR 8/4	Sand	Coarse	20% limestone gravel	Distinct/wavy	Marine deposited	Intact	-
				VI	2.0-2.6	0.60	Very pale brown	10YR 8/1	Limestone	Compact	100% weathered decomposing	-	Bedrock	Intact	-
A-1-3	7.40	2.85	Decomposing limestone bedrock	I	0.0-1.17	1.17	Dark brown	10YR 3/3	Sandy clay loam	Fine, Friable	50% limestone gravel, pebbles, cobbles and boulders	Distinct/wavy	Fill- push pile	Redeposited	Limestone aggregate
				II	1.17-1.45	0.28	Dark brown	7.5YR 3/3	Sandy clay loam	Fine, Friable	10% limestone gravel & pebbles	Distinct/irregular	Reworked	Plow zone	-
				III	1.45-2.15	0.70	Reddish yellow	7.5YR 6/6	Sand	Coarse	sparse reef rubble	Distinct/wavy	Marine deposited	Intact	-
				IV	2.15-2.85	0.70	Very pale brown & light gray	Mottled 10YR 8/2 & 10YR 7/2	Sand	Coarse	100% weathered decomposing limestone	-	Residual	Intact	-
A-2-1	6.80	1.95	Decomposing limestone bedrock	I	0.0-0.33	0.33	Very dark brown	10YR 2/2	Sandy clay loam	Fine, Friable	30% basalt crusher rock	Distinct/wavy	Fill	Redeposited	Basalt
				II	0.33-0.76	0.43	Very dark brown	7.5YR 2.5/3	Sandy clay loam	Fine, Friable	sparse reef rubble	Distinct/irregular	Reworked	Plow zone	-
				III	0.76-1.4	0.64	Pink	Mottled 7.5YR 8/3 & 7.5YR 8/4	Sand	Single grain	sparse reef rubble	Distinct/wavy	Marine deposited	Intact	-
				IV	1.4-1.95	0.55	White	10YR 8/1	Sand & gravel	Coarse	100% weathered decomposing	-	Residual	Intact	-
A-2-2	5.70	1.20	Decomposing limestone bedrock	I	0.0-0.5	0.50	Dark brown	7.5YR 3/2	Sandy clay loam	Fine, Friable	sparse limestone gravel	Distinct/irregular	Reworked	Plow zone	-
				II	0.5-0.75	0.25	Reddish yellow	7.5YR 6/6	Sand	Single grain	sparse reef rubble	Distinct/wavy	Marine deposited	Intact	-
				III	0.75-1.12	0.37	Very pale brown	10YR 7/3	Sand	Fine, single grain	sparse calcium carbonate	Distinct/wavy	Marine deposited	Intact	-
				IV	1.12-1.2	0.08	Very pale brown	10YR 7/3	Sand & gravel	Coarse	100% limestone	Abrupt/wavy	Residual	Intact	-
A-2-3	6.60	2.10	Decomposing limestone bedrock	I	0.0-0.23	0.23	Dark brown	7.5YR 3/3	Sandy loam	Fine, Friable	10% limestone gravel	Abrupt/wavy	Reworked	Plow zone	-
				II	0.23-0.3	0.07	Light yellowish brown	10YR 6/4	Sand	Loose, single grain	sparse reef rubble	Abrupt/smooth	Poss. Storm surge?	Disturbed	-
				III	0.3-0.61	0.31	Dark brown	7.5YR 3/3	Sandy loam	Fine, Friable	10% limestone gravel & pebbles	Distinct/irregular	Reworked	Plow zone	-
				IV	0.61-0.9	0.04	Reddish yellow	7.5YR 6/6	Sand	Fine, sinlge grain	sparse reef rubble	Distinct/wavy	Marine deposited	Intact	-
				V	0.9-1.35	0.45	Very pale brown	10YR 8/2	Sand	Coarse	sparse reef rubble & calcium carbonate lenses	Distinct/wavy	Marine deposited	Intact	-
				VI	1.35-2.1	0.75	White	10YR 8/1	Sand	Coarse	100% weathered decomposing	-	Residual	Intact	-
A-3-1	5.60	2.10	Decomposing limestone bedrock	I	0.0-0.16	0.16	Light yellowish brown	10YR 6/4	Clay loam	Compact	90% crushed limestone	Abrupt/smooth	Fill- push pile	Redeposited	Limestone aggregate
				II	0.16-0.36	0.20	Dark brown	7.5YR 3/2	Sandy clay loam	Fine, Friable	sparse limestone gravel	Distinct/irregular	Reworked	Plow zone	-
				III	0.36-1.4	1.04	Reddish yellow	7.5YR 6/6	Sand	Coarse	sparse reef rubble	Abrupt/wavy	Marine deposited	Intact	-
				IV	1.4-1.5	0.10	Very pale brown	10YR 7/3	Weathered limestone	Compact	-	Abrupt/wavy	Bedrock	Intact	-
				V	1.5-2.1	0.60	Very pale brown	10YR 8/2	Sand	Fine	100% decomposing limestone	-	Residual	Intact	-
A-3-2	6.30	2.15	Decomposing limestone bedrock	I	0.0-0.66	0.66	Very dark brown	7.5YR 2.5/3	Sandy clay loam	Fine, Friable	1% limestone and basalt gravel, pebbles	Distinct/irregular	Reworked alluvium	Plow zone	Waterworn basalt pebble
				II	0.66-1.52	0.86	Reddish yellow	Mottled 7.5YR 7/6 & 7.5YR 6/6	Sand	Coarse, single grain	sparse reef rubble	Distinct/wavy	Marine deposited	Intact	-
				III	1.52-2.15	0.63	Very pale brown	10YR 8/2	Weathered sand	Coarse	100% weathered decomposing	-	Residual	Intact	-

Test Area A Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
A-3-3	5.80	1.95	Decomposing limestone bedrock	I	0.0-0.45	0.45	Very dark brown	7.5YR 2.5/3	Sandy clay loam	Fine, Friable	sparse limestone gravel	Distinct/irregular	Reworked	Plow zone	-
				II	0.45-1.25	0.80	Strong brown	7.5YR 5/8	Sand	Coarse	sparse reef rubble	Distinct/wavy	Marine deposited	Intact	-
				III	1.25-1.95	0.75	White & very pale brown	Mottled 10YR 8/1 & 10YR 8/2	Sand	Coarse	100% weathered decomposing limestone	-	Residual	Intact	-
A-4-1	6.00	2.00	Water table	I	0.0-0.3	0.30	Very dark grayish brown & dark brown	Mottled 10YR 3/2 & 10YR 3/3	Sandy loam	Fine, Friable	-	Distinct/irregular	Reworked alluvium	Plow zone	-
				II	0.3-1.25	0.95	Very pale brown	Mottled 10YR 7/4 & 10YR 8/2	Sand	Coarse, single grain	sparse reef rubble	Distinct/wavy	Marine deposited	Intact	-
				-	1.25	-	-	-	Calcium	Cemented	-	-	Precipitate	Intact	-
				III	1.25-2.0	0.73	White & very pale brown	Mottled 10YR 8/1 & 10YR 8/2	Sand	Coarse, single grain	100% weathered decomposing limestone	-	Residual	Intact	-
A-4-2	6.70	2.30	Water table	I	0.0-0.45	0.45	Dark brown	10YR 3/3	Sandy loam	Fine, Friable	-	Distinct/irregular	Reworked	Plow zone	-
				II	0.45-1.34	0.89	Reddish yellow & very pale brown	Mottled 7.5YR 6/6 & 10YR 7/4	Sand	Coarse, single grain	sparse reef rubble	Distinct/wavy	Marine deposited	Intact	-
				-	1.34	-	-	-	Calcium	Cemented	-	-	Precipitate	Intact	-
				III	1.34-2.3	0.83	White & very pale brown	Mottled 10YR 8/1 & 10YR 8/2	Sand	Coarse, single grain	100% weathered decomposing limestone	-	Residual	Intact	-
A-4-3	6.80	2.00	Water table	I	0.0-0.45	0.45	Dark brown	10YR 3/3	Sandy loam	Fine, Friable	-	Distinct/irregular	Reworked	Plow zone	Plastic
				II	0.45-1.45	0.83	Very pale brown	Mottled 10YR 8/3 & 10YR 8/4	Sand	Coarse, single grain	sparse reef rubble	Distinct/wavy	Marine deposited	Intact	-
				-	1.28	-	-	-	Calcium	Cemented	-	-	Precipitate	Intact	-
				III	1.45-2.0	0.60	White & very pale brown	Mottled 10YR 8/1 & 10YR 8/2	Sand	Coarse, single grain	100% weathered decomposing limestone	-	Residual	Intact	-
A-5-1	7.10	2.30	Water table	I	0.0-0.2	0.20	Very dark grayish brown & dark brown	Mottled 10YR 3/2 & 10YR 3/3	Silt loam	Unconsolidated	50% organics, 10% limestone gravel	Diffuse/wavy	Fill	Redeposited	-
				II	0.2-0.42	0.22	Pale brown	10YR 6/3	Sandy loam	Loose	95% crushed limestone	Distinct/wavy	Fill	Redeposited	Limestone aggregate
				III	0.42-1.1	0.68	Dark brown & brown	Mottled 7.5YR 3/4 & 7.5YR 5/3	Clay loam	Fine, Friable	70% limestone cobbles, pebbles & gravel and 10% basalt pebbles & gravel	Abrupt/smooth	Fill	Redeposited	Limestone & basalt aggregate
				IV	1.1-1.56	0.46	Brown	10YR 3/3	Clay loam	Fine, Friable	10% limestone gravel and pebbles	Distinct/wavy	Banded Fill	Redeposited	Chrome handle, asphalt, sparse charcoal
				V	1.56-2.3	0.74	White & very pale brown	Mottled 10YR 8/1 & 10YR 8/2	Sand	Coarse, single grain	sparse reef rubble	-	Marine deposited	Intact	-
A-5-2	6.80	2.48	Water table	I	0.0-0.22	0.22	Dark reddish	5YR 3/3	Clay loam	Fine, Friable	50% basalt gravel and pebbles	Distinct/wavy	Fill	Redeposited	Basalt
				II	0.22-0.44	0.22	Dark gray & dark grayish brown	Mottled 10YR 4/1 & 10YR 4/2	Loamy sand	Loose, single grain	sparse basalt pebbles	Distinct/irregular	Reworked alluvium	Plow zone	Basalt aggregate
				III	0.44-1.95	1.51	White & very pale brown	Mottled 10YR 8/1 & 10YR 8/2	Sand	Coarse, single grain	sparse reef rubble (concretions, waterworn coral & marine shells)	Distinct/wavy	Marine deposited	Intact	-
				-	1.69	-	-	-	Calcium	Cemented	-	-	Precipitate	Intact	-
				IV	1.95-2.48	0.53	White	10YR 8/1	Sand	Coarse, single	100% weathered decomposing	-	Residual	Intact	-

Test Area A Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
A-5-3	6.90	2.70	Water table	I	0.0-0.4	0.40	Brown	10YR 5/3	Clay loam	Fine, Friable	80% limestone boulers, cobbles, pebbles & gravel; 5% basalt pebbles	Abrupt/wavy	Fill - probable OR&L RR grade,	Secondary deposit	Limestone & basalt
				II	0.4-0.54	0.14	Dusky red	2.5YR 3/4	Clay	Blocky	50% limestone pebbles & gravel, and basalt gravel	Abrupt/smooth	Fill - probable OR&L RR grade,	Redeposited	Limestone & basalt
				III	0.54-0.85	0.31	Very dark grayish brown & dark brown	Mottled 10YR 3/2 & 10YR 3/3	Silty sand	Loose, unconsolidated	sparse waterworn basalt pebbles and gravel	Distinct/irregular	Reworked alluvium	Plow zone	Plastic fragments, plastic fork, charcoal flecks
				IV	0.85-2.3	1.45	Very pale brown	Mottled 10YR 8/3 & 10YR 8/4	Sand	Coarse, single grain	-	Distinct/wavy	Marine deposited	Intact	-
				-	2.3	-	-	-	Calcium	Cemented	-	-	Precipitate	Intact	-
				V	2.3-2.7	0.37	White	10YR 8/1	Sand	Coarse, single	100% weathered decomposing	-	Residual	Intact	-
A-5-4	7.00	2.37	Water table	I	0.0-0.38	0.28	Dusky red	2.5YR 3/4	Clay	Blocky	40% weathered basalt gravel and	Smooth	Fill	Redeposited	-
				II	0.38-0.7	0.42	Very dark grayish brown	10YR 3/2	Silty sand	Loose, single grain	10% subangular basalt pebbles	Distinct/irregular	Reworked alluvium	Plow zone	*Conus* sp. shell
				III	0.7-2.2	1.50	Very pale brown	Mottled 10YR 8/3 & 10YR 7/3	Sand	Coarse, single grain	sparse reef rubble (waterworn coral)	Distinct/wavy	Marine deposited	Intact	-
				IV	2.2-2.37	0.17	White	10YR 8/1	Sand	Coarse, single	100% weathered decomposing	-	Residual	Intact	-
A-6-1	5.50	1.75	Water table	I	0.0-0.64	0.64	Brown	10YR 5/3	Sandy clay loam	Friable	80% limestone gravel, pebbles and cobbles	Abrupt/wavy	Fill	Redeposited	Limestone aggregate
				II	0.64-0.95	0.36	Brown & light yellowish brown	Mottled 10YR 4/3 & 10YR 6/4	Silty sand	Loose, single grain	-	Distinct/irregular	Reworked alluvium	Plow zone	-
				III	0.95-1.75	0.80	Very pale brown	10YR 8/3	Sand	Coarse, single	1% reef rubble (waterworn coral)	-	Marine deposited	Intact	-
A-6-2	6.90	2.70	Water table	I	0.0-0.55	0.55	Very dark gray & very dark grayish brown	Mottled 10YR 3/1 & 10YR 3/2	Silty sand	Loose, single grain	-	Distinct/irregular	Reworked alluvium	Plow zone	-
				II	0.55-2.5	1.95	Very pale brown	Mottled 10YR 8/3 & 10YR 7/3	Sand	Coarse, single grain	1% reef rubble (waterworn coral)	Distinct/wavy	Marine deposited	Intact	-
				III	2.5-2.7	0.20	White	10YR 8/1	Sand	Coarse, single	100% weathered decomposing	-	Residual	Intact	-
A-6-3	7.80	2.50	Water table	I	0.0-0.45	0.45	Dark grayish brown & brown	Mottled 10YR 4/2 & 10YR 4/3	Silty sand	Loose, single grain	sparse limestone gravel and pebbles	Distinct/irregular	Reworked alluvium	Plow zone	-
				II	0.45-2.3	1.85	Very pale brown	Mottled 10YR 8/3 & 10Yr 7/3	Sand	Coarse, single grain	sparse reef rubble (waterworn coral)	Distinct/wavy	Marine deposited	Intact	-
				III	2.3-2.5	0.20	White	10YR 8/1	Sand	Coarse, single grain	99% decomposing limestone & 1% waterworn coral pebbles & gravel	-	Residual	Intact	-
A-7-1	7.50	1.66	Water table	I	0.0-0.33	0.33	Dark brown & brown	Mottled 7.5YR 3/3 & 7.5YR 4/3	Sandy loam	Fine, Friable	-	Distinct	Reworked alluvium	Plow zone	-
				II	0.33-0.55	0.22	Very dark gray & black	Mottled 10YR 3/1 & 10YR 2/1	Silty sand	Loose, single grain	sparse reef rubble & terrestrial gastropods	Distinct/smooth	Buried A horizon-alluvial	Intact	-
				III	0.55-0.64	0.09	Brown	10YR 5/3	Slightly silty sand	Loose, single grain	sparse reef rubble (waterworn coral & marine shells); stained from A horizon	Distinct/smooth	Marine deposited	Intact	-
				IV	0.64-1.16	0.52	Light gray & very pale brown	Mottled 10YR 7/2 & 10YR 7/3	Sand	Coarse, single grain	sparse reef rubble (waterworn coral & marine shells)	Distinct/smooth	Marine deposited	Intact	-
				V	1.16-1.33	0.17	White	10YR 8/1	Lithified sand	Compacted, single grain	-	Distinct/smooth	Marine deposited	Intact	-
				VI	1.33-1.66	0.33	White	10YR 8/1	Sand	Coarse, single	100% weathered decomposing	-	Residual	Intact	-
A-7-2	5.50	2.25	Water table	I	0.0-0.35	0.35	Dark brown	10YR 3/3	Silty loam	Fine, Friable	-	Distinct/wavy	Reworked	Plow zone?	-
				II	0.35-2.0	1.65	Reddish yellow	7.5YR 6/6	Sand	Single grain	1% reef rubble (coral)	Distinct/wavy	Marine deposited	Intact	-
				III	2.0-2.25	0.25	White	10YR 8/1	Sand	Single grain	100% weathered decomposing	-	Residual	Intact	-

Test Area A Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
A-8-1	6.70	2.40	Water table	I	0.0-0.2	0.20	Very dark brown	10YR 2/2	Loamy sand	Loose	1% subangular basalt pebbles	Distinct/smooth	Fill	Redeposited	Plastic fragments
				II	0.2-0.48	0.28	Very dark grayish brown	10YR 3/2	Loamy sand	Compact	1% subangular basalt gravel & limestone pebbles; sparse marine shells	Distinct/irregular	Reworked alluvium	Plow zone	Basalt aggregate
				III	0.48-0.56	0.08	Strong brown	7.5YR 4/6	Slightly silty sand	Single grain	sparse reef rubble	Distinct/wavy	Marine deposited	Intact	-
				IV	0.56-1.47	0.91	Very pale brown	Mottled 10YR 8/2 & 10YR 8/4	Sand	Loose, single grain	sparse reef rubble	Distinct/wavy	Marine deposited	Intact	-
				V	1.47-1.6	0.13	Reddish yellow	7.5YR 7/6	Lithified sand	Compact	sparse reef rubble	Distinct/wavy	Marine deposited	Intact	-
				VI	1.6-2.4	0.80	White	10YR 8/1 & 10YR 8/2	Sand	Coarse, single grain	100% weathered decomposing limestone	-	Residual	Intact	-
A-9-1	8.00	2.60	Decomposing limestone bedrock & Water table	I	0.0-0.15	0.15	Dark reddish	5YR 3/3	Clay	Blocky	-	Abrupt/smooth	Fill	Redeposited	-
				II	0.15-0.25	0.10	Pale brown & dark grayish brown	Mottled 10YR 6/6 & 10YR 4/2	Sand	Loose, unconsolidated	-	Abrupt/smooth	Fill	Redeposited	-
				III	0.25-0.5	0.25	Black	10YR 2/1	Loamy sand	Loose, single grain	-	Distinct/irregular	Reworked alluvium	Plow zone	Waterworn basalt pebble
				IV	0.5-1.4	0.90	Very pale brown	Mottled 10YR 8/3 & 10YR 7/4	Sand	Single grain	sparse reef rubble	Abrupt/wavy	Marine deposited	Intact	-
				Trash Pit	0.5-1.4	0.90	Very pale brown	10YR 7/3	Loamy sand	-	20th Century refuse	Abrupt/smooth	Plantation era trash pit fill	Intrusive into Layer IV	Glass bottles (condiment, medicine, cosmetic), Japanese glazed ceramic teacup, butchered pig & goat bones, sanitary cans; rusted metal; metal & plastic screw caps (post-1936)
				V	1.4-2.6	1.20	-	-	Limestone & clay	-	100% weathered decomposing	-	Bedrock	Intact	-
A-10-1	6.20	2.50	Water table (artesian well)	I	0.0-0.35	0.35	Dark brown	10YR 3/3	Silty sand	Loose	1% limestone gravels & pebbles	Distinct/irregular	Reworked	Plow zone	-
				II	0.35-0.9	0.55	Light gray & very pale brown	Mottled 10YR 7/2 & 10YR 7/4	Sand	Coarse, single grain	sparse reef rubble	Distinct/smooth	Marine deposited	Intact	-
				III	0.9-1.02	0.12	Strong brown	7.5YR 4/6	Sand	Coarse, single	sparse reef rubble	Diffuse/wavy	Marine deposited	Intact	-
				IV	1.02-2.5	1.48	Brown	7.5YR 4/4	Clay	Massive	-	-	Alluvial	Intact	-

Test Area B Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
B-1-1	4.60	1.43	Decomposing limestone bedrock	I	0.0-0.35	0.35	Dark brown	7.5YR 3/3	Sandy clay loam	Fine, friable crumb	sparse limestone gravel	Abrupt/wavy	Push pile fill	Redeposited	Rubber hose, aluminum can
				II	0.35-0.57	0.22	Brown & very pale brown	Mottled 10YR 4/3 & 10YR 7/3	Silty sand	Loose, single grain	sparse limestone gravels & pebbles	Abrupt/irregular	Possible tsunami?	Intact	Sparse charcoal
				III	0.57-1.15	0.58	White & very pale brown	Mottled 10YR 8/1 & 10YR 7/4	Sand	Loose, single grain	60% limestone gravel & pebbles	Distinct/smooth	Marine deposited	Intact	-
				IV	1.15-1.43	0.25	Brown	7.5YR 4/4	Clay (alluvial)	Massive	50% weathered limestone (residual)	Abrupt/wavy	Alluvial, Residual	Intact	
				V	1.43+	-	-	-	Limestone	-	100% weathered decomposing	-	Bedrock	Intact	-
B-1-2	4.80	0.87	Decomposing limestone bedrock	I	0.0-0.12	0.12	Very pale brown & white	Mottled 10YR 7/4 & 10YR 8/1	Sand	Coarse, single grain	50% organic material	Abrupt/wavy	Push pile fill	Redeposited	-
				II	0.12-0.3	0.18	Brown	10YR 5/3	Sandy loam	Fine, friable	sparse limestone gravel	Abrupt/smooth	Alluvium	Intact	-
				III	0.3-0.5	0.20	Very pale brown & light yellowish brown	Mottled 10YR 7/4 & 10YR 6/4	Sand	Compacted, single grain	sparse reef rubble (marine shells)	Diffuse/wavy	Marine deposited	Intact	-
				IV	0.5-0.87	0.37	Brown	7.5YR 4/4	Clay (alluvial)	Massive	10% weathered limestone gravel, pebbles & cobbles (residual)	Abrupt/wavy	Alluvial	Intact	-
				V	0.87+	-	-	-	Limestone	-	100% weathered decomposing	-	Bedrock	Intact	-
B-1-3	5.20	0.42	Decomposing limestone bedrock	I	0.0-0.12	0.12	Dark brown	10YR 3/3	Sandy clay loam	Fine, friable	-	Distinct/wavy	Alluvium	Intact	-
				II	0.12-0.42	0.30	Brown	10YR 4/3	Clay	Fine, friable	sparse limestone gravel	Abrupt/wavy	Alluvial	Intact	-
				III	0.42+	-	-	-	Limestone	-	100% weathered decomposing	-	Bedrock	Intact	-
B-1-4	5.40	0.16	Decomposing limestone bedrock	I	0.0-0.16	0.18	Dark brown	7.5YR 3/3	Clay loam	Fine, friable crumb	10% limestone gravel	Abrupt/wavy	Alluvium	Intact	-
				II	0.16+	-	-	-	Limestone	-	100% weathered decomposing limestone	-	Bedrock	Intact	-
B-2-1	4.80	0.80	Decomposing limestone bedrock	I	0.0-0.28	0.28	Brown	10YR 5/3	Slightly silty sand	Loose, single grain	-	Distinct/irregular	Tsunami Deposit?	Intact (disturbance on surface from horses)	-
				II	0.28-0.5	0.22	Very pale brown	10YR 7/4	Sand	Fine, single grain	-	Diffuse/wavy	Aeolian?	Intact	-
				III	0.5-0.8	0.30	Strong brown	7.5YR 4/6	Sandy clay	Single grain	sparse limestone cobbles	Abrupt/wavy	Alluvial	Intact	-
				IV	0.8+	-	-	-	Limestone	-	100% weathered decomposing	-	Bedrock	Intact	-
B-2-2	5.00	0.60	Decomposing limestone bedrock	I	0.0-0.35	0.35	Dark brown	10YR 3/3	Sandy clay loam	Fine, friable	10% limestone gravel & pebbles	Distinct/wavy	Alluvium	Intact	-
				II	0.35-0.6	0.25	Brown	7.5YR 4/4	Clay	Massive	< 10% limestone gravel & pebbles	Abrupt/wavy	Alluvial	Intact	-
				III	0.6+	-	-	-	Limestone	-	100% weathered decomposing	-	Bedrock	Intact	-
B-2-3	6.20	0.34	Decomposing limestone bedrock	I	0.0-0.2	0.20	Dark brown	7.5YR 3/2	Clay loam	Fine, friable	20% limestone gravel & pebbles	Abrupt/wavy	Alluvium	Intact	-
				II	0.2-0.34	0.14	Dark brown	7.5YR 3/4	Clay	Fine, friable	10% limestone gravel & pebbles	Abrupt/wavy	Alluvial	Intact	-
				III	0.34+	-	-	-	Limestone	-	100% weathered decomposing	-	Bedrock	Intact	-
B-2-4	5.20	0.38	Decomposing limestone bedrock	I	0.0-0.23	0.23	Dark brown	7.5YR 3/2	Clay loam	Fine, friable	< 10% limestone gravel	Distinct/wavy	Alluvium	Intact	-
				II	0.23-0.38	0.15	Dark brown	7.5YR 3/4	Clay	Fine, friable	< 10% limestone gravel	Abrupt/wavy	Alluvial	Intact	-
				III	0.38+	-	-	-	Limestone	-	100% weathered decomposing	-	Bedrock	Intact	-
B-3-1	4.70	1.26	Decomposing limestone bedrock	I	0.0-0.28	0.28	Dark brown	10YR 3/3	Loamy sand	Loose, single	< 10% limestone gravel	Distinct/wavy	Marine deposited	Intact	-
				II	0.28-0.49	0.21	Dark brown	7.5YR 3/4	Sandy loam	Compacted, fine, friable crumb	< 10% limestone gravel	Distinct/wavy	Alluvium?	Intact	-
				III	0.49-0.9	0.41	Very pale brown	10YR 7/4	Sand	Loose, single	1% reef rubble (coral, marine shells)	Abrupt/wavy	Marine deposited	Intact	-
				IV	0.9-1.26	0.36	Brown	7.5YR 3/4	Clay	Massive	sparse limestone gravel	Abrupt/wavy	Alluvial	Intact	-
				V	1.26+	-	-	-	Limestone	-	100% weathered decomposing	-	Bedrock	Intact	-
B-3-2	5.50	0.45	Decomposing limestone bedrock	I	0.0-0.25	0.25	Dark brown	7.5YR 3/3	Sandy clay loam	Fine, friable	< 10% limestone gravel & pebbles	Distinct/wavy	Alluvium	Intact	-
				II	0.25-0.45	0.20	Brown	7.5YR 4/4	Clay	Massive	< 10% limestone gravel & pebbles	Abrupt/wavy	Alluvial	Intact	WWII-era amber glass bottle bases (2) duraglass
				III	0.45+	-	-	-	Limestone	-	100% weathered decomposing	-	Bedrock	Intact	-

Test Area B Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
B-3-3	6.30	0.22	Decomposing limestone bedrock	I	0.0-0.22	0.25	Dark brown	7.5YR 3/3	Sandy clay loam	Fine, friable crumb	< 10% limestone gravel & pebbles	Abrupt/wavy	Alluvium	Intact	-
				II	0.22+	-	-	-	Limestone	-	100% weathered decomposing limestone	-	Bedrock	Intact	-
B-3-4	6.00	1.65	Decomposing limestone bedrock	I	0.0-0.28	0.28	Brown & white	Mottled 10YR 4/3 & 10YR 8/1	Clay loam	Compacted, fine, friable crumb	95% crushed limestone	Abrupt/wavy	Fill	Redeposited	limestone aggregate
				II	0.28-1.27	0.99	Dark reddish	5YR 3/3	Clay	Massive	sparse limestone gravel	Distinct/wavy	Alluvial	Intact	-
				III	1.27-1.65	0.38	Yellowish brown	10YR 5/4	Clay	Non-sticky,	80% weathered decomposing limestone	Abrupt/wavy	Bedrock	Intact	-
B-3-5	4.70	1.32	Decomposing limestone bedrock	I	0.0-0.6	0.50	Dark brown	7.5YR 3/2	Clay loam	Fine, friable crumb	50% limestone & basalt gravel & pebbles	Abrupt/wavy	Push pile fill	Redeposited	basalt aggregate, asphalt frags, plastic frags,
				II	0.23-1.09	0.40	Brown	10YR 4/3	Sandy clay loam	Fine, friable	40% limestone gravel & pebbles	Abrupt/wavy	Push pile fill	Redeposited	basalt
				III	0.41-0.44	0.04	Light gray & light brownish gray	Mottled 10YR 7/2 & 10YR 6/2	Sand	Loose, single grain	-	Abrupt/wavy	Alluvial?	Redeposited, truncated or disturbed	-
				IV	0.44-1.32	0.33	Dark reddish	5YR 3/2	Clay	Massive	sparse limestone gravel	Abrupt/wavy	Alluvial	Intact	-
				V	1.32+	-	-	-	Limestone	-	100% weathered decomposing	-	Bedrock	Intact	-
B-4-1	5.00	1.56	Decomposing limestone bedrock	I	0.0-0.10	0.10	Brown	10YR 5/3	Silty sand	Compact, single grain	-	Abrupt/wavy	Marine deposited	Intact	-
				II	0.10-0.27	0.17	Very pale brown & pale brown	Mottled 10YR 7/3 & 10YR 6/3	Slightly silty sand	Loose, single grain	-	Abrupt/wavy	Possible tsunami	Intact	Bottle glass fragments c. WW II-era
				III	0.27-0.40	0.23	Brown & very pale brown	Mottled 10YR 4/3 & 10YR 8/2	Silty sand	Moderately compacted	-	Abrupt/wavy	Probable tsunami	Intact	-
				Pit	0.40-0.87	0.47	Pale brown & brown	Banded 10YR 6/3 & 10YR 5/3	Slightly silty sand	Single grain	No inclusions visible; originates @ base of Layer III, intrusive into Layer IV	Diffuse	Fill (natural?)	Intact	None visible
				IV	0.40-0.100	0.60	White	10YR 8/1	Sand	Loose, single	Sparse concretions	Distinct/wavy	Aeolian	Intact	-
				-	0.9	-	-	-	Calcium	Cemented	-	-	Precipitate	Intact	-
				V	1.0-1.42	0.42	Very pale brown	Mottled 10YR 8/2 & 10YR 8/3	Sand	Coarse	50% reef rubble	Diffuse/wavy	Marine deposited	Intact	*Nerita* shell fragments
				VI	1.42-1.56	0.14	Yellowish red & Reddish yellow	5YR 5/8 & 5YR 6/8	Slightly silty sand	Coarse	100% weathered decomposing limestone	-	Bedrock	Intact	-
B-4-2	5.50	1.30	Decomposing limestone bedrock	I	0.0-0.5	0.50	Very dark grayish brown	10YR 3/2	Sandy clay loam	Fine, friable crumb	sparse limestone gravel	Abrupt/wavy	Alluvium	Intact	-
				II	0.5-0.85	0.35	Reddish yellow	7.5YR 6/6	Slightly silty sand	Single grain	10% reef rubble (limestone & coral)	Distinct/wavy	Marine deposited	Intact	-
				III	0.85-1.3	0.45	Brown	7.5YR 5/4	Clay	Massive	20% limestone gravel & pebbles	Abrupt/wavy	Alluvial	Intact	-
				IV	1.3+	-	-	-	Limestone	-	100% weathered decomposing	-	Bedrock	Intact	-
B-4-3	5.40	0.12	Decomposing limestone bedrock	I	0.0-0.12	0.12	Dark brown	7.5YR 3/3	Clay	Fine, friable crumb	10% limestone gravel & crushed basalt	Abrupt/wavy	Fill	Redeposited	basalt aggregate
				II	0.12+	-	-	-	Limestone	-	100% weathered decomposing limestone	-	Bedrock	Intact	-
B-4-4	5.70	0.60	Decomposing limestone bedrock	I	0.0-0.15	0.15	Dark brown	10YR 3/3	Clay loam	Fine, friable	sparse limestone gravel	Distinct/wavy	Fill	Redeposited	-
				II	0.15-0.43	0.28	Brown & very dark grayish brown	Mottled 10YR 5/3 & 10YR 3/2	Silty sand	Single grain	-	Abrupt/wavy	Aeolian	Redeposited? Disturbed	-
				III	0.43-0.6	0.17	Dark brown	7.5YR 3/2	Clay	Massive	sparse limestone gravel	Abrupt/wavy	Alluvial	Intact	-
				IV	0.6+	-	-	-	Limestone	-	100% weathered decomposing	-	Bedrock	Intact	-
B-4-5	5.20	1.09	Decomposing limestone bedrock	I	0.0-0.83	0.83	Very dark brown & dark grayish brown	Mottled 7.5YR 2.5/3 & 10YR 4/2	Sandy clay	Fine, friable crumb	15% limestone gravel, pebbles & cobbles	Abrupt/wavy	Banded Fill	Redeposited	Asphalt fragments & basalt
				II	0.83-1.09	-	-	-	Limestone	-	100% weathered decomposing	-	Bedrock	Intact	-

Test Area B Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
B-5-1	6.20	1.15	Decomposing limestone bedrock	I	0.0-0.30	0.30	Pale brown	10YR 6/3	Slightly silty sand	Single grain	-	Abrupt/wavy	Marine deposited	Intact (possibly disturbed over pit)	Electric wire, plastic frags
				Pit I-a	0.20-0.60	0.40	Dark gray	10YR 4/1	Slightly silty sand	Compact, single grain	Pit originates near base of Layer I, intrusive into Layers II & IV	Abrupt/wavy	*Imu* fill (modern)	Secondary deposit	*Conus* shell
				Pit I-b	0.60-0.85	0.25	Grayish brown with light gray	Mottled 10YR 5/2 & 10YR 7/2	Sand	Loose, single grain	Pit originates near base of Layer I, intrusive into Layers II & IV	Distinct/wavy	*Imu* fill (modern)	Secondary deposit	Compacted ash
				Pit I-c	0.85-1.15	0.30	Grayish brown & white	Mottled 10YR 5/2 & 10YR 8/1	Slightly silty sand	Loose, single grain	Pit originates near base of Layer I, intrusive into Layers II & IV	Distinct/smooth	*Imu* fill (modern)	Secondary deposit	Juvenile pig bones at base of pit
				II	0.22-1.15	0.93	White	10YR 8/1	Sand	Loose, single	Sparse concretions	Abrupt/wavy	Aeolian	Intact	-
				-	0.9	-	-	-	Calcium	Cemented	-	-	Precipitate	Intact	-
				III	0.9-0.96	0.06	Very pale brown	10YR 8/4	Sand	Coarse	-	Abrupt/wavy	Marine deposited	Intact	-
				IV	0.35-0.7	0.35	Gray & light gray banded	Banded 10YR 6/1 & 10YR 7/2	Sand	Loose, single grain	Probable draft for pit (*Imu*)	Unknown	Fill	Redeposited	-
				V	0.96+	-	-	-	Limestone	-	100% weathered decomposing	-	Bedrock	Intact	-
B-5-2	5.20	0.80	Decomposing limestone bedrock	I	0.0-0.17	0.17	Dusky red	2.5YR 3/4	Clay	Fine, friable	sparse limestone gravel	Abrupt/wavy	Fill	Redeposited	Irrigation pipe
				II	0.17-0.45	0.28	Brown	10YR 4/3	Sandy clay loam	Fine, friable	10% limestone gravel & pebbles	Distinct/wavy	Marine deposited	Disturbed-churned	Plastic
				III	0.45-0.65	0.20	Pale brown	10YR 6/3	Silty Sand	Loose, single	20% limestone gravel	Distinct/wavy	Marine deposited	Intact?	-
				IV	0.65-0.8	0.15	Dark brown	7.5YR 3/3	Clay	Massive	sparse limestone gravel	Abrupt/wavy	Alluvial	Intact	-
				V	0.8+	-	-	-	Limestone	-	100% weathered decomposing	-	Bedrock	Intact	-
B-5-3	5.80	1.04	Decomposing limestone bedrock	I	0.0-0.38	0.38	Dark brown	10YR 3/3	Sandy clay loam	Fine, friable	20% limestone gravel, pebbles & cobbles	Abrupt/wavy	Fill	Redeposited	-
				II	0.38-0.83	0.45	Dark brown	7.5YR 3/4	Clay loam	Fine, friable crumb	30% limestone gravel & pebbles	Abrupt/wavy	Fill	Redeposited	Asphalt fragments
				III	0.83-0.92	0.09	Very pale brown	Mottled 10YR 8/2 & 10YR 7/3	Sand	Loose, single grain	-	Abrupt/wavy	Marine deposited	Intact	-
				IV	0.92-1.04	-	-	-	Limestone	-	100% weathered decomposing	-	Bedrock	Intact	-
B-5-4	7.20	2.20	Decomposing limestone bedrock	I	0.0-0.2	0.20	Dark reddish	5YR 3/4	Clay	Fine, friable	sparse limestone gravel	Abrupt/smooth	Imported Fill	Redeposited	-
				II	0.2-0.95	0.75	Dark brown	Mottled 7.5YR 3/2 & 7.5YR 3/3	Clay	Fine, friable crumb	50% limestone gravel, pebbles, cobbles & boulders	Abrupt/wavy	Fill	Redeposited	-
				Pit	0.95-2.2	0.25	Brown & dark brown	Mottled 10YR 4/3 & 10YR 3/3	Clay	Loose, fine, friable crumb	20% limestone gravel; green waste	Abrupt/wavy	Trash pit fill	Secondary deposit	Milled lumber, garden hose, plastic
				III	1.55-2.0	0.45	Dark brown	7.5YR 3/3	Clay	Massive	-	Distinct/smooth	Alluvial	Intact	-
				IV	2.0-2.2	0.20	Brown	10YR 5/3	Clay (alluvial)	Massive	10% weathered limestone gravel	Distinct/smooth	Alluvial, Residual	Intact	-
				V	2.2+	-	-	-	Limestone	-	100% weathered decomposing	-	Bedrock	Intact	-
B-6-1	6.70	2.80	Water table	I	0.0-0.11	0.11	Brown	10YR 5/3	Silty sand	Compacted, single grain	-	Abrupt/wavy	Marine deposited?	Intact	-
				II	0.11-0.28	0.17	Brown & pale brown	Mottled 10YR 4/3 & 10YR 6/3	Silty sand	Compacted, single grain	sparse limestone gravels & pebbles	Abrupt/wavy	Probable tsunami	Intact	-
				III	0.28-2.8	2.52	Very pale brown	Mottled 10YR 8/2 & 10YR 7/3	Sand	Loose, single grain	5% lithified chunks & sparse calcium carbonate precipitate laminates	Water table	Aeolian	Intact	1 coral fragment

Test Area B Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
B-6-2	3.00	0.60	Human burial encountered	I	0.0-0.24	0.24	Brown & pale brown	Mottled 10YR 4/3 & 10YR 6/3	Slightly silty sand	Moderately compacted	sparse limestone gravels & pebbles	Distinct/irregular	Cultural Deposit; Site 7288	Probably partially disturbed over burial- possible tsunami?	volcanic glass, burned *kukui* nutshells, marine shells
				Burial Pit	0.35-0.40 (cranium)	unknown	Very pale brown	Mottled 10YR 8/2 & 10YR 7/3	Sand (matrix of redeposited Layer II- pit outline not discernible)	Loose, single grain	human cranium at depth indicated; depth & dimensions of pit not visible in matrix	pit not visible, assumed intrusive into Layer II from Layer I	Human primary burial; Site 7288	Intact	Juvenile (c. 8 yrs) *in situ* primary burial @35-40 cm bgs
				II	0.2-0.6	0.40	Very pale brown	Mottled 10YR 8/2 to 10YR 7/3	Sand	Loose, single grain	-	Unexcavated	Aeolian	Intact	-
B-6-3	5.80	1.95	Decomposing limestone bedrock	I	0.0-0.25	0.25	Dark reddish	5YR 3/4	Clay	Fine, friable	sparse limestone gravel	Abrupt/smooth	Imported Fill	Redeposited	-
				Pit	0.25-1.5	1.25	Black & very dark grayish brown	Mottled 10YR 2/1 & 10YR 3/2	Clay	Fine, friable crumb	20% limestone gravel	Abrupt/wavy	Fill- modern trash	Secondary deposit	Recent garbage
				II	0.25-1.75	1.50	Dark brown	7.5YR 3/2	Clay	Massive	-	Distinct/smooth	Alluvial	Intact	-
				III	1.75-1.95	0.20	Brown	10YR 4/3	Clay	Massive	-	Distinct/smooth	Alluvial	Intact	-
				IV	1.95+	-	-	-	Limestone	-	100% weathered decomposing	-	Bedrock	Intact	-
B-6-4	4.90	1.25	Water table	I	0.0-0.7	0.70	Dusky red	2.5YR 3/2	Clay	Fine, friable	sparse basalt gravel	Distinct/smooth	Imported Fill	Redeposited	-
				II	0.7-0.92	0.22	Pale brown	10YR 6/3	Clay	Fine, friable	20% limestone gravel	Distinct/smooth	Alluvial	Intact	-
				III	0.92-1.25	0.33	Brown	10YR 4/2	Clay	Massive	-	Water table	Alluvial	Intact	-
B-7-1	6.90	2.65	Water table	I	0.0-0.1	0.10	Very dark grayish brown	10YR 3/2	Silty sand	Compacted, single grain	-	Abrupt/wavy	Aeolian?	Intact	-
				II	0.1-2.65	2.55	Very pale brown	10YR 8/2	Sand	Loose, single grain	5% lithified s& chunks; calcium carbonate precipitate laminates; sparse b&s of waterworn marine shells (from storms?)	Water table	Aeolian dune with bedded marine deposits	Intact	2 old utility trenches, 1 poss. post mold
B-7-2	5.10	1.40	Decomposing limestone bedrock	I	0.0-0.56	0.56	Very dark gray	10YR 3/1	Clay	Fine, friable crumb	40% limestone & basalt gravel & pebbles	Abrupt/smooth	Imported Fill	Redeposited	Limestone & basalt
				II	0.56-1.0	0.44	Yellowish brown	10YR 5/4	Slightly silty sand	Very fine, single grain	sparse coral	Distinct/smooth	Marine deposited	Intact	-
				III	1.0-1.4	0.40	Brown	10YR 5/3 & 10YR 4/3	Very slightly silty sand	Coarse, single grain	< 10% limestone gravel & pebbles	Abrupt/wavy	Marine deposited	Intact	-
				IV	1.4+	-	-	-	Limestone	-	100% weathered decomposing	-	Bedrock	Intact	-
B-7-3	6.40	2.70	Water table	I	0.0-0.2	0.20	Dark brown	7.5YR 3/3	Clay	Fine, friable	15% limestone & basalt gravel	Abrupt/smooth	Imported Fill	Redeposited	-
				II	0.2-1.17	0.97	Dark yellowish brown	10YR 3/4	Sandy clay loam	Fine, friable crumb	20% limestone gravel, pebbles & cobbles	Abrupt/wavy	Fill	Redeposited	-
				Pit	1.17-1.8	0.63	Light gray & dark brown	Mottled 10YR 7/2 & 7.5YR 3/4	Clay loam	Fine, friable crumb	15% limestone gravel & pebbles	Distinct/wavy	Fill- modern trash	Secondary deposit- churned	Ziploc bags, Gatorade bottles, Budwiser cans, sporks
				III	1.8-2.08	0.28	Yellowish brown	10YR 5/4	Loamy sand	Single grain	limestone gravel & pebbles	Abrupt/smooth	Marine deposited	Intact	-
				IV	2.08-2.18	0.10	White	10YR 8/1	Weathered limestone	-	-	Abrupt/wavy	Bedrock over void	Intact	-
				V	2.18-2.7+	0.52	Brown	10YR 4/3	Clay	Massive	-	Water table	Alluvial fill in void	Intact	-
B-8-1	5.30	2.70	Water table	I	0.0-0.15	0.15	Grayish brown	10YR 5/2	Slightly silty sand	Single grain	-	Abrupt/wavy	Aeolian	Intact	-
				II	0.15-1.6	1.45	Very pale brown	10YR 8/2	Sand	Single grain	-	Abrupt/wavy	Aeolian	Intact	-
				III	1.6-2.7	1.10	Very pale brown	10YR 7/3	Sand	Coarse, single	-	Water table	Marine deposited	Intact	-

Test Area B Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
B-8-2	5.60	1.55	Decomposing limestone bedrock	I	0.0-0.33	0.33	Brown & grayish brown	Mottled 7.5YR 4/4 & 10YR 5/2	Clay and silty sand	Compacted, fine, friable crumb	50% limestone & basalt gravel & pebbles	Abrupt/wavy	Imported Fill	Redeposited	Plastic bag
				II	0.33-0.51	0.18	Very pale brown	10YR 8/2	Beach sand	Loose, single grain	sparse waterworn marine shells & limestone gravel	Abrupt/smooth	Storm deposit (or tsunami?)	Intact	-
				III	0.51-0.87	0.36	Dark brown	7.5YR 3/3	Silty sand	Compacted, single grain	-	Abrupt/wavy	Alluvial	Intact	-
				IV	0.87-1.32	0.45	Strong brown	7.5YR 5/6	Silty sand	Compacted, single grain	sparse limestone gravel	Diffuse/wavy	Marine deposited	Intact	-
				V	1.32-1.55	0.23	Brown	10YR 5/3	Sand	Loose, single	sparse coral & limestone gravel	Abrupt/wavy	Marine deposited	Intact	-
				VI	1.55+	-	-	-	Limestone	-	100% weathered decomposing	-	Bedrock	Intact	-
B-8-3	4.50	0.75	Decomposing limestone bedrock	I	0.0-0.25	0.25	Dark brown	7.5YR 3/3	Clay	Compact	10% limestone pebbles & cobbles	Abrupt/wavy	Imported Fill	Redeposited	Irrigation pipe
				II	0.25-0.75	0.50	Dark yellowish brown	10YR 4/4	Loamy sand	Single grain & crumb	10% limestone gravel	-	Alluvium	Intact	-
				III	0.75+	-	-	-	Limestone	-	100% weathered decomposing	-	Bedrock	Intact	-
B-9-1	5.70	2.65	Decomposing limestone bedrock	I	0.0-0.1	0.10	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material	Abrupt/wavy	Recent duff	Intact	-
				II	0.1-0.2	0.10	Light gray & very pale brown	Mottled 10YR 7/2 & 10YR 7/3	Sand	Compacted, single grain	10% limestone gravel	Abrupt/smooth	Fill	Redeposited	-
				III	0.2-0.65	0.30	Dark grayish brown & very pale brown	Mottled 10YR 4/2 & 10YR 7/3	Silty sand	Compacted, single grain	10% limestone gravel & pebbles	Abrupt/wavy	Fill	Redeposited	-
				IV	0.5-2.3	1.80	Very pale brown & brown	7.5YR 3/3 & pockets of 10YR 4/3	Sandy clay	Massive	20% limestone gravel, pebbles & cobbles	Abrupt/smooth	Fill	Redeposited	-
				V	2.3-2.65	0.35	Light brownish	10YR 6/2	Sand	Coarse, single	100% decomposing limestone	Abrupt/wavy	Residual	Intact	-
				VI	2.65+	-	-	-	Limestone		100% weathered decomposing	-	Bedrock	Intact	-
B-9-2	5.20	1.54	Decomposing limestone bedrock	I	0.0-0.42	0.42	Brown	10YR 4/3	Sandy clay loam	Compacted, fine, friable crumb	20% limestone & 10% weathered basalt gravel & pebbles	Abrupt/smooth	Imported Fill	Redeposited	-
				II	0.42-0.66	0.24	Pale brown	10YR 6/3	Silty sand	Fine, friable crumb	60% limestone gravel, pebbles & cobbles	Abrupt/smooth	Fill	Redeposited	limestone & basalt
				III	0.66-0.82	0.16	Very pale brown	10YR 7/3	Silty sand	Compacted, single grain	90% crushed limestone	Abrupt/smooth	Crushed limestone fill	Redeposited	limestone & basalt
				IV	0.82-0.9	0.08	Brown	10YR 4/3	Sandy clay loam	Compacted, fine, friable crumb	10% limestone gravel & pebbles	Abrupt/smooth	Alluvium	Intact	-
				V	0.9-1.54	0.64	Strong brown	7.5YR 4/6	Silty Sand (Beach Sand- stained calcareous sand)	Compact, single grain	sparse fine gravel limestone, coral, fragments & marine shells	Abrupt/wavy	Marine deposited	Intact	-
				VI	1.54+	-	-	-	Limestone	-	100% weathered decomposing	-	Bedrock	Intact	-
B-10-1	5.60	2.60	Water table	I	0.0-0.1	0.10	Brown	7.5YR 5/4	Loamy sand	Fine, friable crumb	50% limestone gravel	Abrupt/wavy	Fill	Redeposited	2 utility trenches, irrigation pipe
				II	0.1-2.6	2.50	Very pale brown	10YR 8/2	Sand	Loose, single	lithified s& chunks	Water table	Aeolian dune	Intact	-
B-10-2	5.80	2.50	Water table	I	0.0-0.1	0.10	Brown	7.5YR 5/3	Sand	Single grain	50% organic duff	Abrupt/wavy	Aeolian	Intact	-
				II	0.1-2.5	2.40	White & very pale brown	10YR 8/1 & 10YR 8/2	Sand	Loose, single grain	Sparse concretions	Water table	Aeolian dune	Intact	-
B-10-3	5.00	1.85	Decomposing limestone bedrock	I	0.0-0.88	0.88	Dark reddish brown & very dark	5YR 3/4 & 7.5YR 2.5/3	Sandy clay	Blocky	50% limestone gravel, pebbles & cobbles & basalt crusher rock	Abrupt/wavy	Banded Fill	Redeposited	basalt aggregate
				II	0.88-1.34	0.46	Dark reddish brown & dark gray & yellowish brown	Mottled 5YR 4/4 & 10YR 4/1 & 10YR 5/8	Clay	Platy	-	Abrupt/smooth	Fill	Redeposited	-
				III	1.34-1.56	0.22	Very dark gray	7.5YR 3/1	Silty Sand	Compact, fine, single grain	-	Abrupt/wavy	Marine deposited	Intact?	-
				IV	1.56-1.85+	-	-	-	Limestone	-	100% weathered decomposing limestone	-	Bedrock	Intact	-

Test Area C Trench Stratigraphy

Backhoe Trench	Trench length (m)	Trench width (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
C-1-1	7.60	2.00	3.40	Safety limitations	I	0.0-0.1	0.10	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material	Distinct/wavy	Recent duff	Intact	-
					II	0.1-0.83	0.62	Light gray & grayish brown	Mottled 10YR 7/2 & 10YR 5/2	Sand	Single grain	-	Distinct/wavy	Fill	Redeposited	-
					Pit	0.7-3.26	2.50	Dark gray & Gray	10YR 4/1 & 10YR 5/1	Sand	-	98% WW II refuse	Distinct	Fill-WW II trash	Secondary deposit	Glass bottles (1 dated 1943), tile, batteries, railroad rail
					III	0.6-3.4	2.80	Very pale brown	Mottled 10YR 8/2 & 10YR 8/3	Sand	Single grain	Root concretions & carbonate precipitate	Unexcavated	Aeolian	Intact dune	-
					-	1.7	-	Very pale brown	10YR 8/2 & 10YR 8/3	Calcium carbonate	Cemented	-	-	Precipitate	Intact	-
					-	1.8	-	Very pale brown	10YR 8/2 & 10YR 8/3	Calcium carbonate	Cemented	-	-	Precipitate	Intact	-
C-2-1	7.20	6.00	4.90	Safety limitations	I	0.0-0.08	0.08	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material	Distinct/wavy	Recent duff	Intact	-
					II	0.08-0.4	0.32	Light brownish gray	10YR 6/2	Sand	Loose, single grain	-	Abrupt/wavy	Aeolian	Intact	-
					Pit	0.5-0.69	0.64	-	-	-	-	1940s broken glass bottles, no sediment	Distinct	Fill-WW II trash	Secondary deposit	Colorless & brown beverage glass bottles, crown cap
					III	0.4-0.44	0.04	Gray	10YR 6/1	Calcium carbonate	Laminated	Rootlets	Abrupt/wavy	Precipitate	Intact	-
					IV	0.44-4.9	4.46	Light gray & very pale brown	Mottled 10YR 7/2 & 10YR 7/4	Sand	Single grain	-	Unexcavated	Aeolian	Intact dune	-
C-2-2	7.70	2.00	2.28	Safety limitations	I	0.0-0.07	0.07	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material (ironwood)	Distinct/wavy	Recent duff	Intact	-
					II	0.07-0.18	0.11	Pale brown	10YR 6/3	Slightly loamy sand	Single grain	-	Distinct/smooth	Fill or tsunami infill	Redeposited	-
					III	0.07-1.12	1.05	Light brownish gray	10YR 6/2	Sand	Single grain	-	Abrupt/wavy	Tsunami infill or trash pit backfill	Redeposited	Broken glass throughout
					Pit	0.1-2.28	2.20	Grayish brown & light gray	10YR 5/2 with pockets of 10YR 7/2	Slightly loamy sand	Single grain	-	Distinct	Fill-WW II trash	Secondary deposit	USQMC 1941 ceramic tableware; cosmetic, beverage & condiment glass bottles; brick, large casing
					IV	1.12-2.28	1.16	Very pale brown	10YR 8/2	Sand	Moderately compacted	laminated bands, some semi-lithified	Unexcavated	Aeolian	Intact dune	-
C-3-1	4.80	4.30	2.50	Safety limitations	I	0.0-0.12	0.12	Dark brown	7.5YR 3/2	Humus	Structureless	100% organic material	Abrupt/smooth	Recent duff	Intact	-
					II	0.12-0.2	0.08	Very pale brown	10YR 8/3	Sand	Loose	-	Abrupt/smooth	Aeolian	Intact	-
					III	0.2-0.29	0.09	Light brownish gray & very pale brown	Banded 10YR 6/2 & 10YR 7/3	Banded Sand	Loose	-	Abrupt/smooth	Possible storm or tsunami deposits	Intact	-
					IV	0.29-0.62	0.33	Pale brown	10YR 6/3	Semi-lithified cemented sand	Massive	-	Abrupt/wavy	Aeolian	Intact	-
					V	0.62-2.5	1.88	Very pale brown	10YR 8/2	Fine sand	Loose, single grain	Suspended granular concretions	Unexcavated	Aeolian	Intact	-

Test Area C Trench Stratigraphy

Backhoe Trench	Trench length (m)	Trench width (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
C-3-2	6.70	2.00	3.50	Safety limitations	I	0.0-0.07	0.07	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material	Distinct/wavy	Recent duff	Intact	-
					II	0.07-0.3	0.23	Light brownish gray	10YR 6/2	Sand	Single grain	10% limestone gravel and pebbles	Abrupt/smooth	Fill	Redeposited	-
					III	0.3-1.55	1.25	Very pale brown, light gray, & light brownish gray	10YR 8/2, 10YR 7/2 & 10YR 6/2	Undulating, banded sand	Single grain	Reef rubble	Abrupt/wavy	Tsunami (1957 and/or 1946)	Intact	sparse broken glass evenly distributed throughout
					IV	1.55-2.08	0.53	Very pale brown	10YR 8/2	Sand	Single grain	Root concretions	Distinct/wavy	Aeolian	Intact	-
					V	2.08-3.5	1.42	Very pale brown & light gray	10YR 8/2 & 10YR 7/2	Undulating, banded sand	Compacted	-	Unexcavated	Possible Tsunami	Intact	-
C-4-1	5.50	2.00	2.50	Safety limitations	I	0.0-0.1	0.10	Dark brown	7.5YR 3/3	Humus	Structureless	100% organic material	Distinct/wavy	Recent duff	Intact	-
					II	0.1-0.78	0.68	Very pale brown & white	10YR 8/2 & 10YR 8/1	Sand	Loose	-	Diffuse/wavy	Aeolian	Intact	Modern trash pit: beer cans, food wrappers, beer bottles
					III	0.78-2.5	1.72	White & very pale brown	10YR 8/1 & 10YR 8/2	Sand	Semi-lithified	-	Unexcavated	Aeolian	Intact	-
C-4-2	7.40	2.00	3.50	Safety limitations	I	0.0-0.25	0.25	Dark brown	7.5YR 3/3	Clay	Very fine, friable	-	Abrupt/wavy	Fill	Redeposited	Norfolk Pine nursery deposit
					II	0.25-0.37	0.12	Gray & light gray	10YR 6/1 & 10YR 7/1	Sand	Loose	-	Distinct/wavy	Aeolian	Disturbed	4" PVC pipe, electrical wires for Norfolk Pine nursery
					III	0.37-0.7	0.33	White & very pale brown	10YR 8/1 & 10YR 8/2	Sand	Loose	-	Diffuse/wavy	Aeolian	Intact	-
					IV	0.7-3.5	2.80	White & very pale brown	10YR 8/1 & 10YR 8/2	Sand	Lithified	-	Unexcavated	Aeolian	Intact	-
C-5-1	6.20	2.00	2.40	Safety limitations	I	0.0-0.1	0.10	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material (ironwood)	Distinct/wavy	Recent duff	Intact	-
					II	0.1-2.4	2.30	Very pale brown	10YR 8/2	Sand	Loose, single grain	laminated horizontally banded intact aeolian sand; weathered & waterworn marine shells & sparse concretions suggests marine deposition, too	Unexcavated	Aeolian & marine deposited	Intact dune	-
C-5-2	7.00	2.00	2.35	Safety limitations	I	0.0-0.08	0.08	Brown	10YR 4/3	Sand	Loose	50% organic material	Distinct/wavy	Recent duff	Intact	-
					II	0.08-1.75	1.67	Very pale brown	10YR 8/2	Sand	Semi-lithified	rootlets	Diffuse/wavy	Aeolian	Intact	PVC pipe and electrical wires for Norfolk Pine nursery
					III	1.75-2.35	0.60	Very pale brown	10YR 8/2	Sand	Lithified w/pockets of loose sand	concretions around roots	Unexcavated	Aeolian	Intact	-
C-6-2	7.30	2.55	2.70	Safety limitations	I	0.0-0.09	0.09	Brown	10YR 4/3	Sand	Loose, stained	50% organic material	Distinct/wavy	Recent duff	Intact	-
					II	0.09-2.0	1.91	Very pale brown	10YR 8/2	Sand	Semi-lithified	banded diagonally; slopes 10 degrees from horizontal north, toward sea	Distinct/wavy	Aeolian	Intact	-
					III	2.0-2.7	0.70	Very pale brown	10YR 8/2	Sand	Loose, single grain	-	Unexcavated	Aeolian	Intact	-

Test Area C Trench Stratigraphy

Backhoe Trench	Trench length (m)	Trench width (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
C-7-1	13.20	1.32	3.00	Safety limitations	I	0.0-0.10	0.08	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material	Distinct/smooth	Recent duff	Intact	-
					II	0.03-0.30	0.11	Pale brown	10YR 6/3	Sand	Loose, single grain	-	Distinct/wavy	Aeolian	Intact	-
					III	0.06-0.40	0.22	Gray & black	10YR 5/1 & 7.5YR 2.5/1	Sand	Compacted	Carbon-stained matrix; sparse coral	Distinct/wavy & Diffuse/wavy	Aeolian Infill	Redeposited	Faunal (prob. *Sus*) bones, coral pebble
					IV	0.20-0.80	0.40	Light brownish gray & pale brown	10YR 6/2 & 10YR 6/3	Sand	Moderately compacted	-	Distinct/wavy	Aeolian Infill	Redeposited	-
					V	0.48-0.70	0.16	Very pale brown	10YR 8/2 & 10YR 8/3	Sand	Loose	-	Abrupt/wavy	Aeolian Infill	Redeposited	-
					VI	0.40-1.00	0.58	Pale brown & brown	10YR 6/3 & 10YR 5/3	Sand	Moderately compacted	-	Abrupt/wavy	Aeolian Infill	Redeposited	-
					VII	0.28-3.00	2.10	Very pale brown	10YR 8/3	Sand	Single grain	Concretions	Unexcavated	Aeolian	Intact	-
C-7-2	7.00	2.00	3.20	Safety limitations	I	0.0-0.07	0.07	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material (ironwood)	Distinct/wavy	Recent duff	Intact	-
					II	0.07-0.32	0.25	Very pale brown	10YR 8/2 & 10YR 7/4	Sand	Very loose, single grain	-	Abrupt/smooth	Aeolian-possible fill	Redeposited	-
					III	0.32-0.55	0.22	Pale brown & brown	10YR 6/3 & 10YR 5/3	Sand	Moderately compacted	Concretions	Distinct/wavy & Abrupt/wavy	Aeolian	Intact	-
					IV	0.55-0.95	0.40	Very pale brown	10YR 8/2	Sand	Single grain, moderately compacted	Large concretions	Distinct/wavy	Aeolian	Intact	-
					V	0.95-3.20	2.25	Very pale brown	10YR 8/3 & 10YR 8/2	Sand	Single grain	sparse concreted chunks	Unexcavated	Aeolian	Intact	-
C-7-3	8.00	2.00	2.55	Safety limitations	I	0.0-0.05	0.05	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material	Distinct/wavy	Recent duff	Intact	-
					II	0.05-0.23	0.18	Brown	10YR 5/3	Sand	Single grain	60% limestone gravel, pebbles & cobbles	Abrupt/wavy	Fill from golf course	Redeposited	-
					III	0.23-1.28	1.05	Very pale brown	10YR 8/2	Sand	Loose, single grain	-	Abrupt/smooth	Fill from golf course	Redeposited	-
					IV	1.28-1.55	0.27	Dark reddish brown	5YR 3/3	Clay loam	Very fine, friable	-	Abrupt/wavy	Fill from golf course	Redeposited	-
					V	1.55-2.55	1.00	Very pale brown	10YR 7/4	Sand	Very fine	Root concretions increasing with depth	-	Aeolian	Intact dune	-
C-8-1	6.00	4.00	2.00	Safety limitations	I	0.0-0.05	0.07	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material	Abrupt/wavy	Recent duff	Intact	-
					II	0.06-0.31	0.17	Very pale brown & pale brown	10YR 7/3 & 10YR 6/3	Sand	Loose , unconsolidated	-	Abrupt/wavy	Aeolian	Intact	-
					IIIa	0.16-0.53	0.20	Dark gray & very dark grayish brown	10YR 4/1 & 10YR 3/2	Sand	Moderately compacted	-	Abrupt/wavy	Aeolian Infill	Redeposited	sparse charcoal
					IIIb	0.34-0.89	0.33	Dark gray	10YR 4/1	Sand	-	-		Aeolian Infill	Redeposited	-
					IIIc	0.32-0.72	0.35	Grayish brown, light brownish gray & dark grayish brown	10YR 5/2, 10YR 6/2 & 10YR 4/2	Sand	-	-		Aeolian Infill	Redeposited	-
					IIId	0.31-1.02	0.50	Pale brown	10YR 6/3	Sand	-	-		Aeolian Infill	Redeposited	-
					IIIe	0.79-1.12	0.07	Dark gray	10YR 4/1	Sand	-	-		Aeolian Infill	Redeposited	-
					IIIf	1.0-1.39	0.28	Brown	10YR 5/3	Sand	-	-		Aeolian Infill	Redeposited	-
					IIIg	0.98-1.29	0.06	Very dark gray	10YR 3/1	Sand	-	-		Aeolian Infill	Redeposited	-
					IV	0.23-2.0	1.78	Very pale brown	10YR 8/3	Sand	Moderately compacted	-	Unexcavated	Aeolian	Intact	-

Test Area C Trench Stratigraphy

Backhoe Trench	Trench length (m)	Trench width (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
C-8-2	5.50	1.50	2.62	Decomposing limestone bedrock	I	0.0-0.6	0.36	Brown	7.5YR 4/3	Loamy sand	Loose, v. fine friable crumb	grass	Distinct/wavy	Fill	Redeposited	-
					II	0.28-1.08	0.40	White & light brownish gray	10YR 8/1 & 10YR 6/2	Sand	Single grain, moderately compacted	-	Distinct/wavy	Fill	Redeposited	-
					III	0.8-1.18	0.09	White	10YR 8/1	Sand	Loose, unconsolidated	-	Distinct/wavy	Aeolian	Intact (surface truncated)	-
					IVa	0.84-1.17	0.26	Gray	10YR 5/1	Slightly loamy sand	Compacted, single grain	waterworn marine shells	Diffuse/wavy	Tsunami	Intact	Sparse charcoal
					IVb	1.04-1.2	0.13	Dark gray	10YR 4/1	Sand	Compacted, single grain	-	Diffuse/wavy	Tsunami	Intact	-
					V	1.12-2.62	1.40	Very pale brown	10YR 8/2 & 10YR 8/3	Sand	Moderately compacted	-	Abrupt	Aeolian	Intact dune	-
					VI	2.62+	-	-	-	Limestone	-	100% weathered decomposing limestone	-	Bedrock	Intact	-
C-8-3	5.30	1.25	1.03	Decomposing limestone bedrock	I	0.0-0.67	0.67	Dusky red	2.5YR 4/4	Clay	Compacted	10% limestone gravel	Abrupt/wavy	Fill	Redeposited	Asphalt fragments & 3-inches of gravel on surface
					II	0.67-1.03	0.36	Dark grayish brown	10YR 4/2	Clay loam	Compacted	75% limestone & basalt gravel, pebbles and cobbles	Abrupt/wavy	Fill	Redeposited	limestone & baslt aggregate
					III	1.03+	-	-	-	Limestone	-	100% weathered decomposing limestone	-	Bedrock	Intact	-
C-9-1	5.50	1.50	1.90	Safety limitations	I	0.0-0.23	0.23	Dark grayish brown	10YR 4/2	Stained sand	Loose	10% organic material (ironwood)	Diffuse/wavy	Recent duff	Disturbed	4" PVC pipe, electrical wires
					II	0.23-0.9	0.55	Very pale brown & light brownish gray	Mottled 10YR 8/2 & 10YR 6/2	Sand	Moderately compacted	-	Distinct/wavy	Aeolian	Intact	-
					III	variable 0.65-0.9	0.04	Grayish brown	10YR 5/2	Calcium carbonate	Cemented, Laminated	-	Abrupt/wavy	Precipitate	Intact	-
					IV	0.69-1.9	1.20	Very pale brown	10YR 8/2 & 10YR 8/3	Sand	Moderately compacted, single grain	-	-	Aeolian dune	Intact	-
C-9-2	7.80	1.50	1.60	Safety limitations	I	0.0-0.2	0.20	Dark brown & dark yellowish brown	10YR 3/3 & 10YR 3/4	Sandy clay loam	Very fine, friable	Modern trash	Distinct/wavy	Fill	Redeposited	Plastic, glass, milled lumber
					II	0.2-1.6	1.40	Light gray & very pale brown	10YR 7/2 & 10YR 8/2	Sand	Compacted, single grain	Dense root concretions	Unexcavated	Aeolian dune	Intact	-

Test Area D Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
D-0-1	5.00	2.20	Water table	I	0.0-0.1	0.10	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material	Abrupt/wavy	Recent duff	Intact	-
				II	0.1-1.75	1.65	Very pale brown	10YR 8/2 & 8/3	Sand	Fine	-	Abrupt/smooth	Aeolian dune	Intact	-
				III	1.75-2.2	0.50	Light gray	Gley 1 7/N	Sand	Fine, saturated	-	Unexcavated	Aeolian dune	Intact	-
D-1-1	5.50	1.31	Water table	I	0.0-0.1	0.10	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material	Distinct/wavy	Recent duff	Intact	-
				II	0.1-0.32	0.22	Yellowish brown	10YR 5/4	Sand	Loose, single	Roots & organic staining	Abrupt/wavy	Aeolian	Intact	-
				III	0.32-0.75	0.43	Very pale brown & pale brown	10YR 7/3 & 10YR 6/3	Sand	Single grain	Roots; pebble, cobble & boulder-sized chunks of semi-lithified sand	Abrupt/wavy	Aeolian	Intact	-
				IV	0.75-1.01	0.26	Pink	7.5YR 8/3 & 7.5YR 8/4	Sand	Single grain	Roots at interface between Layers III & IV	Abrupt/wavy	Aeolian	Intact	-
				V	1.01-1.31	0.30	Light gray	10YR 7/1	Silty sand	Single grain	-	Unexcavated	Aeolian	Intact	-
D-1-2	7.00	2.80	Water table	I	0.0-0.1	0.10	Very dark brown	7.5YR 2.5/3	Humus	Structureless	100% organic material (ironwood)	Distinct/wavy	Recent duff	Intact	-
				II	0.1-0.3	0.20	Light brownish gray	10YR 6/2	Sand	Loose	-	Distinct/wavy	Aeolian	Intact	-
				III	0.3-0.8	0.50	Very pale brown	10YR 8/3	Sand	Compacted	-	Abrupt/wavy	Aeolian dune	Intact	-
				IV	0.8-0.84	0.04	Gray	10YR 6/1	Calcium carbonate	Cemented, Laminated	Rootlets; carbonate lenses	Abrupt/wavy	Precipitate	Intact	-
				V	0.84-2.8	1.96	Very pale brown	Mottled 10YR 8/3 & 10YR 8/4	Sand	Moderately compacted	-	Unexcavated	Aeolian dune	Intact	-
D-2-1	8.00	1.70	Water table	I	0.0-0.12	0.12	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material (ironwood)	Distinct/wavy	Recent duff	Intact	-
				II	0.12-0.47	0.35	Dark grayish brown	10YR 4/2	Loamy Sand	Compacted	80% lithified sand chunks; slight organic staining	Distinct/wavy	Aeolian & tsunami	Intact dune with localized tsunami deposited material	Electrical wires, utility trenches
				III	0.38-0.45	0.07	Black	7.5YR 2.5/1	Loamy sand	Very fine friable crumb	carbon-stained	Distinct/wavy	Cultural deposit Site 7289	Intact, truncated on north side	1 *Cellana* shell, 4 basalt flakes, charcoal
				IV	0.38-0.61	0.23	Brown	Mottled 10YR 4/3 & 7.5YR 5/4	Slightly loamy sand	Single grain, compacted	organic staining	Distinct/wavy	Cultural deposit Site 7289	Intact; upper boundary maybe disturbed by Layer II	Charcoal flecks
				V	0.47-0.95	0.48	Very pale brown	10YR 8/2	Sand	Compacted	-	Distinct/wavy	Aeolian dune	Intact	-
				VI	0.83-1.05	0.22	Light gray	10YR 7/2	Sand	Compacted, semi-lithified	Laminated calcium carbonate precipitate lenses throughout	Distinct/wavy	Aeolian dune	Intact	-
				VII	0.93-1.4	0.47	Very pale brown	10YR 8/2	Sand	Single grain	Lithified sand chunks	Distinct/wavy	Aeolian dune	Intact	-
				VIII	1.4-1.7	0.30	White	10YR 8/1	Sand	Very fine single grain	-	Unexcavated	Aeolian dune	Intact	-
D-2-1b	6.00	2.00	Water table	I	0.0-0.1	0.05	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material (ironwood)	Distinct/wavy	Recent duff	Intact	-
				II	0.08-0.45	0.32	Grayish brown & brown	10YR 5/2 & 7.5YR 4/3	Slightly loamy sand	Loose, single grain	-	Distinct/wavy	Aeolian	Intact	-
				III	0.3-0.54	0.19	Dark grayish brown, grayish brown & brown	10YR 4/2, 10YR 5/2 & 10YR 5/3	Loamy sand	Moderately compacted	10% limestone gravel; waterworn marine shells; sparse charcoal flecks throughout	Distinct/wavy	House floor; Site 7289	Intact	*Conus* , *Nerita polita* , bivalve shells; crab claw, urchin, non-human mammal bones, burned *kukui* nutshell & charcoal
				Burial Pit	0.52-1.12	0.60	Very pale brown	10YR 8/2	Sand	Loose, single grain	Subfloor pit, indistinct in profile; originates in Layer III, intrusive into Layer IV to interface with Layer V	Indistinct	Burial pit; Site 7289	Intact	Adult male *in situ* primary burial @ 0.96-1.12 m bs
				IV	0.33-1.12	0.60	Very pale brown	10YR 8/2	Sand	Loose, single	-	Abrupt/wavy	Aeolian	Intact	
				V	1.04-1.5	0.42	Very pale brown	10YR 8/2	Sand	Semi-lithified	-	Abrupt/wavy	Aeolian	Intact	
				VI	1.4-1.9	0.43	Very pale brown	10YR 8/2	Sand	Loose, single	-	Distinct/wavy	Aeolian	Intact	-
				VII	1.84-2.04	0.20	White	Gley 1 8/N	Sand	Single grain, saturated	-	Unexcavated	Aeolian	Intact	-

Test Area D Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
D-2-1c	5.50	2.20	Water table	I	0.0-0.05	0.05	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material	Distinct/wavy	Recent duff	Intact	-
				II	0.05-0.2	0.15	Pale brown	10YR 6/3	Sand	Single grain	-	Distinct/wavy	Aeolian	Disturbed (tsunami?)	-
				III	0.2-0.7	0.50	Very pale brown	10YR 8/2	Sand	Single grain	-	Distinct/wavy	Aeolian dune	Intact	-
				IV	0.7-0.8	0.10	Pale brown	10YR 6/1	Calcium carbonate	Cemented, Laminated	carbonate lenses	Distinct/wavy	Precipitate	Intact	-
				V	0.8-1.15	0.35	Very pale brown	10YR 8/3	Sand	Semi-lithified	Lithified sand chunks	Distinct/wavy	Aeolian dune	Intact	-
				VI	1.15-2.2	1.05	Very pale brown	10YR 8/2	Sand	Loose	Sparse lithified sand chunks	Unexcavated	Aeolian dune	Intact	-
D-2-1d	6.50	2.20	Water table	I	0.0-0.6	0.07	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material	Distinct/wavy	Recent duff	Intact	-
				II	0.04-0.68	0.25	Very pale brown	10YR 8/2	Sand	Loose, single	-	Distinct/wavy	Fill or storm surge	Redeposited? Intact?	
				III	0.4-0.72	0.17	Gray	10YR 5/1	Loamy sand	Compacted	50% crushed basalt	Distinct/wavy	Fill- associated with golf course vista lawn	Secondary Deposit	Basalt aggregate
				IV	0.56-0.8	0.26	Grayish brown	10YR 5/2	Loamy sand	Compacted	Sparse limestone gravel	Distinct/wavy	Cultural deposit Site 7289	Intact	Charcoal, juvenile *Sus scrofa* bones
				V	0.75-1.2	0.49	Very pale brown	10YR 8/3	Sand	Single grain	-	Distinct/wavy	Aeolian dune	Intact	-
				VI	1.04-1.28	0.15	Grayish brown	10YR 5/2	Calcium carbonate	Cemented, Laminated	-	Distinct/wavy	Precipitate	Intact	-
				VII	1.2-1.96	0.80	Very pale brown	10YR 8/3	Sand	Loose, single	-	Distinct/wavy	Aeolian dune	Intact	-
				VIII	1.96-2.2	0.28	Light gray	10YR 7/1	Sand	Loose, single	-	Unexcavated	Aeolian dune	Intact	-
D-2-2	7.50	2.75	Water table	I	0.0-0.09	0.09	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material (ironwood)	Distinct/wavy	Recent duff	Intact	-
				II	0.09-0.25	0.14	Light yellowish brown	10YR 6/4	Sand	Loose, single grain	slight organic staining	Distinct/wavy	Aeolian	Intact	-
				III	0.25-1.05	0.80	Very pale brown & gray	Mottled 10YR 8/3 & 10YR 6/1	Sand	Single grain	-	Abrupt/wavy	Aeolian dune (stabilized)	Intact	-
				IV	1.05-1.1	0.05	Gray	10YR 6/1	Sand	Compacted	calcium carbonate precipitate lenses	Abrupt/wavy	Aeolian dune	Intact	-
				V	1.1-2.75	1.60	Very pale brown	10YR 8/2	Sand	Loose	-	Unexcavated	Aeolian dune	Intact	-
D-3-1	7.90	2.65	Water table	I	0.0-0.1	0.10	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material	Distinct/wavy	Recent duff	Intact	-
				II	0.1-0.37	0.27	Light yellowish gray & pale brown	10YR 6/2 & 10YR 6/3	Sand	Loose, single grain	organic staining; lithified sand chunks	Distinct/wavy	Aeolian	Intact	-
				III	0.37-0.56	0.19	Very pale brown & gray	Mottled 10YR 8/3 & 10YR 6/1	Sand	Compacted	calcium carbonate precipitate lenses	Abrupt/wavy	Aeolian dune	Intact	-
				IV	0.56-0.6	0.04	Gray	10YR 6/1	Sand	Compact	Rootlets; carbonate lenses	Abrupt/wavy	Aeolian dune	Intact	-
				V	0.6-2.65	2.05	Very pale brown	10YR 8/3	Sand	Loose	-	Unexcavated	Aeolian dune	Intact	-
D-4-1	6.50	1.95	Water table	I	0.0-0.06	0.06	Very dark grayish brown	10YR 3/2	Sandy loam	Fine friable crumb	Root mat; sparse limestone gravel	Abrupt/smooth	Fill- for golf course turf (vista lawn)	Secondary Deposit	-
				II	0.06-0.13	0.07	Black	10YR 2/1	Asphalt layer	Compacted	Aggregate	Abrupt/smooth	Asphalt pavement WWII runway Site 7275	Intact	Asphalt
				III	0.13-0.76	0.63	Light brownish gray & yellowish brown	10YR 6/2 & 10YR 5/4	Sandy loam	Banded, fine friable crumb	60% limestone gravel, pebbles and cobbles	Abrupt/wavy	Fill-bedding for WW II runway Site 7275	Secondary Deposit	Limestone aggregate
				IV	0.76-1.28	0.52	Very pale brown	10YR 8/3 & 10YR 8/4	Sand	Single grain, moderately compacted	Sparse carbonate precipitate	Abrupt/wavy	Aeolian dune	Intact	-
				V	1.28-1.32	0.04	Gray & light brownish gray	10YR 6/1 & 10YR 6/2	Calcium carbonate	Cemented, Laminated	-	Abrupt/wavy	Precipitate	Intact	-
				VI	1.32-1.65	0.33	Very pale brown	10YR 8/3	Sand	Loose, single	40% lithified sand chunks	Distinct/wavy	Aeolian dune	Intact	-
				VII	1.65-1.95	0.30	White	7.5YR 8/1	Silty sand	Single grain, moderately compacted	-	Unexcavated	Aeolian dune	Intact	-

Test Area D Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
D-5-1	6.00	2.06	Water table	I	0.0-0.14	0.10	Dark grayish brown & light brownish gray	10YR 4/2 & 10YR 6/2	Loamy sand	Single grain	Grass root mat	Abrupt/smooth	Fill (tsunami?)	Redeposited	-
				II	0.09-0.2	0.10	Black	10YR 2/1	Intact asphalt layer	Compacted	Aggregate	Abrupt/smooth	Asphalt pavement WWII runway Site 7275	Intact	Asphalt
				III	0.17-0.44	0.16	Very dark grayish brown & yellowish brown	10YR 3/2 & 10YR 5/4	Clay loam	Very fine friable crumb	80% limestone gravel	Abrupt/smooth	Banded fill-bedding for WW II runway Site 7275	Secondary Deposit	Limestone aggregate
				IV	0.35-0.53	0.13	Very dark gray & very dark grayish brown	10YR 3/1 & 10YR 3/2	Loamy sand	Single grain	Carbon-stained; sparse limestone gravel; waterworn marine shells	Abrupt/wavy	Cultural deposit; Site 7290	Intact; partially truncated by runway fill at upper surface	Charcoal
				V	0.36-0.56	0.09	Pale brown	10YR 6/3	Sand	Single grain; thin wavy beds	Sparse limestone gravel	Abrupt/wavy	Storm surge/ tsunami?	Intact	-
				VI	0.42-0.9	0.35	Very dark gray & grayish brown	Mottled 10YR 3/1 & 10YR 5/2	Slightly loamy sand	Single grain	Carbon-stained; sparse limestone gravel; waterworn marine shells	Abrupt/wavy	Cultural deposit; Site 7290	Intact	Volcanic glass core, *Trochus intextus* , charcoal
				VII	0.7-1.03	0.25	Very pale brown	10YR 8/2	Sand	Single grain, slightly	Sparse carbonate precipitate	Abrupt/wavy	Aeolian/Beach	Intact	-
				VIII	1.05-1.2	0.12	White	10YR 8/1	Calcium carbonate	Cemented, Laminated	-	Abrupt/wavy	Precipitate	Intact	
				IX	1.15-2.06	0.92	Very pale brown	10YR 8/3	Sand	Single grain, slightly	-	Unexcavated	Aeolian/Beach	Intact	-
D-6-1	5.50	1.55	Water table	I	0.0-0.43	0.43	Brown	10YR 5/3	Sandy clay loam	Compacted	80% limestone gravel, pebbles and cobbles	Abrupt/wavy	Fill-for WW II runway Site 7275	Secondary Deposit	Limestone aggregate
				II	0.17-0.43	0.26	Black & very dark brown	7.5YR 2.5/1 & 10YR 2/2	Loamy sand	Single grain, compacted; banded	Sparse limestone gravel	Abrupt/wavy	Cultural deposit; Site 7290	Intact	*Conus* , *Tellina* , & indeterminate bivalve shells; charcoal
				III	0.3-0.56	0.26	Dark grayish brown, pale brown & grayish brown	10YR 4/2 & 10YR 6/3 & 10YR 5/2	Sand	Single grain	-	Diffuse/wavy	Storm deposits (multiple)	Intact	-
				IV	0.46-0.86	0.40	Very dark grayish brown	10YR 3/2	Sandy loam	Very fine friable	Sparse limestone gravel & waterworn marine shells	Diffuse/wavy	Cultural deposit; Site 7290	Intact	*Cypraea* shell & charcoal flecks
				V	0.73-1.55	0.82	Very pale brown	10YR 7/3	Slightly silty sand	Very fine single grain	Sparse carbonate precipitate; 20% limestone gravel & pebbles; weathered coral	-	Aeolian dune/ Beach	Intact	-
D-6-2	6.75	1.37	Water table	I	0.0-0.05	0.05	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material	Distinct/wavy	Recent duff	Intact	-
				II	0.05-0.37	0.32	Brown	10YR 5/3	Sandy clay loam	Compacted	80% limestone gravel, pebbles and cobbles	Abrupt/wavy	Fill-for WW II runway Site 7275	Secondary Deposit	Limestone aggregate
				III	0.37-0.57	0.20	White	10YR 8/1	Sand	Compacted	weathered limestone; roots (lower)	Abrupt/wavy	Aeolian	Intact	-
				IV	0.57-1.37	0.80	Light gray	10YR 7/2	Silty sand	Very fine	Roots (upper)	Unexcavated	Aeolian	Intact	-
D-7-1	5.05	1.38	Decomposing limestone bedrock	I	0.0-0.08	0.08	Dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material (ironwood)	Distinct/wavy	Recent duff	Intact	-
				II	0.04-0.26	0.14	Light brownish gray	10YR 6/2	Limestone	Compacted	100% crushed limestone gravel	Distinct/wavy	Fill-for WW II runway Site 7275	Secondary Deposit	Limestone aggregate
				III	0.14-0.59	0.26	Dark grayish brown	10YR 4/2	Sandy clay loam	Fine friable crumb,	Sparse limestone gravel & pebbles	Abrupt/smooth	Alluvium	Intact	-
				IV	0.33-0.85	0.25	Very dark gray	7.5YR 3/1	Sandy clay loam	Fine friable crumb	Sparse limestone gravel & pebbles; waterworn marine shells	Distinct/wavy	Cultural deposit; Site 7290	Intact	*Cypraea* shell, probable avian bones, charcoal flecks
				V	0.33-1.38	0.80	Very pale brown	10YR 8/2	Limestone	Coarse	Weathered, decomposing bedrock	Unexcavated	Residual	Intact	-

Test Area D Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
D-7-2	7.20	1.45	Decomposing limestone bedrock & Water table	I	0.0-0.08	0.08	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material	Distinct/wavy	Recent duff	Intact	-
				II	0.08-0.52	0.44	Light brownish gray & light gray	10YR 6/2 & 10YR 7/2	Limestone	Compacted	100% crushed limestone gravel	Distinct/wavy	Fill-for WW II runway or revetment area Site 72725	Secondary Deposit	Limestone aggregate
				III	0.52-0.76	0.24	Very dark grayish brown & dark grayish brown	10YR 3/2 & 10YR 4/2	Sandy clay loam	Very fine friable	20% limestone gravel, pebbles and cobbles	Abrupt & Distinct/wavy	Buried A horizon; Alluvium	Intact	-
				IV	0.76-1.0	0.24	Dark yellowish	10YR 4/4	Sandy clay loam	Very fine friable	60% limestone gravel, pebbles and	Abrupt/wavy	Alluvial	Intact	-
				V	1.0-1.45	0.45	-	-	Limestone	Coarse	100% weathered, decomposing bedrock	Unexcavated	Residual	Intact	-
D-8-1	7.60	1.32	Water table	I	0.0-0.08	0.08	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material	Distinct/wavy	Recent duff	Intact	-
				II	0.08-0.33	0.25	Dark grayish brown	10YR 4/2	Clay loam	Compacted	60% limestone gravel and pebbles	Abrupt/wavy	Fill-for WW II runway Site 7275	Secondary Deposit	Metal pipe; limestone aggregate
				III	0.33-0.75	0.42	Brown & dark grayish brown	10YR 4/3 & 10YR 4/2	Sandy clay loam	Very fine friable crumb	50% limestone gravel and pebbles	Abrupt & Distinct/wavy	Alluvium	Intact	-
				IV	0.75-1.14	0.39	Dark grayish brown	10YR 4/2	Clay	Very fine friable crumb	50% weathered limestone gravel and pebbles	Distinct/wavy	Alluvial	Intact	-
				V	1.14-1.32	0.18	Very pale brown	7.5YR 3/1	Clay	Massive	-	Unexcavated	Alluvial	Intact	-
D-8-2	6.80	1.45	Water table	I	0.0-0.08	0.08	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material	Distinct/wavy	Recent duff	Intact	-
				II	0.08-0.45	0.37	Dark grayish brown	10YR 4/2	Sandy loam	Compacted	80% crushed limestone gravel, pebbles and cobbles	Distinct/wavy	Fill-for WW II runway or revetment area Site 7275	Redeposited- fill? Intact- secondary deposit?	Limestone aggregate
				III	0.45-0.7	0.25	Brown & pale brown	Banded 10YR 4/3 & 10YR 6/3	Slightly silty sand	Single grain	-	Distinct/wavy	Tsunami- outflow?	Intact	-
				IV	0.7-0.9	0.20	Very pale brown	10YR 8/2	Beach sand	Single grain	-	Distinct/wavy	Tsunami inflow?	Intact	-
				V	0.9-1.18	0.28	Very dark grayish brown	10YR 3/2	Clay loam	Very fine friable	Sparse limestone gravel	Unexcavated	Buried A horizon; Alluvium	Intact	-
				VI	1.18-1.45	0.25	Black & very dark grayish brown	7.5YR 2.5/1 & 10YR 3/2	Tropical peat	Vegetal mat	100% organic (partially decomposed logs)	Below water table; only seen in back dirt;	Anaerobic Alluvial	Intact	-
D-8-3	8.10	2.38	Decomposing limestone bedrock & Water table	I	0.0-0.65	0.57	Grayish brown	10YR 5/2	Sandy loam	Compacted	60% limestone gravel, pebbles and cobbles; waterworn marine shells	Abrupt/wavy	1946 Tsunami- outflow?	Intact	*Cypraea* & Mytilidae shells; urchin, crab claw
				II	0.16-0.78	0.13	Light gray	10YR 7/2	Beach sand	Coarse	-	Abrupt/wavy	Tsunami- inflow?	Intact	3/4-inch diameter steel cable
				III	0.29-0.84	0.09	Black	10YR 2/1	Intact asphalt layer	Compacted	Asphalt aggregate	Abrupt/wavy	Asphalt pavement WW II revetment area Site 7275	Intact	Asphalt
				IV	0.36-1.67	0.83	Yellowish brown	10YR 5/4	Silty sand	Very fine friable	80% limestone gravel, pebbles and cobbles	Diffuse/wavy	Fill-for WW II pavement Site	Secondary Deposit	Limestone aggregate
				V	1.15-1.7	0.11	Very dark gray	10YR 3/1	Sandy clay loam	Very fine friable, compacted	Sparse limestone gravel	Diffuse/wavy	Buried A horizon; Alluvium	Intact	-
				VI	1.26-2.38	0.62	Light gray	10YR 7/2	Limestone	Coarse	100% weathered, decomposing bedrock	-	Residual	Intact	-

Test Area D Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
D-9-1	6.80	1.30	Water table	I	0.0-0.08	0.08	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material	Distinct/wavy	Recent duff	Intact	-
				II	0.08-0.15	0.07	Black	10YR 2/1	Intact asphalt layer	Compacted	Asphalt aggegrate	Abrupt/smooth	Asphalt pavement WW II runway or revetment area Site 7275	Intact	Asphalt
				III	0.15-0.4	0.25	Light brownish gray	10YR 6/2	Sandy clay loam	Compacted	90% crushed limestone	Abrupt/smooth	Fill- for WW II pavement Site	Secondary Deposit	Limestone aggregate
				IV	0.4-0.75	0.35	Brown	10YR 4/3	Sandy clay loam	Compact	50% limestone gravel and pebbles	Diffuse/wavy	Fill- bedding for WW II upper fill Site 7275	Secondary Deposit	Limestone aggregate
				V	0.75-1.3+	0.55+	-	-	Limestone	Compact with voids	pebbles, cobbles & boulders	Unexcavated	Fill- bedding for WW II upper fill Site 7275	Secondary Deposit	Limestone aggregate
D-9-2	7.80	1.30	Water table	I	0.0-0.05	0.05	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material	Distinct/wavy	Recent duff	Intact	-
				II	0.05-0.12	0.07	Black	10YR 2/1	Intact asphalt layer	Compacted	Asphalt aggegrate	Abrupt/smooth	Pavement- WW II revetment area Site 7275	Intact	Asphalt
				III	0.12-0.48	0.36	Light gray	10YR 7/2	Limestone	Compacted	100% crushed limestone	Distinct/wavy	Fill-bedding for pavement Site	Secondary Deposit	Limestone aggregate
				IV	0.48-0.95	0.47	Brown	10YR 4/2 & 7.5YR 4/3	Sandy clay loam	Very fine friable	60% limestone gravel, pebbles & cobbles	Distinct/wavy	Fill- bedding for WW II upper fill Site 7275	Secondary Deposit	Limestone aggregate
				V	0.95-1.3	0.35	Dark yellowish	10YR 4/4	Clay	Massive	weathered limestone	Unexcavated	Alluvial	Intact	-
D-9-3	5.70	2.50	Water table	I	0.0-0.91	0.70	Brown	10YR 4/3	Sandy loam	Unconsolidated	60% limestone gravel, pebbles, cobbles and boulders	Abrupt/smooth	Tsunami- outflow	Intact	Sheet metal fragments; limestone aggregate
				II	0.26-1.0	0.07	Black	10YR 2/1	Intact asphalt layer	Compacted	Asphalt aggegrate	Abrupt/smooth	Pavement- WW II revetment area Site 7275	Intact	Asphalt
				III	0.34-1.68	0.70	Grayish brown , very pale brown & dark yellowish	10YR 5/2, 10YR 8/2 & 10YR 4/4	Sandy clay loam	Compacted	95% crushed limestone gravel, pebbles & cobbles	Distinct/wavy	Fill-bedding for pavement Site 7275	Secondary Deposit	Limestone aggregate
				IV	1.18-2.0	0.38	Very dark grayish brown	10YR 3/2	Clay loam	Very fine friable	10% limestone gravel and pebbles	Diffuse & Distinct/wavy	Buried A horizon; Alluvium; possibly cultural	Intact	Bivalve shell, crab claw, sparse charcoal flecks
				V	2.13-2.5	0.48	Very pale brown	10YR 8/2	Clay	Massive	Weathered limestone	-	Alluvial	Intact	-
D-10-1	4.80	0.56	Decomposing limestone bedrock	I	0.0-0.25	0.25	Brown	10YR 4/3	Sandy clay loam	Very fine friable	75% limestone gravel and pebbles	Distinct/wavy	Fill- for WW II revetment area Site 7275	Intact secondary deposit?	Limestone aggregate
				II	0.25-0.4	0.15	Yellowish brown	10YR 5/4	Sandy clay loam	Very fine friable	80% limestone gravel and pebbles	Distinct/wavy	Fill- for revetment area; Site 7275	Intact secondary deposit?	Limestone aggregate
				III	0.4-0.56	0.26	Dark gray	10YR 4/1	Clay	Massive	-	Abrupt/wavy	Alluvial	Intact	-
				IV	0.56+	-	-	-	Limestone	-	100% weathered, decomposing bedrock	-	Bedrock	Intact	-
D-10-2	6.90	1.02	Water table	I	0.0-0.07	0.07	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material	Distinct/wavy	Recent duff	Intact	-
				II	0.07-0.4	0.33	Brown & very pale brown	7.5YR 5/4 & 10YR 8/2	Sandy clay loam	Unconsolidated	Crushed limestone	Distinct/wavy	Fill- WW II revetment area Site 7275	Secondary Deposit	Limestone aggregate
				III	0.4-0.55	0.15	Very dark grayish brown	10YR 3/2	Clay loam	Very fine friable	Sparse limestone gravel	Distinct/wavy	Buried A horizon; Alluvium	Intact	-
				IV	0.55-1.02	0.47	Grayish brown	10YR 5/2	Clay	Massive	-	Unexcavated	Alluvial	Intact	-

Test Area D Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
D-10-3	8.50	1.05	Water table	I	0.0-0.07	0.07	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material	Distinct/wavy	Recent duff	Intact	-
				II	0.07-0.48	0.41	Pinkish gray	7.5YR 7/2	Beach sand	Coarse	-	Distinct/wavy	Probable tsunami	Intact	-
				III	0.48-0.77	0.29	Very dark gray & dark gray	10YR 3/1 & 10YR 4/1	Sandy clay loam	Very fine friable	Very sparse limestone gravel; waterworn marine shells	Distinct/wavy	Buried A horizon; Alluvium	Intact	-
				IV	0.52-0.77	0.25	Dark brown	10YR 3/3	Clay loam	Very fine friable	-	Distinct/wavy	Alluvial	Intact	-
				Va	0.68-1.05	0.32	Light brownish gray	10YR 6/2	Clay	Massive	-	Unexcavated	Alluvial	Intact	-
				Vb	0.70-1.05	0.35	Black & very dark grayish brown	Mottled Giley 1 2.5/N & 10YR 3/2)	Clay	Massive	-	Unexcavated; diffuse boundary btwn Va & Vb	Alluvial	Intact	-
				VI	1.05+	Below water table	Black	7.5YR 2.5/1	Tropical peat	Vegetal mat	100% organic (partially decomposed sticks)	Below water table; only seen in back dirt;	Anaerobic Alluvial	Intact	-
D-11-1	5.90	0.68	Decomposing limestone bedrock	I	0.0-0.28	0.28	-	-	Limestone	Compacted	100% crushed limestone	Abrupt/wavy	Fill- revetment area Site 7275	Secondary Deposit	Limestone aggregate
				II	0.28-0.68	0.40	-	-	Limestone	Coarse	100% weathered, decomposing bedrock	-	Residual	Intact	-
D-11-2	5.20	1.10	Decomposing limestone bedrock & Water table	I	0.0-0.1	0.10	Pale brown & grayish brown	10YR 6/2 & 10YR 5/2	Silty sand	Loose	50% organic material; sparse limestone gravel	Distinct/wavy	Recent duff	Intact	-
				II	0.1-0.45	0.35	Yellowish brown	10YR 5/4	Sandy clay loam	Unconsolidated	80% crushed limestone	Distinct/wavy	Fill- revetment area Site 7275	Secondary Deposit	Limestone aggregate
				III	0.45-1.1	0.65	Very pale brown	10YR 8/2	Limestone	Coarse	100% weathered, decomposing bedrock	-	Residual	Intact	-
D-11-3	7.00	0.80	Decomposing limestone bedrock & Water table	I	0.0-0.05	0.05	Pale brown	10YR 6/2	Silty sand	Unconsolidated, single grain	30% organic material	Distinct/wavy	Recent duff	Intact	-
				II	0.05-0.25	0.20	Dark grayish brown	10YR 4/2	Sandy clay loam	Very fine friable crumb	10% limestone gravel and pebbles	Distinct/wavy	Alluvium	Intact	-
				III	0.25-0.39	0.14	Very dark grayish brown & black	10YR 3/2 & 10YR 2/1	Clay	Massive	-	Distinct/wavy	Alluvial	Intact	-
				IV	0.39-0.8	0.41	Pink	7.5YR 8/3	Limestone	Coarse	100% weathered, decomposing bedrock	-	Residual	Intact	-
D-12-1	6.90	0.90	Water table	I	0.0-0.4	0.40	Yellowish brown	10YR 5/4	Sandy clay loam	Unconsolidated	80% limestone gravel, pebbles & cobbles	Distinct/wavy	Fill- WW II revetment area Site 7275	Secondary Deposit	Limestone aggregate
				II	0.4-0.7	0.30	Dark grayish brown & very dark grayish brown	10YR 4/2 & 10YR 3/2	Clay	Very fine friable crumb	-	Distinct/wavy	Alluvial	Intact	-
				III	0.7-0.9	0.20	Grayish brown	10YR 6/1	Clay	Massive	-	Unexcavated	Alluvial	Intact	-
D-12-2	5.90	1.50	Water table	I	0.0-0.63	0.63	Dark yellowish brown	10YR 3/4	Sandy clay loam	Loose, unconsolidated	80-90% limestone gravel, pebbles, cobbles & boulders	Distinct/wavy	Fill- WW II revetment area Site 7275	Secondary Deposit	Limestone aggregate
				II	0.38-1.05	0.67	Very dark gray & black	10YR 3/1 & 10YR 2/1	Silt loam	Very fine friable crumb	Sparse limestone gravel; waterworn marine shells	Distinct/wavy	Cultural deposit; Alluvial; Site 7291	Intact; partially truncated by runway fill at upper surface	*Conus abbreviatus* & *Nerita picea* shells, unburned *kukui* nutshells, charcoal, coral pebble
				Pit	0.73-1.17	0.44	Very dark gray & black	10YR 3/1 & 10YR 2/1	Silt loam	Very fine friable crumb	Sparse limestone gravel; waterworn marine shells; intrusive into Layer III	Distinct	Pit-possible post mold	Intact	*Nerita picea* shells, charcoal
				III	0.68-1.5	0.82	Very pale brown	10YR 8/2	Sand	Coarse	100% weathered, decomposing bedrock	-	Residual	Intact	-
D-12-3	6.60	1.03	Decomposing limestone bedrock	I	0.0-0.1	0.10	Very dark brown	7.5YR 2.5/2	Sandy loam	Loose	50% organic material	Distinct/wavy	Recent duff	Intact	-
				II	0.1-0.58	0.48	Pale brown & yellowish red	10YR 6/3 & 5YR 4/6	Sandy clay loam & clumps of clay	Very fine friable	90% limestone gravel, pebbles, cobbles & boulders	Distinct/wavy	Fill- revetment area Site 7275	Secondary Deposit	Limestone aggregate
				III	0.58-1.0	0.42	Brown	7.5YR 4/3	Clay loam	Very fine friable	50% limestone gravel and pebbles	Distinct/wavy	Alluvial	Intact	-
				IV	1.0-1.03	0.03	Brown	7.5YR 4/4	Clay	Very fine friable	50% limestone gravel	Abrupt	Alluvial	Intact	-
				V	1.03+	-	-	-	Limestone	-	100% weathered, decomposing bedrock	-	Bedrock	Intact	-

Test Area D Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
D-13-1	5.85	1.19	Decomposing limestone bedrock	I	0.0-0.8	0.80	Dark grayish brown & grayish brown	10YR 4/2 & 10YR 5/2	Sandy clay loam	Moderately compacted	20% limestone gravel and pebbles	Diffuse/wavy	Fill-for golf course	Redeposited	-
				II	0.8-1.0	0.20	Dark grayish brown	10YR 4/2	Slightly sandy clay loam	Very fine friable, compacted	Sparse limestone gravel	Distinct/wavy	Alluvium	Intact	-
				III	1.0-1.19	0.19	Very dark grayish brown & very dark gray	10YR 3/2 & 10YR 3/1	Clay	Massive	-	Abrupt	Alluvial	Intact	-
				IV	1.19+	-	-	-	Limestone	-	100% weathered, decomposing bedrock	-	Bedrock	Intact	-
D-13-2	6.40	1.28	Decomposing limestone bedrock & Water table	I	0.0-0.64	0.64	Very pale brown	10YR 8/2	Limestone	Compacted	100% crushed limestone	Distinct/wavy	Fill-revetment area Site 7275	Secondary Deposit	Limestone aggregate
				II	0.62-1.14	0.52	Reddish brown	5YR 4/3	Clay	Very fine friable	80% limestone gravel, pebbles, cobbles and boulders	Distinct/wavy	Fill- revetment area Site 7275	Secondary Deposit	Limestone aggregate
				III	1.15-1.28	0.33	-	-	Limestone	Coarse	Weathered, decomposing bedrock; black organic staining at interface between Layers II & III is the possible remnant of cultural deposit removed	Unexcavated	Residual	Intact	-
D-13-3	6.90	2.00	Decomposing limestone bedrock & Water table	I	0.0-0.63	0.47	Dark grayish brown	10YR 4/2	Very sandy loam	Loose, unconsolidated	30% limestone gravel & pebbles	Distinct/wavy	Tsunami- outflow	Intact	Marston matting from runway; limestone aggregate
				II	0.44-0.6	0.13	Light gray	10YR 7/2	Beach Sand	Unconsolidated	Clean	Abrupt/smooth	Tsunami- inflow	Intact-pocket	-
				III	0.31-0.64	0.12	Very pale brown & pale brown	10YR 7/3 & 10YR 6/3	Limestone	Compacted	100% crushed limestone	Distinct/wavy	Fill- revetment area Site 7275	Secondary Deposit	Limestone aggregate
				IV	0.55-1.04	0.46	Very dark grayish brown	10YR 3/2	Sandy clay loam	Very fine friable crumb	60% limestone gravel, pebbles and cobbles; waterworn marine shells	Distinct/wavy	Cultural deposit-Alluvium Site 7291	Intact	*Cypraea* , *Nerita picea* & Mytilidae shells, urchin, crab claw, probable *Canis* bone, burned *kukui* nutshell & charcoal
				V	0.92-1.08	0.17	Pinkish gray	7.5YR 6/2	Silty clay	Very compacted	-	Distinct/wavy	Alluvial	Intact	-
				VI	1.06-2.0	0.94	White	10YR 8/1	Limestone	Coarse	100% weathered, decomposing bedrock	-	Residual	Intact	-
D-14-1	5.90	0.95	Decomposing limestone bedrock & Water table	I	0.0-0.07	0.07	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material (ironwood)	Distinct/wavy	Recent duff	Intact	-
				II	0.07-0.54	0.47	Very dark grayish brown	10YR 3/2	Sandy clay loam	Fine friable crumb, loose	20% limestone gravel and pebbles	Distinct/wavy	Tsunami? Fill?- WW II revetment area	Tsunami- Intact? Fill-Secondary deposit?	-
				III	0.54-0.8	0.26	Very dark grayish brown	10YR 3/2	Sandy clay loam	Fine friable crumb	Sparse limestone gravel	Distinct/smooth	Alluvium	Intact	-
				IV	0.8-0.95+	-	White	10YR 8/1	Limestone	Coarse	100% weathered, decomposing bedrock	-	Residual	Intact	-
D-14-2	6.30	1.52	Water table	I	0.0-0.12	0.10	Brown	10YR 5/3	Sandy clay loam	Loose	Roots & organic material	Distinct/wavy	Recent duff	Intact	-
				II	0.0-0.59	0.50	Strong brown	7.5YR 4/6	Clay	Compacted	30% limestone gravel, pebbles and cobbles	Abrupt/wavy	Tsunami? Fill?-revetment area Site 7275	Tsunami- Intact? Fill-Secondary deposit?	Limestone aggregate
				III	0.47-0.78	0.30	Black	7.5YR 2.5/1	Carbon-stained Clay loam	Very fine friable crumb	30% limestone gravel and pebbles	Abrupt to Diffuse/wavy	Cultural deposit-Alluvium Site 7291	Intact- upper surface possibly truncated	*Conus* , *Cypraea* & indeterminate marine shells (1 burned); fish cranial bone & charcoal
				IV	0.64-1.5	0.60+	Light brown & grayish brown	7.5YR 6/3 & 10YR 5/2	Clay	Massive	weathered limestone	Unexcavated	Alluvial	Intact	-
				V	0.38-1.52	1.10+	White	10YR 8/1	Limestone	Coarse	100% weathered, decomposing bedrock	Unexcavated	Residual	Intact	-

Test Area D Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
D-14-3	10.25	3.80	Decomposing limestone bedrock	I	0.0-1.14	1.14	Pale brown & dark grayish brown	10YR 6/3 & 10YR 4/2	Loamy sand	Coarse, compacted	50% limestone gravel, pebbles and cobbles	Indistinct/ arbitrary (trench stepped-boundary could be 2 or 3 than	Storm surge or tsunami draw back? Fill?	Intact- tsunami or Redeposited- fill?	-
				II	1.14-1.8	0.66	Pale brown & dark grayish brown	10YR 6/3 & 10YR 4/2	Wavy, banded, interbedded loamy sand	Coarse, compacted	50% limestone gravel, pebbles and cobbles	Distinct/wavy	Storm surge or tsunami	Intact	-
				III	1.8-3.03	1.23	Grayish brown & dark grayish brown	10YR 5/2 & 10YR 4/2	Sandy clay loam	Very fine friable	50-60% limestone gravel, pebbles, cobbles and boulders	Distinct/wavy	Tsunami- outflow	Intact	-
				IV	3.03-3.53	0.50	Very pale brown (sand) & dark grayish brown (clay)	10YR 7/3 & 10YR 4/2	Beach sand with pockets of clay	Unconsolidated (sand); massive (clay)	40% limestone gravel and pebbles	Distinct/wavy	Tsunami- inflow	Intact	-
				V	3.53-3.66	0.13	Black	7.5YR 2.5/1	Loam	Compacted	Carbon-stained deposit; sparse limestone gravel	Distinct/wavy	Cultural deposit-Alluvium Site 7291	Intact- upper surface probably truncated	*Conus* , *Nerita picea*, Mytilidae & *Tellina palatam* shells, urchin, crab claw, coral pebble & charcoal
				VI	3.66-3.8	0.14	Dark grayish brown	10YR 4/2	Sandy clay loam	Very fine friable	-	Abrupt	Alluvial	Intact	-
				VII	3.8+	-	-	-	Limestone	-	100% weathered, decomposing bedrock	-	Bedrock	Intact	-
D-15-1	7.10	1.47	Decomposing limestone bedrock & Water table	I	0.0-0.1	0.10	Grayish brown & brown	10YR 5/2 & 10YR 5/3	Loamy sand	Single grain	10% limestone gravel and pebbles	Distinct/wavy	Aeolian dune	Intact	-
				II	0.1-0.8	0.70	Dark grayish brown	10YR 4/2	Sandy clay loam	Fine friable	20% limestone gravel, pebbles and	Distinct/wavy	Alluvium	Intact	-
				III	0.67-1.08	0.41	Very dark gray	10YR 3/1	Clay loam	Massive	organically stained matrix; 40% limestone cobbles	Diffuse/wavy	Alluvial	Intact	-
				IV	1.03-1.29	0.26	Yellowish brown	10YR 5/4	Clay	Massive	80% weathered limestone	Diffuse/wavy	Alluvial-Residual	Intact	-
				V	1.05-1.47	0.42	Light gray & very pale brown	10YR 7/2 & 10YR 7/3	Limestone	Coarse	100% weathered, decomposing bedrock	-	Residual	Intact	-
D-15-2	5.50	1.42	Decomposing limestone bedrock	I	0.00-0.05	0.05	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material (roots)	Abrupt/wavy	Recent duff	Intact	-
				II	0.05-0.65	0.60	Yellowish brown & very pale brown	10YR 5/4 & 10YR 8/2	Silty sand	Loose	90% crushed limestone	Distinct/wavy	Fill- WW II revetment area Site 7275	Secondary Deposit	Limestone aggregate
				III	0.65-1.42	0.77	White	10YR 8/1	Limestone	Coarse	100% weathered, decomposing bedrock	-	Residual	Intact	-
D-15-3	8.60	1.64	Decomposing limestone bedrock & Water table	I	0.0-0.12	0.10	Dark reddish brown	5YR 3/3	Clay	Compacted	Sparse limestone gravel & duff	Abrupt/smooth	Fill-for golf course	Redeposited	-
				II	0.08-0.21	0.09	Black	10YR 2/1	Intact asphalt layer	Compacted	Aggregate	Abrupt/smooth	Asphalt pavement WW II revetment area Site 7275	Intact	Asphalt
				III	0.17-0.62	0.32	Very pale brown	10YR 7/3	Limestone	Compacted	100% crushed limestone gravel, pebbles & cobbles	Abrupt/wavy	Fill-bedding for WW II asphalt	Intact	Limestone aggregate
				IV	0.4-0.60	0.20	Brown	10YR 4/3 & 10YR 5/3	Silty sand	Compacted	10% limestone gravel and pebbles	Distinct & Abrupt/smooth	Aeolian	Intact	Charcoal flecks
				V	0.50-0.80	0.16	Black	7.5YR 2.5/1	Sandy clay loam	Compacted	10% limestone gravel and pebbles	Distinct to Diffuse/wavy	Cultural deposit-Alluvial; Site 7291	Intact- upper surface possibly truncated	*Conus* & *Nerita picea* shells collected; pencil urchin spine- not collected
				VI	0.74-1.64+	0.73+	Light gray	10YR 7/2	Limestone	Coarse	100% weathered, decomposing bedrock	-	Residual	Intact	-

Test Area E Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
E-1-1	5.00	1.70	Decomposing limestone bedrock & Water table	I	0.0-1.2	1.20	Dark grayish brown & brown	10YR 4/2 & 10YR 4/3	Sandy clay loam	Very fine friable	Sparse limestone gravel	Distinct/wavy	Push pile fill	Redeposited	Glass Royal Crown cola bottle, mesh cloth
				II	1.2-1.7	0.50	-	-	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-2-1	7.60	0.88	Water table	I	0.0-0.25	0.25	Grayish brown	10YR 5/2	Sandy clay loam	Moderately Compacted	90% crushed limestone gravel, pebbles and cobbles	Abrupt/smooth	Fill- WW II revetment area north of runway Site 7275	Secondary deposit; possibly disturbed from golf course or road	Limestone aggregate
				II	0.25-0.46	0.21	Very dark gray	10YR 3/1	Clay loam	Blocky	10% limestone cobbles, pebbles and gravel	Abrupt/smooth	Alluvial	Intact	-
				III	0.46-0.66	0.20	Yellowish brown	10YR 5/4	Clay	Massive	sparse weathered limestone gravel	Diffuse/wavy	Alluvial	Intact	-
				IV	0.66-0.88	0.22	Very pale brown	10YR 7/3	Sandy clay	Massive	Weathered, decomposing limestone	-	Alluvial	Intact	-
E-2-2	7.70	0.55	Decomposing limestone bedrock	I	0.0-0.37	0.37	Dark grayish brown	10YR 4/2	Sandy loam	Very fine friable	40% limestone gravel and pebbles	Diffuse	Fill- for WW II runway north shoulder Site 7275	Redeposited from golf course or road	Limestone aggregate
				II	0.37-0.55	0.18	Dark grayish brown & brown	10YR 4/2 & 10YR 4/3	Sandy clay loam	Very fine friable	30% limestone gravel and pebbles	Abrupt/wavy	Alluvium	Intact	-
				III	0.55+	-	-	-	Limestone	-	-	-	Bedrock	Intact	-
E-2-3	5.80	1.42	Decomposing limestone bedrock & Water table	I	0.0-0.07	0.07	Black	10YR 2/1	Asphalt surface	Compacted	100% aggregate	Abrupt/smooth	Asphalt pavement WWII runway Site 7275	Intact	Asphalt
				II	0.07-0.26	0.19	Brown	10YR 5/3	Clay loam	Compacted	95% crushed limestone	Distinct/wavy	Fill- runway base course Site 7275	Secondary deposit	Limestone aggregate
				III	0.26-0.86	0.60	Very dark grayish brown	10YR 3/2	Sandy clay loam	Very fine friable	60% limestone gravel, pebbles and cobbles	Distinct/wavy	Fill-- bedding for runway base course Site 7275	Secondary deposit	Asphalt fragments, limestone aggregate
				IV	0.86-0.91	0.05	Very dark gray & black	10YR 3/1 & 10YR 2/1	Clay	Massive	Sparse limestone gravel and pebbles	Distinct/wavy	Cultural deposit; Alluvial, Site 7292	Intact	-
				V	0.91-1.05	0.14	Dark gray	10YR 4/1	Clay	Massive	10% limestone gravel and pebbles	Distinct/wavy	Alluvial	Intact	-
				VI	1.05-1.18	0.13	Gray	10YR 6/1	Clay	Massive	-	Abrupt	Alluvial	Intact	-
				VII	1.18-1.42+	-	-	-	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-2-3b	5.20	1.50	Decomposing limestone bedrock	I	0.0-0.7	0.70	Dusky red	2.5YR 3/3	Clay	Compacted	10% limestone gravel and pebbles	Abrupt/smooth	Fill-for gravel road intersection near airfield	Secondary deposit	Limestone aggregate
				II	0.7-1.2	0.50	Yellowish brown	7.5YR 5/4	Clay	Compacted	10% limestone gravel , pebbles, cobbles and boulders	Abrupt/smooth	Fill- road bedding	Secondary deposit	Limestone aggregate
				III	1.2-1.5+	-	-	-	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-3-1	7.00	1.27	Water table	I	0.0-0.08	0.08	Very pale brown	7.5YR 2.5/3	Humus	Structureless	100% organic material (iron wood)	Distinct/wavy	Recent duff	Intact	-
				II	0.08-0.6	0.52	Pale brown	10YR 6/3	Sandy clay loam	Very fine friable	90% crushed limestone gravel and pebbles	Distinct/wavy	Fill- for WW II runway north shoulder Site 7275	Secondary deposit	Limestone aggregate
				III	0.6-1.0	0.40	Dark grayish brown	10YR 4/2	Sandy clay loam	Very fine friable	10% limestone gravel and pebbles	Distinct/wavy	Alluvium	Intact	-
				IV	1.0-1.11	0.11	Dark yellowish brown	10YR 4/4	Clay	Massive	-	Distinct/wavy	Alluvial	Intact	-
				V	1.11-1.27	0.16	Bluish gray	G2.5/1	Gley	Massive	20% limestone gravel and pebbles	Unexcavated	Anaerobic Alluvial	Intact	-

Test Area E Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
E-3-2	5.5	1.06	Decomposing limestone bedrock	I	0.0-0.07	0.07	Black	10YR 2/1	Asphalt surface	Compacted	100% aggregate	Abrupt/smooth	Asphalt pavement WWII runway Site 7275	Intact	Asphalt
				II	0.07-0.28	0.21	Brown, light yellowish brown & yellowish brown	10YR 4/4, 10YR 6/4 & 10YR 5/4	Sandy clay loam	Compacted, banded	60% limestone gravel, pebbles and cobbles	Abrupt/wavy	Fill- runway base course Site 7275	Secondary deposit	Limestone aggregate
				III	0.28-0.56	0.28	Pale brown	10YR 6/3	Silty sand	Compacted	90% limestone gravel and pebbles	Distinct/wavy	Fill-- bedding for runway base course Site 7275	Secondary deposit	Limestone aggregate
				IV	0.56-0.64	0.08	Black	7.5YR 2.5/1	Sandy clay loam	Very fine friable	30% limestone gravel and pebbles	Distinct/wavy	Cultural deposit; Alluvium, Site 7292	Intact	Basalt flake, *Cypraea* shell
				V	0.64-0.92	0.28	Light brownish	10YR 6/2	Silty sand	Single grain	-	Distinct/wavy	Aeolian	Intact	-
				VI	0.92-1.06+	-	-	-	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-3-2b	4.70	0.56	Decomposing limestone bedrock	I	0.0-0.05	0.05	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material	Distinct/wavy	Recent duff	Intact	-
				II	0.05-0.38	0.33	Very dark grayish brown	10YR 3/2	Silty loam	Loose, fine friable crumb	10% limestone gravel and pebbles; 5% crushed basalt	Distinct/wavy	Fill- from golf course or runway	Redeposited	Basalt aggregate
				III	0.38-0.56+	0.18	White	10YR 8/1	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-3-2c	4.50	0.50	Decomposing limestone bedrock	I	0.0-0.07	0.07	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material	Distinct/wavy	Recent duff	Intact	-
				II	0.07-0.34	0.27	Pale brown	10YR 6/3	Clay loam	Fine friable crumb, moderately compacted	80% crushed limestone	Abrupt/smooth	Fill- for WW II runway north shoulder Site 7275	Secondary deposit	Limestone aggregate
				III	0.34-0.5	0.16	Brown	10YR 4/3	Clay loam	Fine friable crumb	10% limestone gravel and pebbles	Abrupt/wavy	Alluvial	Intact	
				III	0.40-0.52	0.09	-	-	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-3-3	5.4	1.30	Decomposing limestone bedrock (water line = artesian well not water table)	I	0.0-0.06	0.06	Black	10YR 2/1	Asphalt surface	Compacted	100% aggregate	Abrupt/smooth	Asphalt pavement WWII runway Site 7275	Intact	Asphalt
				II	0.06-0.2	0.14	Brown	7.5YR 5/4	Clay loam	Compacted	70% limestone gravel, pebbles and cobbles	Distinct/wavy	Fill- runway base course Site 7275	Secondary deposit	Limestone aggregate
				III	0.2-0.43	0.23	Gray to light browish gray	10YR 6/1-6/2	Limestone	Compacted	100% crushed limestone	Abrupt/wavy	Fill-- bedding for runway base course Site 7275	Secondary deposit	Limestone aggregate
				IVa	0.43-0.59	0.16	Dark gray & very dark gray	7.5YR 4/1 & 7.5YR 3/1	Clay loam	Moderately Compacted	20% limestone gravel and pebbles	Diffuse	Cultural deposit; Alluvium Site 7292	Intact	Charcoal flecks
				IVb	0.59-0.67	0.08	Black	7.5YR 2.5/1	Clay	Very compacted	Carbon-stained matrix; sparse limestone gravel and pebbles	Diffuse	Cultural deposit; Alluvial, Site 7292	Intact	-
				V	0.67-0.85	0.18	Brown	10YR 4/3	Clay	Massive	-	Distinct	Alluvial	Intact	-
				VI	0.85-1.3	0.45	Very pale brown	10YR 8/2 & 10YR 7/4	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-3-3b	4.90	1.20	Water table	I	0.0-0.09	0.09	Dark brown	10YR 3/3	Clay loam	Fine friable crumb	30% limestone gravel, pebbles and cobbles	Diffuse/wavy	Fill- from runway or road construction	Redeposited	Limestone aggregate
				II	0.09-0.4	0.31	White	10YR 8/1	Limestone	Compacted	100% crushed limestone	Diffuse/wavy	Fill- runway base course Site 7275	Secondary deposit	Limestone aggregate
				III	0.4-1.0	0.60	Brown & dark yellowish brown	10YR 4/3 & 10YR 4/4	Clay loam	Fine friable crumb	60% limestone pebbles, cobbles & boulders	Diffuse/wavy	Fill-- bedding for runway base course Site 7275	Secondary deposit	Limestone aggregate
				IV	1.0-1.2	0.20	Dark gray	10YR 4/1	Clay	Massive	10% limestone gravel	Diffuse/wavy	Alluvial	Intact	-

Test Area E Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
E-3-4	5.70	1.15	Decomposing limestone bedrock	I	0.0-0.38	0.38	Dark brown	7.5YR 3/3	Clay loam	Very fine friable	10% limestone gravel and pebbles	Abrupt/wavy	Fill- from road grading	Redeposited	Limestone aggregate
				II	0.38-0.83	0.45	Light brownish gray	10YR 6/2	Clay loam	Compacted	90% crushed limestone gravel, pebbles and cobbles	Distinct/wavy	Fill- runway base course Site 7275	Secondary deposit	Limestone aggregate
				III	0.83-1.15	0.32	Very pale brown	10YR 7/3	Sandy clay loam	Very fine friable	weathered limestone	Unexcavated	Alluvial	Intact	-
E-3-5	5.40	0.69	Decomposing limestone bedrock	I	0 0-0.1	0.10	Brown	7.5YR 4/3	Clay loam	Very fine friable	-	Abrupt/wavy	Fill	Redeposited	Silt fence
				II	0.1-0.17	0.07	Black	10YR 2/1	Asphalt surface	Compacted	100% aggregate	Abrupt/wavy	Asphalt pavement WWII runway Site 7275	Intact	Asphalt
				III	0.17-0.46	0.29	Gray	10YR 5/1	Sandy clay loam	Very fine friable	85% limestone gravel, pebbles and cobbles	Distinct/wavy	Fill- runway base course Site 7275	Secondary deposit	Limestone aggregate
				IV	0.46-0.69	0.20	Grayish brown	10YR 5/2	Clay	Massive	-	Abrupt	Alluvial	Intact	-
				V	0.69+	-	-	-	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-4-1	5.00	0.68	Decomposing limestone bedrock	I	0.0-0.09	0.09	Black	10YR 2/1	Humus	Structureless	100% organic material (iron wood)	Distinct/wavy	Recent duff	Intact	-
				II	0.09-0.29	0.20	Very dark grayish brown	10YR 3/2	Sandy clay loam	Loose	10% limestone gravel and pebbles	Distinct/wavy	Alluvium	Intact	-
				III	0.29-0.39	0.10	Very dark grayish brown & dark brown	Mottled 10YR 3/2 & 7.5 YR 3/4	Clay loam	Compacted	10% limestone gravel and pebbles	Abrupt/smooth	Cultural deposit; Alluvium Site 7292	Intact	Charcoal flecks
				IV	0.39-0.68	0.27	Very pale brown	10YR 8/2	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-4-1b	5.60	1.20	Decomposing limestone bedrock	I	0 0-0.1	0.10	Black	10YR 2/1	Asphalt surface	Compacted	100% aggregate	Abrupt/smooth	Asphalt pavement WWII runway Site 7275	Intact	Asphalt
				II	0.1-0.65	0.55	Pale brown	10YR 6/3	Sandy clay loam	Compacted	70% limestone gravel, pebbles and cobbles	Distinct/wavy	Fill- runway base course Site 7275	Secondary deposit	Glass, limestone aggregate
				III	0.65-1.2+	-	-	-	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-4-2	5.60	1.16	Decomposing limestone bedrock	I	0.0-0.07	0.07	Black	10YR 2/1	Asphalt surface	Compacted	100% aggregate	Abrupt/smooth	Asphalt pavement WWII runway Site 7275	Intact	Asphalt
				II	0.07-0.4	0.33	Brown	10YR 5/3	Sandy clay loam	Very fine friable crumb	60% limestone gravel and pebbles	Abrupt/wavy	Fill- runway base course Site 7275	Secondary deposit	Limestone aggregate
				III	0.4-0.49	0.09	Brown	7.5YR 4/4	Sandy clay loam	Very fine friable crumb	60% limestone gravel and pebbles	Abrupt/smooth	Fill-- bedding for runway base course Site 7275	Secondary deposit	Limestone aggregate
				IV	0.49-0.63	0.14	Very dark gray	7.5YR 3/1	Sandy clay loam	Very fine friable	10% limestone gravel; waterworn marine shells	Abrupt/wavy	Cultural deposit; Alluvium Site 7292	Intact; possibly truncated upper boundary	*Nerita picea* shell & charcoal
				V	0.63-0.71	0.08	Dark grayish brown	10YR 4/2	Sandy clay loam	Very fine friable	10% limestone gravel	Abrupt/wavy	Alluvial	Intact	-
				VI	0.71-0.93	0.22	White	10YR 8/1	Limestone	Weathered	100% decomposing limestone	Distinct/wavy	Bedrock over void	Intact	-
				VII	0.93-1.16	0.23	Yellowish brown	10YR 5/4	Clay	Massive	10% limestone gravel and pebbles	-	Alluvial fill in void	Intact	-
				VIII	1.16+	-	-	-	Limestone	Weathered	100% decomposing limestone	-	Bedrock	Intact	-
E-4-2b	5.00	1.35	Water table	I	0.0-0.07	0.07	Black	10YR 2/1	Asphalt surface	Compacted	100% aggregate	Abrupt/smooth	Asphalt pavement WWII runway Site 7275	Intact	Asphalt
				II	0.07-0.4	0.33	Dark yellowish brown	10YR 4/4	Clay	Fine friable crumb	90% crushed limestone	Abrupt/smooth	Fill- runway base course Site 7275	Secondary deposit	Limestone aggregate
				III	0.33-0.39	0.06	Black	10YR 2/1	Asphalt surface	Compacted	100% aggregate	Abrupt/smooth	Asphalt pavement WWII runway Site 7275	Intact; discontinuous, truncated	Asphalt
				IV	0.39-0.5	0.11	White	10YR 8/1	Limestone	Compacted	100% crushed limestone	Abrupt/wavy	Fill- runway base course Site 7275	Secondary deposit	Limestone aggregate
				V	0.5-0.65	0.15	Very dark gray & black	10YR 3/1 & 10YR 2/1	Clay loam	Fine friable crumb	20% limestone gravel and pebbles	Abrupt/smooth & wavy	Cultural deposit; Alluvium Site 7292	Intact; possibly truncated upper boundary	Charcoal
				VI	0.65-0.95	0.30	White	10YR 8/1	Limestone	Weathered	100% decomposing limestone	Diffuse/wavy	Bedrock over void	Intact	-
				VII	0.8-1.35	0.55	Brown	10YR 4/3	Clay	Massive	-	Unexcavated	Alluvial fill in void	Intact	-

Test Area E Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
E-4-2c	5.80	1.20	Decomposing limestone bedrock & Water table	I	0.0-0.07	0.07	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material	Distinct/wavy	Recent duff	Intact	-
				II	0.07-0.5	0.43	Dark grayish brown	10YR 4/2	Sandy clay loam	Fine friable crumb, loose	10% limestone gravel and pebbles	Abrupt/wavy	Fill- from golf course or runway	Redeposited	Asphalt fragments, limestone aggregate
				III	0.5-1.2	0.70	White	10YR 8/1	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-4-3	4.30	1.09	Decomposing limestone bedrock	I	0.0-0.06	0.06	Black	10YR 2/1	Asphalt surface	Compacted	100% aggregate	Abrupt/smooth	Asphalt pavement WWII runway Site 7275	Intact	Asphalt
				II	0.06-0.21	0.15	Very pale brown	10YR 7/3	Limestone	Compacted	100% crushed limestone	Abrupt/wavy	Fill- runway base course Site 7275	Secondary deposit	Limestone aggregate
				III	0.21-0.29	0.08	Brown	7.5YR 4/4	Sandy clay loam	Very fine friable crumb	70% limestone cobbles, pebbles and gravel	Abrupt/wavy	Fill-- bedding for runway base course Site 7275	Secondary deposit	Limestone aggregate
				IV	0.29-0.34	0.05	Dark grayish brown	10YR 4/2	Sandy clay loam	Very fine friable	10% limestone gravel and pebbles	Abrupt/wavy	Cultural deposit; Alluvium Site 7292	Intact; upper surface truncated by fill	*Cypraea* shell, charcoal
				V	0.34-1.09	0.75	Dark brown	7.5YR 3/4	Sandy clay loam	Very fine friable	Fissured & weathered limestone bedrock-boulders, cobbles, gravel and pebbles	-	Mixed Alluvial-Residual	Intact	-
E-4-3b	4.70	0.98	Decomposing limestone bedrock	I	0 0-0.6	0.60	Pale brown	10YR 6/3	Sandy clay loam	Compacted	50% limestone gravel, pebbles and cobbles	Abrupt/wavy	Fill- for WW II runway south shoulder Site 7275	Secondary deposit	Limestone aggregate
				II	0.6-0.98	0.38	-	-	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-4-3c	5.00	1.05	Water table	I	0.0-0.07	0.07	Very dark brown	10YR 2/1	Humus	Structureless	100% organic material	Distinct/wavy	Recent duff	Intact	-
				II	0.07-0.9	0.83	Very pale brown	10YR 3/2	Limestone	Compacted	100% crushed limestone	Distinct/wavy	Fill- runway base course Site 7275	Secondary deposit	Limestone aggregate
				III	0.5-0.94	0.20	Very dark gray & dark gray	10YR 3/2 & 7.5YR 3/4	Clay loam	Fine friable crumb	20% limestone gravel and pebbles	Distinct/wavy	Cultural deposit; Alluvium Site 7292	Intact; possibly truncated upper boundary	Charcoal
				IV	0.7-1.05	0.35	Dark yellowish brown & gray	10YR 8/2	Clay	Massive	-	-	Alluvial	Intact	-
E-4-4	5.50	1.03	Water table	I	0 0-0.1	0.10	Very dark brown	10YR 2/2	Clay loam	Fine friable crumb	50% organic material & roots	Distinct/wavy	Recent duff	Intact	-
				II	0.1-0.35	0.25	Brown	10YR 4/3	Sandy clay loam	Compacted	90% limestone gravel, pebbles, cobbles & boulders	Abrupt/wavy	Fill- runway base course Site 7275	Secondary deposit	Limestone aggregate
				III	0.35-1.03	0.68+	Gary & dark gray	Mottled 7.5YR 5/1 & 7.5YR 4/1	Sandy clay loam	Compacted	90% limestone gravel, pebbles, cobbles & boulders	-	Fill-- bedding for runway base course Site 7275	Secondary deposit	Limestone aggregate
E-5-1	6.20	0.40	Decomposing limestone bedrock	I	0.0-0.15	0.15	Very dark brown	7.5YR 2.5/2	Clay loam	Very fine friable	40% limestone gravel and pebbles	Distinct/wavy	Recent duff	Intact	-
				II	0.15-0.27	0.12	Yellowish brown	10YR 5/4	Clayey sand	Compacted	80% limestone gravel and pebbles	Abrupt/wavy	Fill- runway base course Site 7275	Secondary deposit	Limestone aggregate
				III	0.27-0.4	0.13	Very pale brown	10YR 7/3	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-5-2	4.70	1.33	Water table	I	0.0-0.05	0.05	Black	10YR 2/1	Asphalt surface	Compacted	100% aggregate	Abrupt/smooth	Asphalt pavement WWII runway Site 7275	Intact	Asphalt
				II	0.05-0.19	0.14	Light gray	10YR 7/1	Limestone	Compacted	100% crushed limestone	Abrupt/wavy	Fill- runway base course Site 7275	Secondary deposit	Limestone aggregate
				III	0.19-0.56	0.37	Dark gray	10YR 4/1	Sandy clay loam	Compacted	50% limestone gravel and pebbles	Abrupt/smooth	Fill-- bedding for runway base course Site 7275	Secondary deposit	Limestone aggregate
				IV	0.56-0.73	0.17	White	10YR 8/1	Limestone	Weathered	100% decomposing limestone	Distinct/wavy	Bedrock over void	Intact	-
				V	0.73-1.33	0.60	Yellowish brown	10YR 5/4	Clay	Massive	-	Unexcavated	Alluvial fill in void	Intact	-

Test Area E Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
E-5-3	7.00	0.67	Decomposing limestone bedrock & Water table	I	0.0-0.23	0.23	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material	Distinct/wavy	Recent duff	Intact	-
				II	0.23-0.67	0.44	Very pale brown	10YR 8/2	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-5-4	5.70	0.87	Water table	I	0.0-0.1	0.10	Very dark grayish brown	10YR 3/2	Clay loam	Fine friable crumb	60% organic material	Distinct/wavy	Recent duff	Intact	-
				II	0.1-0.4	0.30	Light yellowish brown & yellowish brown	10YR 6/4 & 10YR 5/4	Sandy loam	Unconsolidated	80% limestone gravel, pebbles and cobbles	Abrupt/wavy	Fill- runway base course Site 7275	Secondary deposit disturbed by road grading	Limestone aggregate
				III	0.4-0.87	0.47+	Grayish brown	10YR 5/2	Sandy clay loam	Fine friable crumb	70% limestone gravel, pebbles and cobbles	-	Fill-- bedding for runway base course Site 7275	Secondary deposit disturbed by road grading	Fire brick, 6" PVC irrigation pipe, limestone aggregate
E-5-5	5.10	0.90	Water table	I	0.0-0.1	0.10	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material	Distinct/wavy	Recent duff	Intact	-
				II	0.1-0.9	0.8+	Brown	10YR 5/3	Sandy clay loam	Compacted	90% limestone gravel, pebbles and cobbles	-	Fill- runway base course Site 7275	Secondary deposit	Limestone aggregate
E-6-1	5.40	0.68	Decomposing limestone bedrock	I	0.0-0.09	0.09	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material	Distinct/wavy	Recent duff	Intact	-
				II	0.09-0.26	0.17	Very pale brown	10YR 8/2	Limestone	Compacted	100% crushed limestone	Abrupt/wavy	Fill- runway base course Site 7275	Secondary deposit	Limestone aggregate
				III	0.26-0.34	0.08	Yellowish brown	10YR 5/4	Sandy clay loam	Very fine friable	80% limestone gravel, pebbles and cobbles	Abrupt/smooth	Fill-- bedding for runway base course Site 7275	Secondary deposit	Limestone aggregate
				IV	0.34-0.68	0.34	Very pale brown	10YR 7/3 & 10YR 8/2	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-6-2	6.20	1.05	Decomposing limestone bedrock	I	0.0-0.08	0.08	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material	Diffuse	Recent duff	Intact	-
				II	0.08-0.38	0.30	Grayish brown & dark grayish brown	10YR 5/2 & 10YR 4/2	Sandy clay loam	Very fine friable, loose	20% limestone gravel, pebbles and cobbles	Distinct/wavy	Fill	Redeposited	-
				III	0.38-0.56	0.18	Dark yellowish brown	10YR 4/4	Clay	Massive	-	Diffuse	Alluvial	Intact	-
				IV	0.56-1.05+	0.49	Very pale brown	10YR 7/3	Sandy clay	Massive	100% weathered, decomposing limestone	Abrupt	Residual	Intact	-
E-6-3	5.50	0.98	Decomposing limestone bedrock	I	0.0-0.4	0.40	Very dark brown	10YR 2/2	Clay loam	Very fine friable, loose	10% limestone gravel and pebbles & crushed basalt	Abrupt/wavy	Fill- from road grading/bedding	Redeposited	Basalt aggregate
				II	0.4-0.98	0.58	Very pale brown	10YR 7/3	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-6-4	6.20	0.90	Decomposing limestone bedrock & Water table	I	0.0-0.29	0.29	Dark brown	10YR 3/3	Sandy clay loam	Very fine friable	60% limestone gravel, pebbles and cobbles	Diffuse	Fill- from road grading/bedding	Redeposited	Modern trash, plastic, limestone aggregate
				II	0.29-0.33	0.04	Very dark brown	10YR 2/2	Sandy clay loam	Very fine friable	20% organic material	Distinct/wavy	Buried recent duff	Intact	-
				III	0.33-0.65	0.32	Brown	10YR 5/3	Sandy clay loam	Very fine friable	60% limestone gravel, pebbles and cobbles	Abrupt/wavy	Fill-- bedding for runway base course Site 7275	Secondary deposit	Limestone aggregate
				IV	0.65-0.9	0.25	Very pale brown	10YR 8/2	Sand	Very fine friable	100% Weathered, decomposing bedrock	Unexcavated	Residual	Intact	-
E-6-5	5.00	1.05	Water table	I	0.0-0.14	0.14	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material (iron wood)	Distinct/wavy	Recent duff	Intact	-
				II	0.14-0.33	0.19	Very pale brown	10YR 8/2	Limestone	Compacted	100% crushed limestone	Distinct/wavy	Fill- runway base course Site 7275	Secondary deposit	Limestone aggregate
				III	0.33-0.82	0.49	Brown	7.5YR 4/3	Clay	Very fine friable	80% limestone gravel, pebbles, cobbles & boulders	Distinct/wavy	Fill-- bedding for runway base course Site 7275	Secondary deposit	Limestone aggregate
				IV	0.82-1.05	0.23	Brown	10YR 4/3	Clay	Massive	-	Unexcavated	Alluvial	Intact	-
E-7-1	6.00	0.88	Water table	I	0.0-0.1	0.10	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material (iron wood)	Distinct/wavy	Recent duff	Intact	-
				II	0.1-0.45	0.35	Brown	10YR 5/3	Sandy clay loam	Very fine friable, loose	70% limestone gravel, pebbles and cobbles	Diffuse/wavy	Fill- runway base course Site 7275	Secondary deposit	Limestone aggregate
				III	0.45-0.67	0.22	Pale brown	10YR 6/3	Sandy clay loam	Very fine friable	50% limestone gravel and pebbles	Diffuse/wavy	Fill-- bedding for runway base course Site 7275	Secondary deposit	Limestone aggregate
				IV	0.67-0.88	0.21	Dark yellowish brown	10YR 4/4	Clay	Massive	-	-	Alluvial	Intact	-

Test Area E Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
E-7-2	5.80	0.96	Decomposing limestone bedrock	I	0.0-0.09	0.09	Very pale brown	7.5YR 2.5/2	Clay loam	Very fine friable	80% organic material (iron wood)	Distinct/wavy	Recent duff	Intact	-
				II	0.09-0.47	0.38	Pale brown	10YR 6/3	Sandy clay loam	Very fine friable	80% weathered limestone gravel, pebbles and cobbles	Distinct/wavy	Fill- runway base course Site 7275	Secondary deposit	Limestone aggregate
				III	0.47-0.96	0.49	Yellowish brown	10YR 5/4	Clay	Massive	-	Abrupt/wavy	Alluvial	Intact	-
				IV	0.9-0.96	.06+	Very pale brown	10YR 7/3	Sandy clay/Gley	Sticky, plastic	-	Unexcavated	Alluvial	Intact	-
				V	0.69-0.96+	0.25	-	-	Limestone	Weathered	100% decomposing limestone	Unexcavated	Residual	Intact	-
E-7-3	5.00	0.98	Decomposing limestone bedrock & Water table	I	0.0-0.08	0.08	Dark brown	7.5YR 3/2	Sandy clay loam	Very fine friable	organic material	Diffuse	Recent duff	Intact	-
				II	0.08-0.3	0.22	Dark brown & brown	Mottled 7.5YR 3/3 & 7.5YR 4/3	Sandy clay loam	Very fine friable	60% limestone gravel, pebbles and cobbles	Distinct/wavy	Fill- runway base course Site 7275	Redeposited during road construction	4-inch PVC water pipeline & trench; asphalt fragments, limestone aggregate
				III	0.3-0.98	0.68	Very pale brown	10YR 7/3 & 10YR 8/2	Limestone	Weathered	100% decomposing limestone	Unexcavated	Residual	Intact	-
E-7-4	5.00	0.80	Water table	I	0.0-0.3	0.30	Dark brown	10YR 3/3	Sandy clay loam	Very fine friable	60% limestone gravel, pebbles and cobbles	Distinct/wavy	Fill- runway base course Site 7275	Secondary deposit	Limestone aggregate
				II	0.3-0.59	0.29	Pale brown	10YR 6/3	Sandy clay loam	Very fine friable	60% limestone gravel, pebbles and cobbles	Distinct/wavy	Fill-- bedding for runway base course Site 7275	Secondary deposit	Limestone aggregate
				III	0.59-0.8	0.21	Very pale brown	10YR 8/2	Sandy clay loam	Very fine friable	60% weathered limestone gravel, pebbles and cobbles	Unexcavated	Alluvial	Intact?	-
E-7-5	5.70	0.76	Decomposing limestone bedrock & Water table	I	0.0-0.07	0.07	Dark brown	7.5YR 3/2	Humus	Structureless	100% organic material (iron wood)	Abrupt/wavy	Recent duff	Intact	-
				II	0.07-0.14	0.07	Black	10YR 2/1	Asphalt surface	Compacted	100% aggregate	Abrupt/smooth	Asphalt pavement WWII runway Site 7275	Intact	Asphalt
				III	0.14-0.36	0.22	Brown	10YR 4/3	Sandy clay loam	Very fine friable	50% limestone gravel, pebbles and cobbles	Diffuse/wavy	Fill- runway base course Site 7275	Secondary deposit	Limestone aggregate
				IV	0.36-0.76	0.40	Very pale brown	10YR 8/2	Limestone	Weathered	100% decomposing limestone	Unexcavated	Residual	Intact	-
E-8-1	5.30	0.76	Decomposing limestone bedrock & Water table	I	0.0-0.05	0.05	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material (iron wood)	Distinct/wavy	Recent duff	Intact	-
				II	0.05-0.4	0.35	Very pale brown	10YR 8/2	Limestone	Weathered	100% decomposing limestone	Abrupt/wavy	Bedrock over void	Intact	-
				III	0.4-0.57	0.17	Yellowish brown	10YR 5/4	Clay	Massive	< 10% limestone gravel	Abrupt/wavy	Alluvial fill in void	Intact	-
				V	0.57-0.76	0.19	White	10YR 8/1	Limestone	Weathered	100% decomposing limestone	Unexcavated	Bedrock	Intact	-
E-8-2	6.20	0.90	Decomposing limestone bedrock & Water table	I	0.0-0.08	0.08	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material (iron wood)	Distinct/wavy	Recent duff	Intact	-
				II	0.08-0.53	0.45	Very pale brown	10YR 8/2	Limestone	Weathered	100% decomposing limestone	Abrupt/wavy	Bedrock over void	Intact	-
				III	0.53-0.83	0.30	Yellowish brown	10YR 5/4	Clay	Massive	-	Distinct/wavy	Alluvial fill in void	Intact	-
				V	0.83-0.9	0.07	White	10YR 8/1	Clay	Massive	-	Unexcavated	Alluvial fill in void	Intact	-
E-8-3	5.30	1.58	Decomposing limestone bedrock & Water table	I	0.0-0.73	0.73	Dark brown	7.5YR 3/3	Sandy clay loam	Very fine friable	25% limestone gravel, pebbles and	Abrupt/smooth	Fill- push pile	Redeposited	Asphalt fragments
				II	0.73-0.77	0.04	Very dark gray	10YR 3/1	Sandy clay loam	Very fine friable	70% limestone gravel and pebbles	Abrupt/smooth	Fill- runway base course Site 7275	Redeposited during road construction	-
				III	0.77-1.00	0.23	Very pale brown	10YR 8/2	Limestone	Weathered	100% decomposing limestone	Distinct/wavy	Bedrock over void	Intact	-
				V	1.00-1.48	0.48	Pale brown & dark yellowish brown	10YR 6/3 & 10YR 4/4	Clay	Massive	20% limestone gravel and pebbles	Unexcavated	Alluvial fill in void	Intact	-
E-8-4	5.30	0.86	Decomposing limestone bedrock & Water table	I	0.0-0.15	0.15	Dark brown	7.5YR 3/3	Clay loam	Very fine friable	organic duff	Abrupt/wavy	Fill- from golf course or road	Redeposited	-
				II	0.15-0.23	0.08	Black	10YR 2/1	Asphalt surface	Compacted	100% aggregate	Abrupt/smooth	Asphalt pavement WWII runway Site 7275	Intact	Asphalt
				III	0.23-0.62	0.39	Dark yellowish brown	10YR 4/4	Sandy clay loam	Loose	10% limestone gravel and pebbles	Distinct/wavy	Fill- runway base course Site 7275	Secondary deposit	-
				V	0.62-0.86	0.24	Brown	10YR 5/2 & 7.5YR 5/4	Limestone	Weathered	100% decomposing limestone	Unexcavated	Residual	Intact	-

Test Area E Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
E-9-1	6.30	1.08	Decomposing limestone bedrock	I	0.0-0.12	0.12	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material	Distinct/wavy	Recent duff	Intact	-
				II	0.12-0.35	0.23	Dusky red	2.5YR 3/3	Clay loam	Very fine friable	40% limestone gravel	Abrupt/wavy	Fill- associated w/golf course	Redeposited	-
				III	0.35-0.67	0.32	Very dark grayish brown	10YR 3/2	Sandy clay loam	Very fine friable crumb	30% limestone gravel and pebbles	Abrupt/wavy	Fill- from golf course or pond	Redeposited	-
				V	0.67-1.08	0.41	White	10YR 8/1	Sand	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-9-2	6.50	0.95	Water table	I	0.0-0.07	0.07	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material	Distinct/wavy	Recent duff	Intact	-
				II	0.07-0.33	0.26	Dark grayish brown	10YR 4/2	Sandy clay loam	Loose, very fine friable crumb	80% limestone gravel, pebbles and cobbles	Distinct/wavy	Fill- runway base course Site 7275	Redeposited during road construction	-
				III	0.33-0.68	0.35	Dark grayish brown	10YR 4/2	Sandy clay loam	Very compacted	80% limestone gravel, pebbles, cobbles and boulders	Diffuse/wavy	Fill- runway bedding for base course Site 7275	Redeposited during road construction	-
				V	0.68-0.95	0.27	Grayish brown	10YR 5/2	Clay	Massive	-	Unexcavated	Alluvial	Intact	
E-9-3	6.30	1.20	Decomposing limestone bedrock & Water table	I	0.0-0.3	0.30	Very dark brown	7.5YR 2.5/2	Green waste	Structureless	100% organic material	Abrupt/wavy	Fill- push pile	Redeposited	Modern trash; Xmas lights, plastic
				II	0.3-1.05	0.75	Brown	10YR 5/3	Sandy clay loam	Very fine friable	80% limestone gravel, pebbles and cobbles	Distinct/wavy	Fill- runway base course Site 7275	Redeposited during road construction	Asphalt- large fragments
				III	1.05-1.2	0.15	Very pale brown	10YR 8/2	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-9-4	4.50	0.36	Decomposing limestone bedrock	I	0.0-0.08	0.08	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material (iron wood)	Abrupt/smooth	Recent duff	Intact	-
				II	0.08-0.15	0.07	Black	10YR 2/1	Asphalt surface	Compacted	100% aggregate	Abrupt/smooth	Asphalt pavement WWII runway Site 7275	Intact	Asphalt
				III	0.15-0.36+	-	-	-	Limestone	Weathered	100% decomposing limestone	Unexcavated	Residual	Intact	-
E-9-5	5.00	1.42	Decomposing limestone bedrock & Water table	I	0.0-0.25	0.25	Dusky red	2.5YR 3/2	Clay loam	Loose, very fine friable crumb	-	Diffuse/wavy	Fill- associated w/golf course	Redeposited	-
				II	0.25-0.5	0.25	Grayish brown	10YR 5/2	Clay loam	Compacted	80% limestone gravel, pebbles and cobbles	Diffuse/wavy	Fill- runway base course Site 7275	Redeposited during golf course construction	-
				III	0.5-0.66	0.16	Pale brown	10YR 6/3	Sandy clay loam	Very fine friable crumb	80% limestone gravel, pebbles and cobbles	Diffuse/wavy	Fill- runway bedding for base course Site 7275	Redeposited during golf course construction	-
				IV	0.66-0.9	0.24	Dark grayish brown	10YR 4/2	Sandy clay	Very fine crumb	20% limestone gravel, pebbles and cobbles	Diffuse/wavy	Alluvial	Intact	-
				V	0.9-1.26	0.36	Very pale brown	10YR 8/2	Limestone	Weathered	100% decomposing limestone	Distinct/wavy	Bedrock over void	Intact	-
				VI	1.26-1.42	0.16	Dark gray	10YR 4/1	Clay	Massive	-	Unexcavated	Alluvial fill in void	Intact	-
E-10-1	5.50	1.16	Decomposing limestone bedrock	I	0.0-0.1	0.10	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material (iron wood)	Abrupt/smooth	Recent duff	Intact	-
				II	0.1-0.35	0.25	Brown	10YR 4/2	Clay loam	Very fine friable crumb	20% limestone gravel and pebbles	Abrupt/wavy	Fill- associated w/golf course	Redeposited	Plastic fragments
				III	0.35-1.16	0.81	Very pale brown	10YR 8/2	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-10-2	5.20	0.54	Decomposing limestone bedrock	I	0.0-0.45	0.40	Brown	10YR 4/3	Clay loam	Loose, very fine friable crumb	20% limestone gravel, pebbles and cobbles	Distinct/wavy	Fill- from pond construction	Redeposited	black plastic
				II	0.40-0.54	0.14	Black & brown	7.5YR 2.5/1 & 10YR 5/3	Clay loam & clayey sand	Very fine friable crumb	< 10% limestone gravel	Abrupt/smooth	Cultural deposit; Alluvial, Site 7293	Intact; truncated from pond construction	urchin, charcoal & heat-altered rock
				III	0.40+	-	-	-	Limestone	Weathered	100% decomposing limestone	Unexcavated	Residual	Intact	-
E-10-3	6.60	0.90	Decomposing limestone bedrock	I	0.0-0.44	0.44	Very dark brown	10YR 2/2	Loam	Loose, very fine friable crumb	15% limestone gravel and pebbles	Distinct/wavy	Fill- near road	Redeposited	Modern trash: aluminum can, black plastic, asphalt
				II	0.44-0.54	0.10	Dark yellowish brown	10YR 4/4	Sandy clay loam	Very fine friable	10% limestone gravel and pebbles	Distinct/wavy	Alluvium	Intact	-
				III	0.54-0.68	0.14	Pale brown	10YR 6/3	Sand	Loose, single grain	< 10% limestone gravel and pebbles; sand derived from limestone substrate	Abrupt/smooth	Alluvial	Intact	-
				IV	0.68-0.79	0.11	Dark gray	10YR 4/1	Clay	Massive	-	Distinct/wavy	Alluvial	Intact	-
				V	0.79-0.9	0.11	White	10YR 8/1	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-

Test Area E Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
E-10-4	5.90	0.72	Decomposing limestone bedrock	I	0.0-0.09	0.09	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material	Distinct/wavy	Recent duff	Intact	-
				II	0.09-0.3	0.21	Very dark grayish brown	10YR 3/2	Clay loam	Compacted	95% crushed basalt- 2-inch	Distinct/wavy	Fill- road construction	Secondary deposit	Basalt aggregate
				III	0.3-0.72	0.42	Grayish brown	10YR 5/2	Sandy clay loam	Compacted	80% weathered limestone gravel, pebbles and cobbles	Distinct/wavy	Fill- runway base course Site 7275	Redeposited during road construction	Asphalt fragments
				IV	0.72+	-	-	-	Limestone	Weathered	100% decomposing limestone	Unexcavated	Residual	Intact	-
E-10-5	5.20	0.98	Decomposing limestone bedrock & Water table	I	0.0-0.25	0.25	Very dusky red	2.5YR 2.5/2	Clay loam	Very fine friable	50% limestone gravel	Abrupt/wavy	Fill- runway base course Site 7275	Redeposited during golf course construction	Limestone aggregate
				II	0.25-0.45	0.20	Pale brown	10YR 6/3	Sandy clay loam	Very fine friable crumb	80% limestone gravel, pebbles and cobbles	Distinct/wavy	Fill- runway bedding for base course Site 7275	Redeposited during golf course construction	Limestone aggregate
				III	0.45-0.9	0.45	Very pale brown	10YR 8/2	Sand	Coarse	50% limestone gravel and pebbles	Abrupt/smooth	Alluvial	Intact	-
				IV	0.9-0.98	0.08	Yellowish brown	10YR 5/4	Clay	Sticky, plastic	-	Abrupt	Alluvial	Intact	-
				V	0.98+	-	-	-	Limestone	Weathered	100% decomposing limestone	Unexcavated	Residual	Intact	-
E-10-6	5.60	1.25	Decomposing limestone bedrock	I	0.0-0.36	0.36	Very dusky red	2.5YR 2.5/2	Clay loam	Coarse	50% limestone gravel, pebbles and cobbles	Abrupt/wavy	Fill- associated w/golf course	Redeposited	Limestone aggregate
				II	0.36-0.56	0.20	Very dark grayish brown	10YR 3/2	Sandy clay loam	Very fine friable	80% limestone gravel and pebbles	Distinct/wavy	Fill- runway base course Site 7275	Redeposited during golf course construction	Asphalt fragments, limestone aggregate
				III	0.56-0.75	0.19	Very dark grayish brown	10YR 3/2	Sandy clay loam	Very fine friable	50% limestone gravel and pebbles	Distinct/wavy	Fill-- bedding for runway base course Site 7275	Redeposited during golf course construction	Limestone aggregate
				IV	0.75-1.25	0.50	Very pale brown	10YR 8/2	Sand	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-11-1	5.80	1.75	Decomposing limestone bedrock	I	0.0-0.75	0.75	Dark reddish brown	5YR 3/3	Sandy clay loam	Very fine friable crumb	15% limestone gravel, pebbles and cobbles; green waste	Distinct/smooth	Fill- push pile	Redeposited	Plastic, glass fragments, limestone aggregate
				II	0.41-0.5	0.09	Black	10YR 2/1	Asphalt surface	Compacted	100% aggregate	Distinct/smooth	Asphalt pavement WWII runway Site 7275	Intact	Asphalt
				III	0.5-0.62	0.11	Light gray	10YR 7/2	Limestone	Compacted	100% crushed limestone	Distinct/smooth	Fill- runway base course Site 7275	Secondary deposit	Limestone aggregate
				IV	0.62-0.92	0.30	Yellowish brown	10YR 5/4	Sandy clay loam	Very fine friable crumb	70% limestone gravel, pebbles, cobbles and boulders	Abrupt/wavy	Fill-- bedding for runway base course Site 7275	Secondary deposit	Limestone aggregate
				V	0.92-1.42	0.50	Light gray	10YR 7/2	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-11-2	5.80	1.35	Decomposing limestone bedrock & Water table	I	0.0-0.07	0.07	Black	7.5YR 2.5/1	Clay loam	Structureless	60% organic material; 30% crushed	Abrupt/wavy	Recent duff	Redeposited	Asphalt fragments
				II	0.07-0.13	0.06	Black	10YR 2/1	Asphalt surface	Compacted	100% aggregate	Abrupt/smooth	Asphalt pavement WWII runway Site 7275	Intact	Asphalt
				III	0.13-0.4	0.27	Light gray	10YR 7/2	Limestone	Compacted	100% crushed limestone	Abrupt/smooth	Fill- runway base course Site 7275	Secondary deposit	Limestone aggregate
				IV	0.4-0.95	0.55	Dark grayish brown	10YR 4/2	Sandy clay loam	Very fine friable	80% weathered limestone	Distinct/wavy	Fill-- bedding for runway base course Site 7275	Secondary deposit	
				V	0.95-1.35	0.40	Light gray	10YR 7/2	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-11-3	4.50	1.03	Decomposing limestone bedrock	I	0.0-0.1	0.10	Black	7.5YR 2.5/1	Clay loam	Structureless	60% organic material; 30% crushed asphalt fragments	Abrupt/wavy	Recent duff	Redeposited	Asphalt fragments
				II	0.1-0.19	0.09	Brown	10YR 4/3	Sandy clay loam	Very fine friable crumb	40% limestone gravel, pebbles and cobbles	Abrupt/wavy	Fill- road grading	Redeposited	Limestone aggregate
				III	0.19-0.45	0.26	Brown	10YR 4/3	Sandy clay loam	Very fine friable crumb	40% limestone gravel, pebbles and cobbles	Distinct/wavy	Alluvial	Intact- upper surface truncated by grading	-
				IV	0.45-1.03	0.58	-	-	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-

Test Area E Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
E-11-4	5.30	0.88	Water table	I	0.0-0.1	0.10	Black	7.5YR 2.5/1	Clay loam	Structureless	60% organic material; 30% crushed asphalt fragments	Distinct/wavy	Recent duff	Redeposited	Asphalt fragments
				II	0.1-0.62	0.52	Brown	10YR 5/3	Loamy sand	Very fine friable crumb	50% limestone gravel, pebbles and cobbles	Abrupt/smooth	Alluvial	Intact	-
				III	0.62-0.88	0.26	Light brownish gray	10YR 6/2	Sand	Single grain	-	-	Aeolian	Intact	-
E-11-5	5.50	1.00	Decomposing limestone bedrock	I	0.0-0.17	0.17	Black	7.5YR 2.5/1	Clay loam	Structureless	60% organic material; 30% crushed asphalt fragments	Distinct/wavy	Recent duff	Redeposited	Asphalt fragments
				II	0.17-0.25	0.08	Very pale brown	10YR 7/4	Limestone	Compacted	100% crushed limestone	Distinct/wavy	Fill- runway base course Site 7275	Secondary deposit	Limestone aggregate
				III	0.25-0.75	0.50	Brown	10YR 4/3	Sandy clay loam	Very fine friable	70% limestone gravel, pebbles and	Distinct/wavy	Alluvial	Intact	-
				IV	0.75-1.0	0.25	White	10YR 8/1	Limestone	Coarse	100% weathered, decomposing limestone	-	Residual	Intact	-
E-11-6	3.60	0.88	Decomposing limestone bedrock & Water table	I	0.0-0.24	0.24	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material	Distinct/wavy	Recent duff	Intact	-
				II	0.24-0.88	0.64	Brown & Pinkish white	7.5YR 4/4 & 7.5YR 8/2	Sand	Coarse	100% weathered, decomposing limestone	-	Residual	Intact	-
E-11-7	5.00	1.25	Decomposing limestone bedrock & Water table	I	0.0-0.13	0.13	Very dusky red	2.5YR 2.5/2	Clay loam	Very fine friable crumb	10% limestone gravel and pebbles	Abrupt/smooth	Redeposited	Disturbed	-
				II	0.13-0.21	0.08	Black	10YR 2/1	Asphalt surface	Compacted	100% aggregate	Abrupt/smooth	Asphalt pavement WWII runway Site 7275	Intact	Asphalt
				III	0.21-0.36	0.15	Brown	10YR 5/3	Sandy clay loam	Compacted	80% crushed limestone gravel, pebbles and cobbles	Diffuse/wavy	Fill- runway base course Site 7275	Secondary deposit	Limestone aggregate
				IV	0.36-1.25	0.89	Very pale brown	10YR 8/2	Sand	Coarse	100% weathered, decomposing limestone	-	Residual	Intact	-
E-12-1	5.60	1.40	Decomposing limestone bedrock	I	0.0-0.6	0.60	Brown	10YR 4/3	Sandy clay loam	Fine friable crumb	30% limestone gravel, pebbles and cobbles	Abrupt/smooth	Fill- associated w/golf course	Redeposited	undecorated white earthenware fragment
				II	0.6-0.68	0.08	Black	10YR 2/1	Asphalt surface	Compacted	100% aggregate	Abrupt/smooth	Asphalt pavement WWII runway Site 7275	Intact	Asphalt
				III	0.68-0.92	0.24	Brown & light gray	Mottled 10YR 5/3 & 10YR 7/2	Clay loam	Fine friable crumb	90% weathered limestone gravel and pebbles	Distinct/wavy	Fill- runway base course Site 7275	Secondary deposit	-
				IV	0.92-1.4	0.48	Brown	10YR 4/3	Clay loam	Fine friable crumb	20% limestone gravel and pebbles	Abrupt/wavy	Alluvial	Intact	-
				V	1.4+	-	-	-	Limestone	Weathered	100% decomposing limestone	Unexcavated	Residual	Intact	-
E-12-2	5.00	1.62	Decomposing limestone bedrock & Water table	I	0.0-0.06	0.06	Black	10YR 2/1	Asphalt surface	Compacted	100% aggregate	Abrupt/smooth	Asphalt pavement WWII runway Site 7275	Intact	Asphalt
				II	0.06-0.5	0.44	Dark grayish brown	10YR 4/2	Sandy clay loam	Fine friable crumb	50% crushed limestone gravel, pebbles and cobbles	Distinct/wavy	Fill- runway base course Site 7275	Secondary deposit	Limestone aggregate
				III	0.5-0.85	0.35	Dark brown & brown	Mottled 10YR 3/3 & 10YR 4/3	Clay loam	Compacted	20% limestone gravel and pebbles	Abrupt/wavy	Alluvial	Intact- upper surface possibly truncated	-
				IV	0.85-1.1	0.25	Light brownish gray	10YR 6/2	Limestone	Weathered	100% decomposing limestone	Abrupt/smooth	Bedrock over void	Intact	-
				V	1.1-1.24	0.14	Brown	Mottled 10YR 4/2 & 5YR 3/4	Clay	Massive	Sparse limestone gravel	Distinct/smooth	Alluvial fill in void	Intact	-
				VI	1.24-1.62	0.38	Gray	10YR 5/1	Clay	Massive	Sparse limestone gravel	-	Alluvial fill in void	Intact	-
E-12-3	5.20	1.45	Decomposing limestone bedrock & Water table	I	0.0-0.06	0.06	Very dark brown	7.5YR 2.5/2	Clay loam	Structureless	75% organic material	Distinct/wavy	Recent duff	Intact	-
				II	0.06-0.3	0.24	Dark yellowish brown	10YR 4/4	Sandy clay loam	Fine friable crumb	70% limestone gravel, pebbles and cobbles	Distinct/wavy	Fill- runway base course Site 7275	Redeposited during road construction	Limestone aggregate
				III	0.3-0.73	0.43	Brown	10YR 5/3	Sandy clay loam	Fine friable crumb	80% limestone gravel, pebbles and cobbles (predominantly cobbles)	Abrupt/wavy	Fill-- bedding for runway base course Site 7275	Secondary deposit	Limestone aggregate
				IV	0.73-1.0	0.27	Dark grayish brown	10YR 4/2	Clay	Massive	Sparse limestone gravel	Distinct/smooth	Alluvial	Intact	-
				V	1.0-1.45	0.35	Very pale brown	10YR 7/3	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-

Test Area E Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
E-12-4	5.30	1.05	Decomposing limestone bedrock & Water table	I	0.0-0.15	0.15	Very dark brown	7.5YR 2.5/2	Clay loam	Structureless	80% organic material (ironwood) & roots	Distinct/wavy	Recent duff	Intact	-
				II	0.15-0.4	0.25	Yellowish brown	10YR 5/4	Sandy clay loam	Fine friable crumb	60% limestone gravel, pebbles and cobbles	Abrupt/wavy	Fill-- bedding for runway base course or runway shoulder Site 7275	Secondary deposit	Limestone aggregate
				III	0.4-1.05	0.65	-	-	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-12-5	5.40	0.80	Water table	I	0.0-0.24	0.24	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material	Distinct/wavy	Recent duff	Intact	Sheet metal
				II	0.24-0.5	0.26	Brown	10YR 4/3	Sandy clay loam	Fine friable crumb	30% limestone gravel, pebbles and	Abrupt/smooth	Alluvial	Intact	-
				III	0.5-0.8	0.3+	Light greenish gray	G1 7/10GY	Gley	Non-sticky, slightly plastic	-	-	Residual	Intact	-
E-12-6	6.00	1.10	Decomposing limestone bedrock & Water table	I	0.0-0.12	0.12	Very dark brown	7.5YR 2.5/2	Clay loam	Structureless	80% organic material (ironwood) & roots	Abrupt/smooth	Recent duff	Intact	-
				II	0.12-0.2	0.08	Black	10YR 2/1	Asphalt surface	Compacted	100% aggregate	Abrupt/smooth	Asphalt pavement WWII runway Site 7275	Intact	Asphalt
				III	0.2-0.27	0.07	Very pale brown	10YR 7/4	Limestone	Compacted	100% crushed limestone	Abrupt/wavy	Fill- runway base course Site 7275	Secondary deposit	Limestone aggregate
				IV	0.27-0.7	0.43	Brown	10YR 4/3	Sandy clay loam	Fine friable crumb	60% limestone gravel, pebbles and cobbles	Distinct/wavy	Fill-- bedding for runway base course Site 7275	Secondary deposit	Limestone aggregate
				V	0.7-1.1	0.40	Very pale brown	10YR 8/2	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-12-7	5.00	0.90	Decomposing limestone bedrock	I	0.0-0.25	0.25	Dark reddish brown	5YR 3/4	Clay	Sticky, fine friable crumb	Sparse limestone gravel	Abrupt/wavy	Fill- associated w/golf course	Redeposited	-
				II	0.25-0.9	0.65	Light gray	10YR 7/2	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-12-8	5.20	0.76	Decomposing limestone bedrock	I	0.0-0.21	0.21	Dark reddish brown	5YR 3/4	Clay	Sticky, fine friable crumb	Sparse limestone gravel	Abrupt/wavy	Fill- associated w/golf course	Redeposited	-
				II	0.21-0.76	0.55	Light gray	10YR 7/2	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-13-1	5.90	0.87	Decomposing limestone bedrock	I	0.0-0.08	0.24	Black	7.5YR 2.5/1	Humus	Structureless	100% organic material & roots	Abrupt/wavy	Recent duff	Intact	-
				II	0.08-0.32	0.24	Brown	10YR 5/3	Clay loam	Fine friable crumb	60% limestone gravel and pebbles	Distinct/wavy	Fill- associated w/golf course	Redeposited	-
				III	0.32-0.87	0.55	Very pale brown	10YR 8/2	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-13-2	5.50	0.90	Water table	I	0.0-0.1	0.10	Very dark brown	7.5YR 2.5/2	Clay loam	Structureless	90% organic material (ironwood)	Abrupt/wavy	Recent duff	Intact	-
				II	0.1-0.38	0.28	Dark grayish brown	10YR 4/2	Clay loam	Very fine friable crumb	80% weathered limestone	Abrupt/smooth	Fill- runway base course Site 7275	Secondary deposit; disturbed	Asphalt fragments
				III	0.38-0.46	0.08	Black	10YR 2/1	Clay loam	Very fine friable crumb	10% limestone gravel; oxidation	Abrupt & discontinuous	Alluvium- Buried A horizon?	Intact	Charcoal flecks
				IV	0.22-0.66	0.44	Very pale brown	10YR 8/2	Limestone	Weathered	100% decomposing limestone	Distinct/wavy	Bedrock over void	Intact	-
				V	0.66-0.9	0.24+	Dark yellowish brown	10YR 4/4	Clay	Massive	< 10% limestone gravel	-	Alluvial fill in void	Intact	-
E-13-3	7.00	0.35	Water table	I	0.0-0.12	0.12	Black	10YR 2/1	Clay loam	Very fine friable crumb	50% organic material (ironwood, date palm)	Distinct/wavy	Recent duff	Intact	-
				II	0.12-0.35	0.23+	Brown	10YR 5/3	Clay	Very fine friable crumb	20% limestone gravel and pebbles	-	Alluvial	Intact	-
E-13-4	4.60	0.76	Water table	I	0.0-0.1	0.10	Very dark brown	7.5YR 2.5/2	Clay loam	Structureless	80% organic material (ironwood, date palm)	Abrupt/wavy	Recent duff	Intact	-
				II	0.1-0.38	0.28	Brown	10YR 4/3	Sandy clay loam	Very fine friable crumb	10% limestone gravel and pebbles	Distinct/smooth	Alluvium	Intact	-
				III	0.38-0.76	0.38+	Dark grayish brown	10YR 4/2	Clay	Very fine friable crumb	70% weathered limestone	-	Alluvial	Intact	-

Test Area E Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
E-13-5	6.50	0.94	Water table	I	0.0-0.8	0.08	Very dark brown	7.5YR 2.5/2	Clay loam	Structureless	80% organic material (ironwood, date palm)	Distinct/wavy	Recent duff	Intact	-
				II	0.08-0.64	0.56	Dark grayish brown	10YR 4/2	Sandy clay loam	Fine friable crumb	10% limestone gravel and pebbles	Distinct/wavy	Alluvium	Intact	-
				III	0.64-0.94	0.3+	Dark grayish brown	10YR 4/2	Clay	Fine friable crumb	10% limestone gravel	-	Alluvial	Intact	-
E-13-6	5.00	0.95	Decomposing limestone bedrock	I	0-0.0.1	0.10	Very dark brown	7.5YR 2.5/2	Clay loam	Structureless	80% organic material & roots	Abrupt/wavy	Recent duff	Intact	-
				II	0.1-0.55	0.45	Brown	10YR 4/3	Sandy clay loam	Fine friable crumb	15% limestone gravel and pebbles	Abrupt/smooth	Fill- road construction	Redeposited (churned)	-
				III	0.45-0.67	0.22	Black	10YR 2/1	Loam	Fine friable crumb	10% limestone gravel and pebbles	Abrupt/smooth	Cultural deposit; Alluvium-buried A horizon, Site 7294	Intact; upper surface possibly truncated by road construction	Sparse fire-altered rock, 1 basalt flake, burned crab claw & sparse charcoal flecks
				IV	0.52-0.95	0.43	Dark gray & light gray	10YR 4/1 & 10YR 7/2	Limestone w/pockets of clay	Fine friable crumb	90% weathered and decomposing limestone	-	Residual	Intact	-
E-13-6b	4.95	1.12	Decomposing limestone bedrock	I	0.0-0.05	0.05	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material	Distinct/wavy	Recent duff	Intact	-
				II	0.05-0.4	0.35	Brown	10YR 4/3	Clay loam	Very fine friable crumb	50% limestone gravel and pebbles	Distinct/wavy	Fill- WW II revetment area south of runway Site 7275	Redeposited during road construction?	Limestone aggregate
				III	0.25-0.54	0.29	Yellowish brown	10YR 5/4	Clay loam	Very fine friable crumb	60% limestone gravel and pebbles	Distinct/wavy	Fill- WW II revetment area south of runway Site 7275	Redeposited during road construction?	Limestone aggregate
				IV	0.29-0.98	0.69	Brown	10YR 4/3	Clay loam	Very fine friable crumb	50% limestone gravel, pebbles and cobbles	Distinct/wavy	Cultural deposit; Alluvium-buried A horizon, Site 7294	Intact; upper surface possibly truncated by road construction	*Theodoxus neglectus* shell
				V	0.95-1.12	0.17	Dark gray to Dark grayish brown	10YR 4/1 to 10YR 4/2	Clay	Very fine friable crumb	60% weathered limestone	-	Alluvial	Intact	-
E-13-6c	3.20	1.00	Decomposing limestone bedrock	I	0.0-0.08	0.08	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material (ironwood)	Distinct/wavy	Recent duff	Intact	-
				II	0.08-0.45	0.37	Brown	10YR 4/3	Clay loam	Very fine friable crumb	15% limestone gravel and pebbles	Distinct/wavy	Alluvium	Intact	-
				III	0.4-0.85	0.45	Dark grayish brown	10YR 4/2	Clay loam	Very fine friable crumb	20% limestone gravel, pebbles & cobbles	Distinct/wavy	Cultural deposit; Alluvium-buried A horizon, Site 7294	Intact	Charcoal
				IV	0.84-1.0	0.16	Light gray & Very pale brown	10YR 7/2 & 10YR 7/3	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-13-6d	3.50	0.82	Decomposing limestone bedrock	I	0.0-0.07	0.07	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material (ironwood)	Distinct/wavy	Recent duff	Intact	-
				II	0.07-0.5	0.43	Brown	10YR 4/3	Clay loam	Very fine friable crumb	10% limestone gravel and pebbles	Distinct/wavy	Alluvium	Intact	-
				III	0.4-0.65	0.25	Dark grayish brown	10YR 4/2	Clay loam	Very fine friable crumb	40% weathered limestone gravel, pebbles & cobbles	Distinct/wavy	Cultural deposit, Alluvium-buried A horizon, Site 7294	Intact	*Cypraea* shell, charcoal
				IV	0.6-0.82	0.22	Light gray & Very pale brown	10YR 7/2 & 10YR 7/3	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-

Test Area E Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
E-13-6e	3.00	0.80	Decomposing limestone bedrock	I	0.0-0.07	0.07	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material (ironwood)	Distinct/wavy	Recent duff	Intact	-
				II	0.07-0.44	0.37	Brown	10YR 4/3	Clay loam	Very fine friable	10% limestone gravel and pebbles	Distinct/wavy	Alluvium	Intact	-
				III	0.44-0.52	0.08	Very dark grayish brown & dark grayish brown	10YR 3/2 & 10YR 4/2	Clay loam	Very fine friable crumb	10% limestone gravel and pebbles	Distinct/wavy	Cultural deposit; Alluvium-buried A horizon, Site 7294	Intact	Very sparse charcoal flecks
				IV	0.52-0.72	0.20	Brown	10YR 5/3	Clay	Very fine friable crumb	30% weathered limestone	Distinct/wavy	Alluvial	Intact	-
				V	0.72-0.8	0.08	-	-	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-13-6f	3.00	1.05	Decomposing limestone bedrock	I	0.0-0.07	0.07	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material	Distinct/wavy	Recent duff	Intact	-
				II	0.07-0.48	0.41	Dark grayish brown	10YR 4/2	Clay loam	Very fine friable	30% limestone gravel and pebbles	Distinct/wavy	Fill- road construction	Redeposited	Plastic, aluminum pop cans
				III	0.48-1.05	0.57	Very pale brown	10YR 8/2	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-13-6g	3.00	0.95	Decomposing limestone bedrock	I	0.0-0.07	0.07	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material (*haole koa*)	Distinct/wavy	Recent duff	Intact	-
				II	0.07-0.7	0.63	Dark yellowish brown & light yellowish brown	10YR 4/4 & 10YR 6/4	Clay loam	Very fine friable	95% crushed limestone	Distinct/wavy	Fill- WW II revetment area south runway shoulder Site 7275	Secondary deposit	Limestone aggregate
				III	0.7-0.75	0.05	Pale brown	10YR 6/3	Beach Sand	Fine, single grain	-	Distinct/wavy	Fill	Secondary deposit	-
				IV	0.75-0.95	0.20	Very pale brown	10YR 7/4	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-13-7	5.50	1.15	Decomposing limestone bedrock	I	0.0-0.15	0.15	Very dark grayish brown	10YR 3/2	Clay loam	Fine friable crumb	50% organic material & roots	Abrupt/wavy	Recent duff	Intact	-
				II	0.15-0.53	0.38	Brown	10YR 4/3	Loamy sand	Unconsolidated	30% limestone gravel, pebbles and cobbles	Abrupt/wavy	Fill- WW II revetment area south of runway Site 7275	Redeposited during road construction?	Limestone aggregate
				III	0.53-0.85	0.32	Pale brown & light brownish gray	10YR 6/3 & 10YR 6/2	Sand	Coarse, single grain	10% limestone gravel and pebbles	Abrupt/wavy	Fill- WW II revetment area south of runway Site 7275	Redeposited during road construction?	Sparse asphalt fragments, limestone aggregate
				IV	0.85-1.15	0.30	Dark grayish brown	10YR 4/2	Sandy clay	Fine friable crumb	10% limestone gravel	-	Alluvial	Intact	-
				V	1.15	-	-	-	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-13-8	5.70	0.72	Decomposing limestone bedrock	I	0.0-0.08	0.08	Very dark brown	7.5YR 2.5/2	Clay loam	Friable	-	Diffuse/wavy	Organic humus	Intact	-
				II	0.08-0.57	0.49	Dark grayish brown	10YR 4/2	Clay loam	Friable	20% limestone gravel, pebbles and	Abrupt/smooth	Redeposited	Disturbed	Asphalt fragments, plastic bag
				III	0.57-0.65	0.08	Black	10YR 2/1	Asphalt surface	Compacted	100% aggregate	Abrupt/smooth	Asphalt pavement WWII revetment area south of runway Site 7275	Intact	Asphalt
				IV	0.65-0.72	0.07	Very pale brown	10YR 7/4	Limestone	Structureless	100% pulverized limestone	-	Residual	Truncated surface graded for asphalt pavement	-
E-13-9	6.00	1.30	Decomposing limestone bedrock	I	0.0-0.22	0.22	Dark reddish brown	5YR 3/2	Clay loam	Fine friable crumb	15% limestone gravel and pebbles	Abrupt/wavy	Fill- associated w/golf course	Redeposited	-
				II	0.22-0.85	0.63	Dark grayish brown	10YR 4/2	Sandy clay loam	Fine crumb	25% limestone gravel and pebbles	Distinct/wavy	Fill- associated w/golf course	Redeposited	Large asphalt fragments
				III	0.85-1.3	0.45	Dark grayish brown	10YR 4/2	Clay	Very fine friable crumb	10% limestone gravel	Abrupt/smooth	Alluvial	Intact	-
				IV	1.3+	-	-	-	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-14-1	5.00	0.43	Water table	I	0.0-0.43	0.43	Very dark gray	10YR 3/1	Clay loam	Very fine friable crumb	< 10% limestone gravel	-	Recent muck	Intact	-

Test Area E Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
E-14-2	5.70	1.07	Decomposing limestone bedrock	I	0.0-0.1	0.10	Dark brown	7.5YR 3/2	Clay loam	Structureless	80% organic material & roots	Abrupt/wavy	Recent duff	Intact	-
				II	0.1-0.86	0.76	Brown	10YR 4/3	Sandy clay loam	Fine friable crumb	30% limestone gravel, pebbles & cobbles	Abrupt/smooth	Fill- WW II revetment area south of runway Site 7275	Redeposited during road construction?	Asphalt fragments, steel fragments, glass bottle, limestone aggregate
				III	0.86-1.07	0.21	Gray	10YR 5/1	Clay	Non-sticky, super plastic	10% limestone gravel	Abrupt/smooth	Alluvial	Intact	-
				IV	1.07+	-	-	-	Limestone	Weathered	100% decomposing limestone	Unexcavated	Residual	Intact	-
E-14-3	6.90	1.25	Decomposing limestone bedrock & Water table	I	0.0-0.05	0.05	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material (ironwood) & roots	Distinct/wavy	Recent duff	Intact	-
				II	0.05-0.69	0.50	Brown	10YR 4/3	Sandy clay loam	Fine friable crumb	25% limestone cobbles, pebbles and	Diffuse/wavy	Fill	Redeposited	Limestone aggregate
				III	0.5-1.1	0.60	Yellowish brown to brown & Dark reddish brown	Mottled 10YR 5/4 to 10YR 5/3 and 5YR 3/3	Sandy clay loam	Fine friable crumb	70% weathered limestone	Diffuse/wavy	Fill- WW II revetment area south of runway Site 7275	Secondary deposit	Limestone aggregate
				IV	1.1-1.25	0.15	Dark gray	10YR 4/1	Clay	Sticky, plastic	10% limestone gravel	-	Alluvial	Intact	-
				V	1.25+	-	-	-	Limestone	Weathered	100% decomposing limestone	Unexcavated	Residual	Intact	-
E-14-4	6.80	1.07	Water table	I	0.0-0.08	0.08	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material (ironwood) & roots	Abrupt/wavy	Recent duff	Intact	-
				II	0.08-0.4	0.32	Brown	10YR 4/3	Sandy clay loam	Fine friable crumb	20% limestone gravel and pebbles	Distinct/wavy	Fill	Redeposited	-
				III	0.4-0.9	0.50	Dark grayish brown	10YR 4/2	Sandy clay loam	Fine friable crumb	50% limestone gravel and pebbles	Distinct/smooth	Fill- WW II revetment area south of runway Site 7275	Secondary deposit, disturbed	Asphalt fragments, limestone aggregate
				IV	0.9-1.07	0.17	Dark gray	7.5YR 4/1	Clay	Sticky, plastic	30% limestone gravel and pebbles	-	Alluvial	Intact	-
E-14-5	5.7	0.59	Decomposing limestone bedrock	I	0.0-0.07	0.07	Very dark brown	7.5YR 2.5/2	Clay loam	Very fine friable crumb	70% organic material (palm fronds) & roots	Abrupt/wavy	Recent duff	Intact	-
				II	0.07-0.2	0.13	Brown	10YR 5/3	Sandy clay loam	Fine friable crumb	10% limestone gravel and pebbles	Distinct/wavy	Alluvium	Intact	-
				III	0.2-0.43	0.23	Dark grayish brown	10YR 4/2	Clay	Non-sticky, plastic	10% limestone gravel and pebbles	Distinct/wavy	Alluvial	Intact	-
				IV	0.43-0.59	0.16	Light yellowish brown & light gray	Mottled 10YR 6/4 & 10YR 7/1	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-14-6	6.80	0.70	Water table	I	0.0-0.08	0.08	Very dark brown	7.5YR 2.5/2	Clay loam	Structureless	75% organic material & roots	Abrupt/wavy	Recent duff	Intact	-
				II	0.08-0.36	0.28	Brown	10YR 4/3	Sandy clay loam	Fine friable crumb	15% limestone gravel and pebbles	Distinct/wavy	Fill	Redeposited	Sparse asphalt fragments
				III	0.36-0.56	0.20	Pale brown	10YR 6/3	Clay	Fine friable crumb	90% weathered limestone	Abrupt/smooth	Fissured bedrock over void	Intact	-
				IV	0.56-0.7	0.13	Dark gray	10YR 4/1	Clay	Non-sticky, plastic	20% limestone cobbles, pebbles and	-	Alluvial fill in void	Intact	-
E-14-7	6.90	0.60	Decomposing limestone bedrock	I	0.0-0.1	0.08	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material (ironwood) & roots	Abrupt/wavy	Recent duff	Intact	-
				II	0.1-0.6	0.50	Brown	10YR 5/3	Sandy clay loam	Fine friable crumb	10% limestone gravel and pebbles	Abrupt/smooth	Alluvium	Intact	-
				III	0.6+	-	-	-	Limestone	Weathered	100% decomposing limestone	Unexcavated	Residual	Intact	-
E-15-1	8.90	1.00	Decomposing limestone bedrock	I	0.0-0.1	0.10	Very dark grayish brown	10YR 3/2	Clay loam	Fine friable crumb	50% organic material	Abrupt/wavy	Recent duff	Intact	-
				II	0.1-0.8	0.70	Brown	10YR 4/3	Sandy clay loam	Fine friable crumb	50% limestone gravel and pebbles; 10% asphalt fragments	Distinct/smooth	Fill- WW II south edge revetment area south of runway Site 7275	Secondary deposit, disturbed	Asphalt fragments, limestone aggregate
				III	0.8-0.9	0.10	Brown	10YR 5/3	Clay	Non-sticky, plastic	10% limestone gravel	Abrupt/wavy	Alluvial	Intact	-
				IV	0.9-1.0+	-	-	-	Limestone	Weathered	100% decomposing limestone	Unexcavated	Residual	Intact	-
E-15-2	5.60	1.40	Decomposing limestone bedrock	I	0.0-0.15	0.15	Dark grayish brown	10YR 4/2	Clay loam	Loose, unconsolidated	10% limestone gravel and pebbles	Diffuse/wavy	Fill	Redeposited	-
				II	0.15-0.45	0.30	Brown	10YR 4/3	Clay loam	Moderately compacted	10% limestone gravel and pebbles	Abrupt/wavy	Fill	Redeposited	-
				III	0.45-0.75	0.30	Dark grayish brown	10YR 4/2	Clay loam	Compacted	20% limestone cobbles, pebbles and gravel	Abrupt/smooth	Fill- WW II revetment area south of runway Site 7275	Secondary deposit, disturbed	Limestone aggregate
				IV	0.75-1.05	0.30	Very dark grayish brown & dark grayish brown	Mottled 10YR 3/2 & 10YR 4/2	Clay loam	Compacted	25% limestone cobbles, pebbles and gravel	Abrupt/wavy	Fill- WW II revetment area south of runway Site 7275	Secondary deposit, disturbed	Limestone aggregate
				V	1.05-1.4	0.35	Brown	10YR 4/3	Clay	Massive, compacted	15% weathered limestone gravel	Abrupt/wavy	Alluvial	Intact	-
				VI	1.4+	-	-	-	Limestone	Weathered	100% decomposing limestone	Unexcavated	Residual	Intact	-

Test Area E Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
E-15-3	23.00	1.35	Decomposing limestone bedrock & Water table	I	0.0-0.32	0.08	Very dark brown	10YR 2/2	Humus	Structureless	100% organic material (ironwood) & roots	Abrupt/wavy	Recent duff	Intact	-
				II	0.04-0.56	0.40	Brown	10YR 4/3	Sandy clay loam	Very fine friable crumb, moderately compacted	20% limestone gravel and pebbles; roots	Diffuse/wavy	Fill- WW II revetment area south of runway Site 7275	Secondary deposit	Limestone aggregate
				III	0.32-0.84	0.14	Yellowish brown	10YR 5/4	Silty sand	Moderately compacted	75% limestone gravel and pebbles	Abrupt/smooth	Fill- WW II revetment area south of runway Site 7275	Secondary deposit	Limestone aggregate
				IV	0.48-1.04	0.29	Very dark grayish brown	10YR 3/2	Slightly sandy clay loam	Fine friable crumb, compacted	10% limestone gravel and pebbles; waterworn marine shells	Abrupt/wavy	Cultural deposit; Alluvium-buried A horizon, Site 7295	Intact	1 volcanic glass core, *Nerita picea* shell, charcoal
				V	0.82-1.35	0.30	Brown	10YR 4/3	Clay	Massive, saturated, compacted	-	-	Alluvial	Intact	-
				VI	1.00-1.28	0.05	Dark grayish brown & Black	Mottled 10YR 4/2 & 10YR 2/1	Gley	Saturated, compacted; patchy oxidation	-	-	Anaerobic Alluvial	Intact	-
				VII	0.80-1.32+	-	-	-	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-15-3a	7.80	1.26	Water table	I	0.0-0.07	0.07	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material (ironwood) & roots	Distinct/wavy	Recent duff	Intact	-
				II	0.07-0.4	0.33	Brown	10YR 5/3	Clay loam	Very fine friable	30% limestone gravel and pebbles	Distinct/wavy	Fill- WW II revetment area south of runway Site 7275	Secondary deposit	Limestone aggregate
				III	0.23-0.54	0.21	Brown & yellowish brown	10YR 5/3 & 10YR 5/4	Clay loam	Very fine friable	50% limestone gravel, pebbles & cobbles	Distinct/wavy	Fill- WW II revetment area south of runway Site 7275	Secondary deposit	Limestone aggregate
				IV	0.53-0.75	0.20	Dark gray & very dark gray	7.5YR 4/1 & 7.5YR 3/1	Clay loam	Very fine friable	40% weathered limestone gravel & pebbles	Distinct/wavy	Cultural deposit; Alluvium-buried A horizon, Site 7295	Intact	-
				V	0.75-1.26	0.51	Dark yellowish brown	10YR 3/4	Clay	Massive	Weathered limestone gravel & pebbles	-	Alluvial	Intact	
E-15-3b	6.80	1.20	Decomposing limestone bedrock & Water table	I	0.0-0.07	0.07	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material (ironwood) & roots	Distinct/wavy	Recent duff	Intact	-
				II	0.07-0.38	0.31	Brown	10YR 5/3	Clay loam	Very fine friable	30% limestone gravel and pebbles	Distinct/wavy	Fill- WW II revetment area south of runway Site 7275	Secondary deposit	Limestone aggregate
				III	0.3-0.61	0.31	Brown & yellowish brown	10YR 5/3 & 10YR 5/4	Clay loam	Very fine friable	50% limestone gravel, pebbles & cobbles	Distinct/wavy	Fill- WW II revetment area south of runway Site 7275	Secondary deposit	Limestone aggregate
				IV	0.42-0.75	0.20	Dark gray & very dark gray	7.5YR 4/1 & 7.5YR 3/1	Clay loam	Very fine friable	40% weathered limestone gravel & pebbles	Distinct/wavy	Cultural deposit; Alluvium-buried A horizon, Site 7295	Intact	Very sparse charcoal flecks
				V	0.7-1.2	0.50	Dark yellowish brown	10YR 3/4	Clay	Massive	Weathered limestone	Abrupt	Alluvial	Intact	-
				VI	1.02-1.2	-	-	-	Limestone	Weathered	100% decomposing limestone	Unexcavated	Residual	Intact	-
E-15-3c	4.10	1.15	Decomposing limestone bedrock	I	0.0-0.07	0.07	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material (ironwood) & roots	Distinct/wavy	Recent duff	Intact	-
				II	0.07-0.18	0.11	Brown	10YR 5/3	Clay loam	Very fine friable crumb	30% limestone gravel and pebbles	Diffuse/wavy	Fill- WW II revetment area south of runway Site 7275	Secondary deposit	Limestone aggregate
				III	0.18-0.52	0.34	Brown & yellowish brown	10YR 5/3 & 10YR 5/4	Clay loam	Very fine friable crumb	50% limestone gravel and pebbles	Distinct/wavy	Fill- WW II revetment area south of runway Site 7275	Secondary deposit	Limestone aggregate
				IV	0.52-1.15	0.63	Very dark grayish brown	10YR 3/2	Clay	Massive	-	-	Alluvial	Intact	-
				V	1.15+	-	-	-	Limestone	Weathered	100% decomposing limestone	Unexcavated	Residual	Intact	-

Test Area E Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
E-15-3d	4.00	0.89	Decomposing limestone bedrock	I	0.0-0.07	0.07	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material (ironwood) & roots	Distinct/wavy	Recent duff	Intact	-
				II	0.07-0.3	0.23	Brown	10YR 5/3	Clay loam	Very fine friable	30% limestone gravel and pebbles	Distinct/wavy	Fill- WW II revetment area south of runway Site 7275	Secondary deposit	Limestone aggregate
				III	0.16-0.77	0.61	Brown & yellowish brown	10YR 5/3 & 10YR 5/4	Clay loam	Very fine friable	50% limestone gravel and pebbles	Distinct/wavy	Fill- WW II revetment area south of runway Site 7275	Secondary deposit	Limestone aggregate
				IV	0.43-0.6	0.10	Dark gray & very dark gray	7.5YR 4/1 & 7.5YR 3/1	Clay loam	Very fine friable	40% weathered limestone gravel & pebbles	Distinct/wavy	Cultural deposit; Alluvium-buried A horizon, Site 7295	Intact	-
				V	0.6-0.65	0.05	Dark yellowish brown	10YR 3/4	Clay	Massive	-	Abrupt	Alluvial	Intact	-
				VI	0.5-0.89+	-	-	-	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-15-4	6.10	1.20	Decomposing limestone bedrock & Water table	I	0.0-0.04	0.04	Black	10YR 2/1	Humus	Structureless	100% organic material & roots	Abrupt/smooth	Recent duff	Intact	-
				II	0.04-0.75	0.71	Brown	10YR 5/3	Sandy clay loam	Very fine friable crumb	10% limestone gravel and pebbles; roots	Diffuse/wavy	Alluvium	Intact	-
				III	0.75-1.2	0.45	Very pale brown	10YR 8/2	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-15-5	5.30	1.00	Decomposing limestone bedrock & Water table	I	0.0-0.17	0.17	Very dark brown	10YR 2/2	Clay loam	Loose, unconsolidated	50% organic material & abundant roots	Abrupt/wavy	Recent duff	Intact	-
				II	0.17-0.4	0.23	Brown	10YR 5/3	Sandy clay loam	Loose, unconsolidated	30% limestone gravel and pebbles; abundant roots	Abrupt/smooth	Alluvium	Intact	-
				III	0.4-0.7	0.30	Dark gray	10YR 4/1	Sandy clay loam	Moderately compacted	-	Abrupt/wavy	Alluvial	Intact	-
				IV	0.7-1.0	0.30	Light gray	10YR 7/2	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-15-6	7.30	1.19	Unsafe trench; severed water line	I	0.0-0.27	0.27	Dark brown	7.5YR 3/3	Clay loam	Fine friable crumb	40% limestone gravel and pebbles	Diffuse/wavy	Fill- associated w/golf course	Redeposited	Electrical lines, PVC water pipeline (golf course infrastructure)
				II	0.27-1.19	0.92	Brown	10YR 5/3	Sandy clay loam	Fine friable crumb	90% limestone boulders, cobbles, gravel and pebbles	-	Fill- associated w/golf course	Redeposited	-
E-15-7	6.90	0.70	Decomposing limestone bedrock & Water table	I	0.0-0.1	0.10	Very dark grayish brown	10YR 3/2	Clay loam	Loose	50% organic material (m/o)	Distinct/wavy	Recent duff	Intact	-
				II	0.1-0.32	0.22	Brown	10YR 5/3	Clay	Very fine friable	70% limestone gravel and pebbles	Distinct/wavy	Alluvial	Intact	-
				III	0.32-0.70+	-	-	-	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-15-8	7.00	0.48	Decomposing limestone bedrock & Water table	I	0.0-0.20	0.20	Black	10YR 2/1	Clay loam	Very fine friable	organic material	Distinct/wavy	Recent duff	Intact	-
				II	0.20-0.48	-	Very pale brown	10YR 8/2	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-16-1	5.90	1.50	Water table	I	0.0-0.43	0.43	Dark brown	7.5YR 3/2	Clay loam	Very fine friable crumb	30% limestone gravel, pebbles and cobbles	Abrupt/smooth	Imported Fill	Secondary deposit	-
				II	0.43-0.85	0.42	Very dark gray	10YR 3/1	Limestone	Compacted	100% crushed limestone- 1-inch	Abrupt/wavy	Fill- WW II between revetment area & barracks Site 7275	Secondary deposit	Limestone aggregate; Nylon mesh bags w/ black soil to stabilize base of aggregate fill
				III	0.85-1.5	0.65+	Gray	10YR 5/1	Gley	Compacted, saturated	-	-	Anaerobic Alluvial	Intact	-
E-16-2	5.90	1.50	Water table	I	0.0-0.9	0.90	Very dark brown	10YR 2/2	Clay loam	Very fine friable crumb	90% limestone small boulders, cobbles, gravel and pebbles	Abrupt/smooth	Fill	Redeposited	Concrete slab fragments, rusted metal, aluminum cans
				II	0.9-1.5	0.6+	Gray & white	10YR 5/1 & 10YR 8/1	Gley	Compacted, saturated	-	-	Anaerobic Alluvial	Intact	-
E-16-3	6.00	1.07	Decomposing limestone bedrock & Water table	I	0.0-0.07	0.07	Black & very dark brown	10YR 2/1 & 10YR 2/2	Humus	Structureless	100% organic material (ironwood) & roots	Abrupt/wavy	Recent duff	Intact	-
				II	0.07-0.75	0.68	Brown	10YR 4/3	Sandy loam	Friable	20% limestone gravel and pebbles	Abrupt/wavy	Fill- WW II revetment area south of runway Site 7275	Redeposited	Asphalt fragments
				III	0.75-1.07	0.32	Pink	7.5YR 8/3	Limestone	Sticky, non-plastic goo	100% weathered, decomposing bedrock	-	Residual	Intact	-
E-16-4	6.50	0.50	Decomposing limestone bedrock & Water table	I	0.0-0.16	0.16	Black	10YR 2/1	Clay loam	Loose, unconsolidated	50% organic material (ironwood)	Diffuse/wavy	Recent duff & alluvium	Intact?	-
				II	0.16-0.5	0.34	Pale brown	10YR 6/3	Limestone	Sticky, non-plastic goo	100% weathered, decomposing bedrock; muck	-	Residual	Intact	-
E-16-5	4.60	0.40	Decomposing limestone bedrock & Water table	I	0.0-0.1	0.10	Black	10YR 2/1	Clay loam	Loose	50-60% organic material; roots	Diffuse/wavy	Recent duff & alluvium	Intact?	-
				II	0.1-0.4	0.30	Pale brown	10YR 6/3	Limestone	Sticky, non-plastic goo	100% weathered, decomposing bedrock; muck	-	Residual	Intact	-

Test Area E Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
E-16-6	5.20	0.20	Decomposing limestone bedrock	I	0.0-0.13	0.13	Very dark brown	10YR 2/2	Clay loam	Loose, unconsolidated	60% organic material (ironwood) & roots; 10% limestone gravel and pebbles	Abrupt/wavy	Recent duff & alluvium	Intact?	-
				II	0.13-0.2	0.07	Brown	10YR 4/3	Clay loam	Compacted, discontinuous pockets	-	Abrupt/wavy	Alluvial	Intact	-
				III	0.13-0.2+	-	-	-	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-16-7	5.20	0.75	Decomposing limestone bedrock & Water table	I	0.0-0.18	0.18	Very dark brown	10YR 2/2	Clay loam	Very fine friable crumb, loose, unconsolidated	10% organic material & roots; 10% limestone gravel and pebbles	Abrupt/wavy	Alluvium	Intact?	-
				II	0.18-0.75	0.57	Brown	10YR 5/3	Sandy clay loam	Moderately compacted	20% limestone gravel and pebbles	Abrupt/wavy	Alluvium	Intact	-
E-16-8	5.00	1.00	Decomposing limestone bedrock & Water table	I	0.0-0.15	0.15	Very dusky red	2.5YR 2.5/2	Silt loam	Loose, unconsolidated	50% organic material & abundant roots; 10% limestone gravel and pebbles	Abrupt/wavy	Alluvium	Intact	-
				II	0.15-0.3	0.15	Dark grayish brown	10YR 4/2	Sandy loam	Very fine friable crumb	Abundant roots; 10% limestone gravel and pebbles	Abrupt/wavy	Alluvium	Intact	-
				III	0.3-0.45	0.15	Very dark grayish brown	10YR 3/2	Clay loam	Very fine friable	10% limestone gravel and pebbles	Diffuse/wavy	Alluvial	Intact	-
				IV	0.45-1.0	0.55	Pale brown	10YR 6/3	Limestone	Weathered, saturated	100% decomposing limestone	-	Residual	Intact	-
E-16-9	7.00	0.58	Decomposing limestone bedrock	I	0.0-0.36	0.36	Dark reddish brown	2.5YR 2.5/3	Clay	Fine friable crumb	Sparse limestone gravel	Distinct/wavy	Fill- associated w/golf course	Redeposited	-
				II	0.36-0.58+	0.22+	-	-	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-16-10	5.80	1.00	Decomposing limestone bedrock & Water table	I	0.0-0.27	0.27	Dark brown	7.5YR 3/3	Humus	Structureless	100% organic material	Distinct/wavy	Recent duff	Intact	-
				II	0.27-1.0+	0.73+	Light gray	10YR 7/2	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-16-11	7.50	0.60	Water table	I	0.0-0.25	0.25	Black	10YR 2/1	Clay loam	Fine friable crumb	50% organic material, roots; sparse limestone gravel	Distinct/smooth	Recent duff	Intact	-
				II	0.25-0.6	0.35+	Brown	10YR 4/3	Clay	Fine friable crumb	90% limestone gravel, pebbles & cobbles	-	Fill- associated w/road construction	Redeposited	-
E-17-1	5.60	1.20	Decomposing limestone bedrock	I	0.0-0.35	0.35	Dark brown	7.5YR 3/2	Clay loam	Fine friable crumb	Sparse roots; 30% limestone cobbles, gravel and pebbles	Abrupt/smooth	Fill- push pile	Redeposited	Asphalt fragments; fabric @ interface between Layers I & II
				II	0.35-0.78	0.43	Brown	10YR 5/3	Sandy clay loam	Fine friable crumb	95% crushed limestone	Abrupt/wavy	Fill- WW II between revetment area & barracks Site 7275	Secondary deposit	Limestone aggregate
				III	0.78-0.98	0.20	Dark grayish brown	10YR 4/2	Clay	Massive, plastic, non-sticky	< 5% limestone gravel	Diffuse/smooth	Alluvial	Intact	-
				IV	0.98-1.2	0.22	Very dark gray	10YR 3/1	Gley	Non-sticky, plastic	-	Abrupt/wavy	Anaerobic Alluvial	Intact	-
				V	1.2+	-	-	-	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-17-2	7.80	1.50	Water table	I	0.0-0.12	0.12	Very dark gray & dark brown	7.5YR 3/1 & 7.5YR 3/2	Clay loam	Fine friable crumb, loose	5% organic material & roots; 13% limestone gravel	Distinct/wavy	Recent alluvium	Intact	-
				II	0.12-1.5	1.38+	Brown	10YR 5/3	Sandy clay loam	Fine friable crumb, loose	40% limestone boulders, cobbles, gravel and pebbles	-	Fill- WW II between revetment area & barracks Site 7275	Redeposited	-
E-17-3	6.00	1.30	Decomposing limestone bedrock & Water table	I	0.0-0.1	0.10	Very dark gray & dark brown	7.5YR 3/1 & 7.5YR 3/2	Clay loam	Fine friable crumb	Roots; 10% limestone gravel	Distinct/wavy	Fill	Redeposited	-
				II	0.1-0.84	0.74	Brown	7.5YR 4/2	Clay loam	Fine friable crumb	40% limestone cobbles, pebbles & gravel	Abrupt/smooth	Fill	Redeposited	-
				III	0.84-0.88	0.04	Black	7.5YR 2.5/1	Organic	Loose	100% decomposing organic material	Abrupt/smooth	Anaerobic muck	Redeposited	-
				IV	0.88-1.3+	0.42+	Very dark gray	10YR 3/1	Limestone	Very weathered	100% decomposing limestone	-	Residual	Intact	-
E-17-4	4.90	0.24	Decomposing limestone bedrock	I	0.0-0.21	0.21	Very dark brown & black	Mottled 10YR 2/2 & 10YR 2/1	Clay loam; humus	Loose	70% organic material	Distinct/wavy	Recent duff	Intact	-
				II	0.21-0.24	0.03	Dark brown	7.5YR 3/3	Clay loam	Fine friable crumb	-	Abrupt/ discontinuous	Alluvial	Intact	-
				III	0.24+	-	-	-	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-17-5	4.90	0.45	Water table	I	0.0-0.25	0.25	Black	10YR 2/1	Clay loam	Fine friable crumb, loose	70% organic material & roots	Abrupt/smooth	Recent duff & alluvium	Intact	-
				II	0.25-0.45	0.20	Gray	10YR 6/1	Gley	Sticky, plastic	-	-	Anaerobic Alluvial	Intact	-
E-17-6	6.40	1.75	Decomposing limestone bedrock & Water table	I	0.0-0.3	0.30	Very dark grayish brown	10YR 3/2	Slightly sandy clay loam	Fine friable crumb	15% limestone gravel	Abrupt/smooth	Fill- associated w/golf course	Redeposited	-
				II	0.3-0.55	0.25	Light brownish gray	10YR 6/2	Beach sand	Single grain	20% limestone gravel	Abrupt/smooth	Fill- associated w/golf course	Redeposited	-
				III	0.55-1.4	0.85	Very dark grayish brown	10YR 3/2	Sandy clay loam	Fine friable crumb	20% limestone gravel and pebbles	Abrupt/wavy	Alluvium	Intact	-
				IV	1.4-1.75+	0.35+	-	-	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-

Test Area E Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
E-17-7	7.00	0.36	Decomposing limestone bedrock	I	0.0-0.36	0.36	Very dark brown	7.5YR 2.5/2	Sandy clay loam	Fine friable crumb, loose	Roots; 20% limestone cobbles, gravel and pebbles	Abrupt/wavy	Fill- associated w/sod farm	Redeposited	-
				II	0.36+	-	-	-	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-17-8	5.70	1.17	Water table	I	0.0-0.17	0.17	Very dark grayish brown	10YR 3/2	Sandy clay loam	Fine friable crumb	10% organic material; 60% limestone cobbles, gravel and pebbles	Distinct/wavy	Recent duff & Fill- associated w/road construction	Redeposited	-
				II	0.17-0.4	0.23	Light gray	10YR 7/2	Limestone	Compacted	100% crushed limestone	Abrupt/wavy	Fill- WW II between revetment area & barracks Site 7275	Secondary deposit	Limestone aggregate
				III	0.4-0.84	0.44	Very dark grayish brown	10YR 3/2	Sandy clay loam	Compacted	< 10% limestone gravel and pebbles	Distinct/wavy	Fill- WW II between revetment area & barracks Site 7275	Redeposited	Conglomerate, basalt & concrete fragment
				IV	0.84-1.17	0.33+	Pale brown	10YR 6/3	Clay	Massive	Sparse limestone gravel	-	Alluvial	Intact	-
E-17-9	7.10	1.10	Decomposing limestone bedrock	I	0.0-0.87	0.87	Banded Dark brown & Dark yellowish brown	10YR 3/3 & 10YR 4/4	Clay loam	Fine friable crumb	Roots; 50% limestone cobbles, pebbles & gravel	Distinct/wavy	Banded Fill- WW II between revetment area & barracks Site 7275	Redeposited	Steel wire
				II	0.87-1.1	0.23	Dark grayish brown	10YR 4/2	Clay	Massive	50% limestone gravel	Distinct/wavy	Alluvial	Intact	-
				III	1.1+	-	-	-	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-18-1	4.70	1.44	Decomposing limestone bedrock & Water table	I	0.0-0.42	0.42	Dark brown	7.5YR 3/2	Clay loam	Very fine friable crumb	Roots; 20% limestone cobbles, pebbles & gravel	Abrupt/smooth	Fill	Redeposited	-
				II	0.2-0.35	0.15	Brown	10YR 4/3	Sandy loam	Very fine friable crumb	10% limestone gravel and pebbles	Abrupt/smooth	Fill	Redeposited	-
				Pit-IIa	0.22-0.62	0.40	Yellowish brown	10YR 5/4	Sandy clay loam	Fine friable crumb	Roots; 60% limestone gravel and pebbles	Abrupt/smooth	Historic pit fill	Intact- secondary deposit	Amber glass bottle (3-piece mold, crown cap finish), charcoal
				Pit-IIb	0.42-0.93	0.51	Dark brown	7.5YR 3/4	Sandy loam	Fine friable crumb	Roots; 10% limestone gravel and pebbles	Abrupt/smooth	Historic pit fill	Intact- secondary deposit	-
				Pit-IIc	0.4-1.24	0.84	Brown	10YR 4/3	Clay loam	Fine friable crumb	Roots; 10% limestone gravel and pebbles	Abrupt/smooth	Historic pit fill- plantation era?	Intact- secondary deposit	Charcoal, porcelain, nails, milled lumber (burned)
				III	0.32-1.24	0.92	Brownish yellow	10YR 6/6	Sand	Loose	95% weathered & decomposing limestone cobbles, pebbles, gravel	Abrupt/wavy	Residual	Intact; truncated by historic trash pits	-
				IV	0.96-1.44+	-	-	-	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-18-2	3.60	0.84	Water table	I	0.0-0.28	0.28	Very dark brown	7.5YR 2.5/2	Clay loam	Fine friable crumb	Roots; 20% limestone gravel and pebbles	Abrupt/wavy	Fill	Redeposited	-
				II	0.28-0.45	0.17	Brown	10YR 4/3	Clay loam	Fine friable crumb	50% limestone cobbles, pebbles & gravel	Abrupt/wavy	Fill	Redeposited	-
				III	0.45-0.47	0.02	Black	10YR 2/1	Organic	Loose	Roots; 100% decomposing organic	Abrupt/wavy	Anaerobic muck	Redeposited	-
				IV	0.47-0.52	0.05	Dark brown	7.5YR 3/3	Clay loam	Fine friable crumb	10% limestone gravel	Abrupt/wavy	Alluvial	Intact	-
				V	0.52-0.84+	0.32+	Dark gray	7.5YR 4/1	Gley	Non-sticky, plastic	-	-	Alluvial	Intact	-
E-18-3	6.00	1.30	Decomposing conglomerate bedrock & Water table	I	0.0-0.15	0.15	Very dark gray	7.5YR 3/1	Clay loam	Fine friable crumb, unconsolidated	10% limestone gravel and pebbles	Distinct/wavy	Alluvium	Intact	-
				II	0.15-0.32	0.17	Brown	10YR 4/3	Clay loam	Fine friable crumb, unconsolidated	10% limestone gravel and pebbles	Abrupt/wavy	Alluvium	Intact	-
				III	0.32-1.3	-	-	-	Conglomerate	Weathered	100% crushed shell conglomerate	-	Bedrock	Intact	-
E-18-4	5.40	1.18	Decomposing conglomerate bedrock & Water table	I	0.0-0.15	0.15	Dark brown	7.5YR 3/2	Clay loam	Fine friable crumb, unconsolidated	10% limestone gravel and pebbles	Distinct/wavy	Alluvium	Intact	-
				II	0.15-0.6	0.45	Brown	10YR 4/3	Clay loam	Fine friable crumb, unconsolidated	10% limestone gravel	Distinct/wavy	Alluvium	Intact	-
				III	0.6-0.78	0.18	Dark yellowish brown	10YR 4/4	Clay loam	Fine friable crumb, moderately compacted	10% limestone gravel	Abrupt/smooth	Alluvium	Intact	-
				IV	0.78-1.18	0.4+	Very pale brown	10YR 8/2	Conglomerate	Weathered	100% crushed shell conglomerate	-	Bedrock	Intact	-
E-18-5	6.30	1.70	Decomposing limestone bedrock & Water table	I	0.0-0.29	0.29	Dark brown	7.5YR 3/2	Clay loam	Fine friable crumb	20% limestone gravel, pebbles & cobbles	Abrupt/wavy	Alluvium	Intact	-
				II	0.29-1.55	1.26	Brown	10YR 4/3	Sandy loam	Loose, unconsolidated	75% limestone gravel, pebbles, cobbles & boulders (size-sorted w/largest on bottom & progressively smaller toward	Distinct/wavy	Residual	Intact	-
				III	1.55-170+	-	-	-	Limestone	Weathered	100% decomposing limestone	-	Bedrock	Intact	-
E-18-6	6.40	1.10	Decomposing limestone bedrock	I	0.0-0.45	0.45	Very dark grayish brown	10YR /3.2	Clay loam	Fine friable crumb	Roots; 20% limestone cobbles, pebbles & gravel	Distinct/wavy	Fill- associated w/sod farm	Redeposited	Electrical wire
				II	0.45-0.66	0.21	Dark grayish brown	10YR 4/2	Clay loam	Fine friable crumb	60% limestone gravel and pebbles	Abrupt/wavy	Alluvial	Intact	-
				III	0.66+	-	-	-	Limestone	Weathered	100% decomposing limestone	-	Bedrock	Intact	-

Test Area E Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
E-18-7	5.50	1.20	Water table	I	0.0-0.48	0.48	Very dark grayish brown	10YR 3/2	Sandy clay loam	Loose	30% limestone cobbles, pebbles & gravel	Distinct/wavy	Fill- associated w/sod farm	Redeposited	Plastic fragments
				II	0.48-1.20	0.72	Very pale brown & brown	10YR 8/2 & 10YR 5/3	Limestone & Clay	Weathered & Massive	Weathered, decomposing limestone with pockets of clay	-	Fissured bedrock with voids filled with alluvial clay	Intact	-
E-18-8	7.10	1.10	Decomposing limestone bedrock & Water table	I	0.0-0.3	0.30	Very dark grayish brown	10YR 3/2	Sandy clay loam	Loose	20% limestone cobbles, pebbles and gravel	Distinct/wavy	Fill- associated w/sod farm or road	Redeposited	Plastic fragments, bottle glass
				II	0.3-0.52	0.22	Dark brown	10YR 3/3	Sandy clay loam	Compacted	10% limestone gravel and pebbles	Distinct/wavy	Alluvium	Intact	-
				III	0.52-0.74	0.22	Brown	10YR 4/3	Clay	Massive	50% limestone gravel and pebbles	Distinct/wavy	Alluvial	Intact	-
				IV	0.74-1.1	0.36	Light gray	10YR 7/2	Limestone	Weathered	100% decomposing limestone	-	Bedrock	Intact	-
E-18-9	5.00	0.32	Decomposing limestone bedrock	I	0.0-0.05	0.05	Dark brown	10YR 3/3	Clay loam	Structureless	50% organic material	Distinct/wavy	Recent duff & Fill- associated w/sod farm	Redeposited	-
				II	0.05-0.24	0.19	Dark grayish brown	10YR 4/2	Clay loam	Fine friable crumb	50% limestone gravel and pebbles	Distinct/wavy	Fill- associated w/sod farm	Redeposited	-
				III	0.24-0.32	0.08	Dark yellowish brown	10YR 3/4	Clay loam	Fine friable crumb	10% limestone gravel and pebbles	Abrupt/wavy	Alluvial	Intact	-
				IV	0.32+	-	-	-	Limestone	Weathered	100% decomposing limestone	-	Bedrock	Intact	-
E-19-1	6.30	0.75	Decomposing limestone bedrock	I	0.0-0.17	0.17	Dark brown	7.5YR 3/2	Clay loam	Very fine friable crumb, moderately compacted	Roots common	Abrupt/smooth	Fill- associated w/sod farm	Redeposited	-
				II	0.17-0.75	0.58	Brown	10YR 5/3	Sandy loam	Very fine friable, loose, unconsolidated	60% limestone cobbles, pebbles and gravel	Abrupt/wavy	Imported Fill	Secondary deposit	-
				III	0.4-0.75	0.35	Dark brown	7.5YR 3/4	Clay loam	Moderately compacted	-	Abrupt/smooth	Alluvial	Intact	-
				IV	0.75+	-	-	-	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-19-2	5.40	0.44	Decomposing limestone bedrock	I	0.0-0.15	0.15	Very dark grayish brown	10YR 3/2	Clay loam	Very fine friable, loose, unconsolidated	> 10% limestone gravel	Diffuse/wavy	Fill- associated w/sod farm	Redeposited	-
				II	0.15-0.36	0.21	Very dark grayish brown & dark grayish brown	Mottled 10YR 3/2 & 10YR 4/2	Clay loam	Very fine friable, loose, unconsolidated	10% limestone gravel and pebbles	Abrupt/wavy	Fill- associated w/sod farm	Redeposited	-
				III	0.36-0.44	0.08	Dark brown	10YR 3/3	Clay	Moderately compacted	-	Abrupt/wavy	Alluvial	Intact	-
				IV	0.44+	-	-	-	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-19-3	6.40	0.76	Decomposing limestone bedrock & Water table	I	0.0-0.48	0.48	Very dark grayish brown	10YR 3/2	Silty clay loam	Loose, unconsolidated	Roots; 20% limestone gravel and pebbles	Abrupt/smooth	Fill- associated w/sod farm	Redeposited	Colorless glass bottle
				II	0.48-0.76	0.28	Dark gray & dark grayish brown	Mottled 10YR 4/1 & 10YR 4/2	Gley	Compacted, saturated	Chunks of weathered limestone	-	Anaerobic Alluvial	Intact	-
				III	0.76+	-	-	-	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-19-4	5.60	0.54	Decomposing limestone bedrock	I	0.0-0.08	0.08	Black & very dark brown	7.5YR 2.5/1 & 7.5YR 2.5/2	Humus	Structureless	100% organic material; roots common	Abrupt/smooth	Recent duff	Intact	-
				II	0.08-0.17	0.09	Brown	10YR 5/3	Beach sand	Loose, single grain	Roots common	Abrupt/smooth	Fill- sod farm	Redeposited	-
				III	0.17-0.23	0.06	Very dark grayish brown	10YR 3/2	Basalt	Crushed	Roots common; 95% crushed basalt gravel and pebbles (1-inch)	Abrupt/smooth	Fill	Secondary deposit	Basalt aggregate
				IV	0.23-0.54	0.31	Dark grayish brown	10YR 4/2	Sandy clay loam	Very fine friable crumb, loose, unconsolidated	Few roots; 10% limestone gravel & pebbles	Abrupt/wavy	Alluvium	Intact	-
				V	0.54+	-	-	-	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-19-5	6.60	1.50	Water table	I	0.0-0.06	0.06	Black	10YR 2/1	Humus	Structureless	100% organic material; roots common	Abrupt/smooth	Recent duff	Intact	-
				II	0.06-0.44	0.38	Brown	10YR 4/3	Silty sand	Loose, single grain	Roots common	Abrupt/smooth	Imported Fill	Secondary deposit	2-inch PVC pipe
				III	0.44-0.53	0.09	Black	10YR 2/1	Limestone	Compacted	95-100% crushed limestone (1-inch	Abrupt/smooth	Fill	Secondary deposit	Limestone aggregate
				IV	0.53-0.85	0.32	Very dark grayish brown	10YR 3/2	Sandy clay loam	Very fine friable crumb, moderately compacted	20% limestone gravel and pebbles	Diffuse/wavy	Alluvium	Intact	-
				V	0.85-1.5+	0.65+	Dark grayish brown	10YR 4/2	Clay	Massive, compacted	-	-	Alluvial	Intact	
E-19-6	7.20	1.48	Water table	I	0.0-0.66	0.66	Very dark grayish brown & dark	10YR 3/2 & 10YR 3/3	Sandy clay loam	Very fine friable	70% limestone gravel, pebbles & cobbles	Distinct/wavy	Fill	Redeposited	-
				II	0.66-0.83	0.17	Very dark grayish brown & dark	10YR 3/2	Clay loam	Very fine friable	10% limestone gravel	Distinct/wavy	Alluvium	Intact	-
				III	0.83-1.05	0.22	Brown & grayish brown	10YR 5/3 & 10YR 5/2	Clay	Massive	Weathered limestone	Diffuse	Alluvial	Intact	-
				IV	1.05-1.48+	0.43+	Dark yellowish brown	10YR 4/4	Clay	Massive	-	-	Alluvial	Intact	-

Test Area E Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
E-19-7	6.90	0.61	Decomposing limestone bedrock	I	0.0-0.18	0.18	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material; roots common	Distinct/wavy	Recent duff	Intact	-
				II	0.18-0.32	0.14	Brown	10YR 4/3	Clay	Very fine friable crumb, loose	Sparse limestone gravel	Abrupt/wavy	Alluvial	Intact	-
				III	0.32-0.61	0.29	Dark grayish brown & dark gray	10YR 4/2 & 10YR 4/1	Clay	Massive	Sparse limestone gravel	Abrupt	Alluvial	Intact	-
				IV	0.61+	-	-	-	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-19-8	6.30	0.20	Decomposing limestone bedrock	I	0.0-0.2	0.20	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material; roots common	Abrupt/wavy	Recent duff	Intact	-
				II	0.20+	-	-	-	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-20-1	6.40	0.53	Decomposing limestone bedrock	I	0.0-0.23	0.23	Dark reddish brown	5YR 3/3	Clay loam	Fine friable crumb	Roots & pockets of underlying Layer II matrix	Abrupt/wavy	Fill- associated w/sod farm	Redeposited	-
				II	0.23-0.53	0.30	Brown	7.5YR 5/6	Sandy loam	Loose	70% limestone cobbles, pebbles and	Abrupt/wavy	Alluvial	Intact	-
				III	0.53+	-	-	-	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-20-2	6.50	0.40	Decomposing limestone bedrock	I	0.0-0.3	0.30	Dark brown	7.5YR 3/2	Clay loam	Fine friable crumb, loose	Roots; 10% limestone gravel and pebbles	Distinct/wavy	Fill- associated w/sod farm	Redeposited	-
				II	0.3-0.37	0.07	Dark brown	7.5YR 3/3	Clay loam	Compacted	< 5% limestone gravel ; discontinuous	Abrupt/wavy	Alluvial	Intact	-
				III	0.24-0.40+	-	-	-	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-20-3	6.50	1.15	Decomposing limestone bedrock & Water table	I	0.0-0.3	0.30	Dark grayish brown	10YR 4/2	Clay loam	Fine friable crumb, loose	Roots ; 15% limestone gravel	Distinct/wavy	Fill- associated w/sod farm	Redeposited	-
				II	0.3-0.65	0.35	Very dark grayish brown	10YR 3/2	Clay loam	Fine friable crumb, moderately compacted	25% limestone gravel and pebbles; sparse crushed basalt 1-inch gravel	Diffuse/wavy	Fill	Redeposited	Sparse basalt aggregate
				III	0.65-0.9	0.25	Brown	10YR 4/3	Clay	Non-sticky, plastic	< 10% limestone gravel	Abrupt/wavy	Alluvial	Intact	-
				IV	0.9-1.15+	0.25+	-	-	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-20-4	5.00	0.95	Water table	I	0.0-0.37	0.37	Dark grayish brown	10YR 4/2	Clay loam	Loose	Roots; 15% limestone gravel and pebbles; abundant basalt aggregate on surface	Distinct/wavy	Fill- associated w/sod farm	Redeposited	Basalt aggregate; 2-inch diam PVC pipe
				II	0.37-0.55	0.18	Brown	10YR 4/3	Clay	Compacted	< 10% limestone gravel	Distinct/wavy	Alluvium	Intact	-
				III	0.55-0.95+	0.4+	Dark gray	10YR 4/1	Gley	Sticky, plastic	-	-	Anaerobic Alluvial	Intact	-
E-20-5	5.60	0.95	Decomposing limestone bedrock	I	0.0-0.65	0.65	Brown	10YR 4/3	Sand	Fine, single grain	95% crushed basalt (1-inch)	Abrupt/smooth	Fill	Secondary deposit	Basalt aggregate
				II	0.65-0.95	0.30	Dark grayish brown	10YR 4/2	Sandy clay loam	Fine friable crumb	10% limestone gravel and pebbles	Abrupt/smooth	Alluvium	Intact- upper surface possibly truncated	-
				III	0.95+	-	-	-	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-20-6	5.80	1.66	Water table	I	0.0-0.13	0.13	Dark brown	7.5YR 3/2	Clay loam	Fine friable crumb	Roots; 20% organic material; 20% limestone gravel and pebbles	Distinct/wavy	Fill	Redeposited	-
				II	0.13-0.93	0.80	Dark brown	7.5YR 3/3	Clay loam	Fine friable crumb	20% limestone gravel and pebbles ; 30% basalt boulders ; humic soil at interface between Layers II & III	Abrupt/smooth	Fill	Redeposited	-
				III	0.93-1.48	0.55	Pinkish white	7.5YR 8/2	Limestone	Weathered	100% decomposing limestone	Abrupt/smooth	Bedrock over void	Intact	-
				IV	1.48-1.66+	0.18+	Dark gray	10YR 4/1	Gley	Non-sticky, non-plastic	-	-	Anaerobic Alluvial fill in void	Intact	-
E-20-7	5.60	1.04	Decomposing limestone bedrock & Water table	I	0.0-0.28	0.28	Very dark grayish brown	10YR 3/2	Silty loam	Fine friable crumb, loose	Roots; <5% limestone gravel	Abrupt/smooth	Fill- associated w/golf course	Redeposited	-
				II	0.28-0.7	0.42	Light brownish	10YR 6/2	Clay loam	Fine friable crumb	Roots	Distinct/smooth	Alluvium	Intact	-
				III	0.7-0.85	0.15	Dark gray	10YR 4/1	Gley	Non-sticky, plastic	-	Abrupt/smooth	Anaerobic Alluvial	Intact	-
				IV	0.85-1.04+	0.19+	-	-	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-21-1	5.90	0.95	Decomposing limestone bedrock	I	0.0-0.2	0.20	Dark brown	7.5YR 3/2	Clay loam	Fine friable crumb	Roots; 15% limestone gravel and pebbles	Distinct/wavy	Fill	Redeposited	-
				II	0.2-0.95	0.95	Dark grayish brown & Very dark grayish brown	Mottled 10YR 4/2 & 10YR 3/2	Silty clay loam	Fine friable crumb	Sparse roots; 20% limestone gravel and pebbles; recent trash at interface of Layers II & III	Abrupt/wavy	Fill	Redeposited	Recent trash: Budwiser beer can, melted glass, metal, plastic, fabric, 5-gal bucket lid, milled lumber
				III	0.95+	-	-	-	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-21-2	6.20	0.90	Decomposing limestone bedrock & Water table	I	0.0-0.16	0.16	Dark brown	7.5YR 3/2	Clay loam	Fine friable crumb	15% limestone gravel and pebbles	Distinct/wavy	Fill- road construction?	Redeposited	-
				II	0.10-0.35	0.19	Light gray	10YR 7/2	Limestone & Clay	Compacted	20% limestone cobbles, pebbles and	Abrupt/wavy	Fill-pipeline	Redeposited	pipeline
				III	0.35-0.45	0.10	Brown	10YR 5/3	Clay	Non-sticky, plastic	10% limestone gravel and pebbles	Distinct/wavy	Alluvial	Intact	-
				IV	0.42-0.9	0.48	Dark greenish gray	Gley1 10Y 4/1	Gley	Sticky, plastic	-	Abrupt/wavy	Anaerobic Alluvial	Intact	-
				V	0.90+	-	-	-	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-21-3	6.00	1.40	Decomposing limestone bedrock & Water table	I	0.0-0.9	0.90	Brown & dark grayish brown	Mottled 10YR 4/3 & 10YR 4/2	Silty loam	Loose	70% limestone gravel and pebbles	Diffuse/wavy	Fill- associated w/sod farm	Redeposited	2" PVC pipe
				II	0.9-1.4	0.50	Light brownish gray & pale brown	10YR 6/2 & 10YR 6/3	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-

Test Area E Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
E-21-4	6.80	1.70	Decomposing limestone bedrock & Water table	I	0.0-0.35	0.35	Dark reddish brown	5YR 3/4	Clay	Very fine friable crumb	< 10% limestone gravel and pebbles	Abrupt/smooth	Fill- associated w/golf course	Redeposited	-
				II	0.35-0.41	0.06	Brown & yellowish brown	10YR 4/3 & 10YR 5/4	Slightly clayey sand	Fine	30% limestone gravel and pebbles; sparse crushed basalt aggregate	Abrupt/wavy	Fill- associated w/golf course	Redeposited	Basalt aggregate
				III	0.41-0.71	0.30	Dark brown	7.5YR 3/3	Clay	Massive	-	Abrupt/wavy	Fill- associated w/golf course	Redeposited	-
				IV	0.71-0.78	0.07	Very dark brown	10YR 2/2	Sandy clay	Very fine friable	10% limestone gravel and pebbles; crushed basalt aggregate (1-inch) at interface between Layers IV & V	Diffuse/wavy	Fill- associated w/golf course	Secondary deposit	Basalt aggregate
				V	0.78-0.83	0.10	Dark brown	10YR 3/3	Clay	Very fine friable crumb	Sparse limestone gravel	Diffuse/wavy	Alluvial	Intact	-
				VI	0.83-1.13	0.30	Light gray	10YR 7/2	Limestone	Weathered	100% decomposing limestone	Diffuse/wavy	Bedrock over void	Intact	-
				VII	1.13-1.4	0.27	Brown	10YR 4/3	Clay	Massive	-	Diffuse/wavy	Alluvial fill in void	Intact	-
				VIII	1.4-1.70+	0.30+	Pale brown	10YR 6/3	Limestone	Weathered	100% decomposing limestone	-	Bedrock	Intact	-
E-21-5	6.30	0.80	Decomposing limestone bedrock	I	0.0-0.11	0.11	Very dark grayish brown	10YR 3/2	Sandy loam	Very fine friable	50% organic material; 20% Limestone gravel & pebbles	Abrupt/wavy	Recent duff & Fill- associated w/sod farm	Redeposited	-
				II	0.11-0.27	0.16	Very pale brown	10YR 7/3	Limestone	Compacted	100% crushed limestone	Distinct/wavy	Fill- WW II barracks area Site 727S	Secondary deposit	-
				III	0.27-0.62	0.35	Dark yellowish brown	10YR 3/4	Sandy clay loam	Very fine friable	80% limestone cobbles, pebbles & gravel	Distinct/wavy	Fill- WW II barracks area Site 727S	Redeposited	-
				IV	0.62-0.8+	0.18+	Very pale brown	10YR 8/3	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-21-6	7.00	0.95	Decomposing limestone bedrock	I	0.0-0.12	0.12	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material; roots common	Distinct/wavy	Recent duff	Intact	-
				II	0.12-0.4	0.28	Brown	10YR 5/3	Sandy clay loam	Loose	70% limestone cobbles, pebbles & gravel	Abrupt/wavy	Fill	Redeposited	-
				III	0.4-0.95	0.55	-	-	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-22-1	5.40	0.75	Decomposing limestone bedrock	I	0.0-0.44	0.44	Very dusky red	2.5YR 2.5/2	Clay loam	Friable crumb	-	Abrupt/smooth	Fill-recent	Redeposited	Plastic garbage bags, corrugated plastic pipes
				II	0.44-0.54	0.10	Brown	10YR 4/3	Sandy loam	Loose	70% limestone cobble, pebbles and gravel	Diffuse/wavy	Fill- WW II barracks area Site 727S	Redeposited	-
				III	0.54-0.65	0.11	Dark brown	10YR 3/3	Sandy loam	Moderately Compacted	15% limestone pebbles & gravel	Distinct/wavy	Fill- WW II barracks area Site 727S	Redeposited	-
				IV	0.65-0.75	0.10	Brown	10YR 4/3	Silty clay loam	Compacted	10% limestone pebbles & gravel	Abrupt/wavy	Alluvial	Intact	-
				V	0.75+	-	-	-	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-
E-22-2	6.70	0.40	Decomposing limestone bedrock	I	0.0-0.15	0.15	Dark brown	7.5YR 3/2	Clay loam	Loose, unconsolidated	Sparse roots ; < 10% limestone gravel and pebbles; limestone aggregate at interface between Layers I & II	Distinct/wavy	Fill- associated w/golf course	Secondary deposit	Limestone aggregate
				II	0.15-0.25	0.10	Brown	10YR 4/3	Sandy loam	Loose	20% limestone gravel and pebbles	Abrupt/wavy	Fill- associated w/golf course	Redeposited	-
				III	0.25-0.4	0.15	Very dark brown	7.5YR 2.5/2	Clay loam	Loose	10% limestone gravel and pebbles	Abrupt/wavy	Alluvial	Intact- upper surface possibly truncated	-
				IV	0.4+				Limestone	Weathered	100% decomposing limestone		Residual	Intact	-
E-22-3	5.50	0.40	Decomposing limestone bedrock	I	0.0-0.08	0.08	Dark reddish	5YR 3/2	Clay loam	Loose	90% organic material; roots	Abrupt/smooth	Recent duff	Intact	
				II	0.08-0.3	0.22	Brown	10YR 5/3	Sandy loam	Loose	Sparse roots; 80% limestone cobbles, pebbles & gravel	Distinct/wavy	Fill- associated w/sod farm or golf course	Disturbed	Marine shell, 20-penny nail
				III	0.3-0.4	0.10	Very dark grayish brown	10YR 3/2	Clay loam	Fine friable crumb, compacted	5% limestone gravel	Abrupt/wavy	Alluvial	Intact	-
				IV	0.4+	-	-	-	Limestone	Weathered	100% decomposing limestone	-	Residual	Intact	-

Test Area E Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
E-22-4	10.40	1.92	Decomposing limestone bedrock & Water table	I	0.0-0.35	0.13	Dark brown	7.5YR 3/2	Clay loam	Fine friable crumb	Moderate roots	Abrupt/smooth	Recent duff & alluvium	Intact	
				II	0.12-0.68	0.40	Dark grayish brown & Dark brown	Mottled 10YR 4/2 & 10YR 3/3	Clay loam	Loose, unconsolidated	70% limestone gravel, pebbles and cobbles	Distinct/wavy	Fill- associated w/sod farm	Redeposited	Copper wire
				IIIa	0.27-1.33	0.85	Dark grayish brown & dark brown	Mottled 10YR 4/2 & 10YR 3/3	Clay loam	Moderately Compacted	70% limestone gravel, pebbles and cobbles	Abrupt/smooth	Fill- WW II barracks area Site 7275	Redeposited	Copper wire, asphalt, concrete
				IIIb	0.81-1.25	0.35	Light yellowish brown	10YR 6/4	Sand	Loose, unconsolidated	80% limestone gravel, pebbles and cobbles	Abrupt/smooth-boundary w/Layer IV	Fill- WW II barracks area Site 7275	Intact	Limestone aggregate
				IV	1.22-1.62	0.16	Black	7.5YR 2.5/1	Clay loam	Fine friable crumb	15% limestone gravel & pebbles; waterworn marine shells	Abrupt/smooth	Cultural deposit; Alluvium-buried A horizon, Site 7296	Intact- upper surface possibly truncated by fill episode	2 basalt flakes; *Nerita picea* , *Trochus intextus* , Mytilidae & indeteminate bivalve shells; urchin, burned *kukui* nutshells, & abundant charcoal
				Hearth	1.2-1.36	0.16	Black	10YR 2/1	Clay loam	Fine friable crumb	-	Distinct	Cultural feature Site 7296	Intact	Charcoal
				V	1.36-1.59	0.27	Brown	7.5YR 4/4	Clay loam	Very fine friable crumb	< 5% limestone gravel	Abrupt/wavy	Oxidized alluvium-from burning cultural deposit	Intact	-
				VI	1.33-1.77	0.38	Very pale brown	10YR 7/3	Limestone	Weathered	100% fissured decomposing limestone	Abrupt/smooth	Bedrock over void	Intact	-
				VII	1.22-1.92	0.20	Brown	10YR 5/3	Clay	Non-sticky, plastic	-	-	Alluvial fill in void	Intact	-
				VIII	0.96-1.92+	-	-	-	Limestone	Weathered	100% decomposing limestone	-	Bedrock	Intact	-
E-22-4b	6.10	1.75	Decomposing limestone bedrock & Water table	I	0.0-0.15	0.15	Dark brown	7.5YR 3/2	Clay loam	Fine friable crumb	Roots; sparse limestone gravel and	Abrupt/wavy	Alluvium	Intact	-
				II	0.15-0.8	0.65	Dark grayish brown	10YR 4/2	Sandy loam	Moderately Compacted	70% limestone gravel, pebbles, cobbles and boulders	Distinct/wavy	Fill- WW II barracks area Site 7275	Secondary deposit	Limestone aggregate
				III	0.8-1.8	1.00	Light brownish gray & Light yellowish brown	10YR 6/2 & 10YR 6/4	Limestone	Weathered	100% fissured decomposing limestone	Abrupt/wavy	Bedrock	Intact	-
				IV	1.05-1.45	0.40	Very dark grayish brown	10YR 3/2	Clay loam	Fine friable crumb	10% limestone gravel	Abrupt/wavy	Alluvial fill in void	Intact	-
				V	1.45-1.75	0.30	Dark grayish brown	10YR 4/2	Clay	Sticky, plastic	10% limestone pebbles & gravel	Abrupt/wavy	Alluvial fill in void	Intact	-
E-22-5	5.80	1.44	Decomposing limestone bedrock & Water table	I	0.0-0.19	0.19	Dark grayish brown	10YR 4/2	Clay loam	Loose	80% crushed basalt (1-inch)	Abrupt/wavy	Fill	Secondary deposit	Basalt aggregate
				II	0.19-0.4	0.21	Light yellowish brown	10YR 6/4	Clay loam	Loose	90% crushed limestone	Abrupt/smooth	Fill- WW II barracks area Site 7275	Secondary deposit	Limestone aggregate
				III	0.4-0.58	0.18	Dark grayish brown	10YR 4/2	Clay loam	Fine friable crumb	10% limestone gravel	Distinct/smooth	Alluvium	Intact	-
				IV	0.58-1.22	0.64	Brown	7.5YR 4/3	Clay loam	Massive	-	Abrupt/wavy	Alluvium	Intact	-
				V	1.22-1.44+	0.22+	-	-	Limestone	Weathered	100% decomposing limestone	-	Bedrock	Intact	-

Test Area F Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
F-1-1	5.00	0.40	Decomposing limestone bedrock	I	0.0-0.4	0.40	Very dark brown	7.5YR 2.5/2	Clay loam	Friable crumb	-	Abrupt	Alluvial	Intact	-
				II	0.4+	-	-	-	Limestone	-	100% weathered & decomposing limestone	-	Bedrock	Intact	-
F-1-2	5.00	0.48	Decomposing limestone bedrock	I	0.0-0.3	0.30	Dark brown	7.5YR 3/3	Clay loam	Unconsolidated	Roots	Abrupt/wavy	Alluvium	Intact	Glass bottle
				II	0.3-0.38	0.08	Black	5YR 2.5/1	Clay loam	Loose	Charcoal throughout; 20% burned limestone gravel and pebbles	Abrupt/smooth	Alluvial- burn event	Intact	-
				III	0.38-0.48	0.10	Brown	7.5YR 4/4	Clay loam	Friable crumb	-	Abrupt	Alluvial	Intact	-
				IV	0.38+	-	-	-	Limestone	-	100% weathered & decomposing	-	Bedrock	Intact	-
F-1-3	5.00	0.50	Decomposing limestone bedrock	I	0.0-0.18	0.18	Dark brown	7.5YR 3/3	Clay loam	Unconsolidated	Roots; 30% subangular basalt gravel & pebbles (road base material)	Distinct	Alluvial	Intact	Basalt aggregate
				II	0.18-0.5	0.32	Dark brown	7.5YR 3/2	Clay	Blocky	50% limestone gravel and pebbles	Abrupt	Alluvial	Intact	-
				III	0.5+	-	-	-	Limestone	-	100% weathered & decomposing	-	Bedrock	Intact	-
F-2-1	9.00	2.40	Water table	I	0.0-1.8	1.80	Dark brown	7.5YR 3/2	Clay loam	Loose	10% limestone gravel and pebbles	Diffuse/smooth	Fill	Redeposited	WWII structural concrete
				II	1.4-1.65	0.25	Black	7.5YR 2/1	Clay loam	Loose, friable	50% decomposing organic material	Abrupt w/III; Diffuse w/ IV	Alluvial	Intact	-
				III	1.65-1.8	0.15	Dark brown	7.5YR 3/3	Clay	Friable crumb	10% limestone gravel, pebbles and	Distinct/wavy	Alluvial	Intact	-
				IV	1.8-2.0	0.20	Very dark grayish brown	10YR 3/2	Clay	Fine, friable crumb	-	Diffuse	Alluvial	Intact	-
				V	2.0-2.4+	0.40	Dark gray	10YR 4/1	Gley	Non-sticky,	-	Unexcavated	Anaerobic Alluvial	Intact	-
F-2-2	5.30	1.10	Water table	I	0.0-0.15	0.15	Very dark gray	7.5YR 3/1	Clay loam	Loose	decomposing organic material; roots	Distinct	Humus	Intact	-
				II	0.15-0.6	0.45	Brown	7.5YR 4/3	Clay	Fine, friable	Sparse roots	Abrupt/smooth	Alluvium	Intact	-
				III	0.6-0.8	0.20	Very dark gray	10YR 3/1	Clay	Fine	-	Abrupt/smooth	Alluvial	Intact	-
				IV	0.8-0.95	0.15	Gray	10YR 5/1	Gley	Non-sticky, super plastic	-	Abrupt/smooth	Anaerobic Alluvial	Intact	-
				V	0.95-1.1+	0.15	Very dark brown to very dark grayish brown	Mottled 10YR 2/2 and 10YR 3/2	Tropical peat	Vegetal mat	100% organic (partially decomposed reeds)	Unexcavated	Anaerobic Alluvial	Intact	-
F-2-3	5.00	1.04	Water table	I	0.0-0.1	0.10	Very dark gray	7.5YR 3/1	Clay loam	Loose	Roots	Distinct	Humus	Intact	-
				II	0.1-0.35	0.25	Brown	7.5YR 4/3	Clay	Fine, friable	Root layer between Layers II/III	Abrupt/wavy	Alluvium	Intact	-
				III	0.35-1.04	0.69+	Very dark gray	10YR 3/1	Gley	Non-sticky, super plastic	-	Unexcavated	Anaerobic Alluvial	Intact	-
F-2-4	5.00	1.60	Water table	I	0.0-0.2	0.20	Very dark gray	7.5YR 3/1	Clay loam	Loose	-	Distinct/wavy	Humus	Intact	-
				II	0.2-0.45	0.25	Brown	7.5YR 4/4	Clayey sand (not marine)	Loose, coarse	-	Abrupt/wavy	Fill	Redeposited	-
				III	0.45-0.7	0.25	Brown	7.5YR 4/3	Clay	Friable	Sparse limestone	Abrupt/smooth	Alluvium	Intact	-
				IV	0.7-1.6	0.9+	Dark gray	10YR 4/1	Gley	Non-sticky, super plastic	-	-	Residual	Intact	-
F-2-5	5.80	1.50	Decomposing limestone bedrock	I	0.0-0.37	0.37	Very dark grayish brown	10YR 3/2	Clay loam	Very fine, friable crumb	20% limestone gravel and pebbles	Distinct/wavy	Alluvial	Redeposited	-
				II	0.37-0.6	0.23	Dark brown	7.5YR 3/2	Clay	Blocky	-	Abrupt/wavy	Alluvial	Intact	-
				III	0.6-1.5	0.90	Very pale brown	10YR 8/3 & 10YR 7/3	Limestone	Weathered, decomposing	100% weathered & decomposing limestone	-	Residual over bedrock	Intact	-
F-2-6	4.80	0.40	Decomposing limestone bedrock	I	0.0-0.33	0.33	Pale brown	10YR 6/3	Sand	Loose, single grain	50% crushed basalt	Abrupt/wavy	Road fill	Secondary Deposit	Basalt aggregate
				II	0.33+	-	-	-	Limestone	-	100% weathered & decomposing limestone	-	Bedrock	Intact	-
F-2-7	5.70	1.17	Decomposing limestone bedrock	I	0.0-0.49	0.49	Dark brown	7.5YR 3/3	Clay	Very fine, friable	20% limestone gravel and pebbles	Abrupt/wavy	Alluvial	Redeposited	-
				II	0.15-0.64	0.40	Light brownish	10YR 6/2	Sand	Single grain	-	Abrupt/wavy	Pipe Trench Fill	Secondary Deposit	-
				III	0.57-0.75	0.18	Light brownish	10YR 6/2	Clay and sand	Single grain	-	Abrupt/wavy	Pipe Trench Fill	Secondary Deposit	-
				IV	0.7-1.17	0.47	Light brownish	10YR 6/2	Sand	Single grain	-	Abrupt/wavy	Pipe Trench Fill	Secondary Deposit	Copper pipe water line
				V	0.25-1.17+	-	-	-	Limestone	-	100% weathered & decomposing	-	Bedrock	Intact	-

Test Area F Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
F-3-1	5.50	1.40	Decomposing limestone bedrock	I	0.0-1.07	1.07	Very dark brown	7.5YR 2.5/2	Clay loam	Loose	Roots & 10% weathered limestone gravel & pebbles	Distinct/wavy	Fill	Redeposited	Barbed wire
				II	1.0-1.4	0.40	Dark brown to dark gray	Mottled 7.5YR 3/2 & 10YR 4/1	Clay loam & Gley	Friable	10% limestone gravel and pebbles	Distinct/smooth	Mixed- alluvial & anaerobic	Disturbed	-
				III	1.35-1.5	0.15	Dark gray	10YR 4/1	Gley	Compact	-	Abrupt/wavy	Anaerobic Alluvial	Intact	-
				IV	0.55-1.4	0.85	Yellowish brown	10YR 5/4	Sand	Compact	70% weathered limestone gravel, pebbles & cobbles	Abrupt	Residual	Intact	-
				V	0.95+	-	-	-	Limestone	-	100% weathered & decomposing	-	Bedrock	Intact	-
F-3-2	4.60	0.70	Decomposing limestone bedrock	I	0.0-0.3	0.30	Dark brown	7.5YR 3/2	Silty clay	Very fine crumb	Roots	Abrupt/wavy	Alluvium	Intact	-
				II	0.3-0.48	0.18	Reddish yellow	7.5YR 6/6	Sand	Loose	70% weathered limestone cobbles, pebbles and gravel	Distinct/wavy	Alluvial	Intact	-
				III	0.48-0.7	0.22	Dark brown	7.5YR 3/2	Clay loam	Very fine, friable crumb;	20% weathered limestone	Abrupt	Alluvial	Intact	-
				IV	0.70+	-	-	-	Limestone	-	100% weathered & decomposing	-	Bedrock	Intact	-
F-3-3	5.20	0.70	Water table	I	0.0-0.05	0.05	Very dark gray	7.5YR 3/1	Clay loam	Loose	Roots, decomposing organic material	Distinct/wavy	Humus	Intact	Bottle glass
				II	0.05-0.4	0.35	Dark brown	Mottled 7.5YR 3/2 & 7.5YR 3/3	Clay loam	Fine, friable crumb	-	Distinct/smooth	Alluvium	Intact	-
				III	0.4-0.7	0.30	Dark gray	10YR 4/1	Gley	Non-sticky, super plastic	-	Unexcavated	Anaerobic Alluvial	Intact	-
F-3-4	4.70	1.25	Immovable boulders at base of trench	I	0.0-0.1	0.10	Dark brown	7.5YR 3/2	Clay loam	Loose	Roots & 10% limestone gravel & pebbles	Gradual/wavy	Humus	Intact	-
				II	0.1-0.5	0.40	Dark brown	7.5YR 3/3	Clay	Loose	15% limestone pebbles and cobbles	Distinct/wavy	Tsunami? Push	Intact tsunami?	-
				III	0.5-1.25	0.75	Dark gray	7.5YR 4/1	Clay	Blocky	10% subrounded limestone boulders, cobbles and pebbles	Unexcavated	Tsunami (severe, violent)? Push	Intact tsunami? Redeposited fill?	-
F-3-5	4.60	0.46	Decomposing limestone bedrock	I	0.0-0.16	0.16	Very dark gray	7.5YR 3/1	Clay loam	Loose	Roots; 15% crushed basalt	Distinct/smooth	Humus	Intact	Basalt aggregate
				II	0.16-0.25	0.09	Gray	7.5YR 5/1	Silty sand	Coarse, unconsolidated	50% crushed basalt	Distinct/wavy	Fill (associated w/ Airfield?)	Redeposited	Basalt aggregate
				III	0.25-0.46	0.21	Dark brown	7.5YR 3/2	Clay	Fine, friable crumb	10% weathered limestone gravel and pebbles	Abrupt	Alluvial	Intact	-
				IV	0.46+	-	-	-	Limestone	-	100% weathered & decomposing	-	Bedrock	Intact	-
F-3-6	5.10	0.24	Decomposing limestone bedrock	I	0.0-0.24	0.24	Yellowish brown & dark brown	10YR 5/4 & 10YR 3/3	Sandy loam	Very loose, unconsolidated	20% limestone gravel and pebbles	Abrupt/wavy	Alluvial	Redeposited	-
				II	0.24+	-	-	-	Limestone	-	100% weathered & decomposing limestone	-	Bedrock	Intact	-
F-3-7	5.10	0.40	Decomposing limestone bedrock	I	0.0-0.3	0.30	Light yellowish brown & dark brown	10YR 6/4 & 10YR 3/3	Loamy sand	Very loose, unconsolidated	20% limestone gravel and pebbles	Abrupt/wavy	Alluvial	Redeposited	-
				II	0.3+	-	-	-	Limestone	-	100% weathered & decomposing	-	Bedrock	Intact	-
F-3-8	4.60	0.37	Decomposing limestone bedrock	I	0.0-0.33	0.33	Dark brown	10YR 3/3	Sandy loam	Loose, unconsolidated	2-inch crushed basalt; 20% limestone gravel and pebbles	Abrupt/smooth	Alluvial	Redeposited	Bottle glass, basalt & limestone aggregate
				II	0.33-0.37	0.04	Dark brown	7.5YR 3/3	Clay	Blocky	-	Abrupt/wavy	Alluvial	Intact	-
				III	0.37+	-	-	-	Limestone	-	100% weathered & decomposing	-	Bedrock	Intact	-
F-3-9	5.30	1.00	Decomposing limestone bedrock	I	0.0-0.05	0.05	Dusky red	2.5YR 3/4	Sandy clay	Very fine, friable	-	Abrupt/wavy	Recent duff/fill	Redeposited	-
				II	0.05-0.09	0.04	Black	10YR 2/1	Disintegrating asphalt	Compacted	-	Abrupt/smooth	Asphalt pavement, Site	Intact	Asphalt
				III	0.09-0.55	0.46	Yellowish brown & very pale brown	10YR 5/4 & 10YR 7/4	Limestone	Massive	100% crushed limestone	Diffuse/smooth	OR&L RR bedding fill, Site 5791	Secondary Deposit	Limestone aggregate
				IV	0.55-0.91	0.36	Brown	7.5YR 4/3	Clay	Massive	-	Diffuse/wavy	Alluvial	Intact	-
				V	0.91+	-	-	-	Limestone	-	100% weathered & decomposing	-	Bedrock	Intact	-

Test Area F Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
F-4-1	5.60	1.50	Water table	I	0.0-0.65	0.65	Brown to dark brown	Mottled 7.5YR 4/2 & 7.5YR 3/2	Clay loam	Fine, friable crumb	Roots & 25% limestone cobbles & pebbles	Abrupt/wavy	Fill	Redeposited (berm)	-
				I	0.45-1.45	1.00	Brown to light yellowish brown	Mottled 10YR 5/3 & 10YR 6/4	Sand	Loose, coarse	Roots & 50% limestone gravel, pebbles & cobbles	Diffuse/wavy	Alluvial	Intact	-
				III	1.3-1.5	0.2+	Dark gray	10YR 4/1	Gley	Non-sticky, super plastic	-	Unexcavated	Anaerobic Alluvial	Intact	-
F-4-2	5.00	0.40	Decomposing limestone bedrock	I	0.0-0.3	0.30	Very dark gray	7.5YR 3/1	Clay loam	Fine, friable	Roots; 10% limestone cobbles & pebbles	Abrupt/wavy	Alluvium	Intact	-
				II	0.18-0.4	0.22	Brown	7.5YR 4/4	Clay	Single grain	30% limestone cobbles and pebbles	Abrupt/wavy	Alluvial	Intact	-
				III	0.4+	-	-	-	Limestone	-	100% weathered & decomposing	-	Bedrock	Intact	-
F-4-3	5.30	0.95	Decomposing limestone bedrock	I	0.0-0.4	0.40	Dark brown	7.5YR 3/2	Clay loam	Loose, unconsolidated	Moderate roots; 10% limestone gravel and pebbles	Distinct/wavy	Fill	Redeposited	-
				II	0.4-0.75	0.35	Brown	7.5YR 4/2	Clay loam	Friable crumb, moderately compacted	10% limestone gravel and pebbles	Distinct/smooth	Alluvial	Intact (upper possibly truncated)	-
				III	0.75-0.95	0.20	Yellowish brown	10YR 5/4	Clay	Fine, plastic, compacted	-	Abrupt/wavy	Alluvial	Intact	-
				IV	0.95+	-	-	-	Limestone	-	100% weathered & decomposing	-	Bedrock	Intact	-
F-4-4	5.20	1.35	Decomposing limestone bedrock	I	0.0-0.64	0.64	Very dark grayish brown	10YR 3/2	Clay loam	Fine, friable crumb	Ironwood roots & 25% limestone cobbles, pebbles & gravel	Abrupt/wavy	Fill	Redeposited	-
				II	0.64-0.8	0.16	Very pale brown	10YR 8/2	Limestone	Weathered	100% weathered & decomposing	Abrupt/wavy	Bedrock over void	Intact	-
				III	0.8-0.95	0.15	Dark brown	7.5YR 3/3	Clay	Massive	Ironwood roots & 20% limestone pebbles & gravel	Diffuse/wavy	Alluvial fill in void	Intact	-
				IV	0.95-1.35	0.40	Very pale brown	10YR 7/3	Limestone	Decomposing	100% weathered & decomposing	-	Bedrock	Intact	-
F-4-5	7.50	0.93	Decomposing limestone bedrock	I	0.0-0.1	0.10	Very dark brown	10YR 2/2	Vegetation	Structureless	100% organic material	Distinct/wavy	Recent duff	Intact	-
				II	0.1-0.62	0.55	Very dark grayish brown & very pale brown	10YR 3/2, 10YR 8/3 & 10YR 7/3	Beach sand w/clay loam pockets	Loose, single grain	Sparse limestone gravel, pebbles, cobbles	Abrupt/wavy	Tsunami? Fill?	Intact- tsunami? Redeposited- fill?	Fiberglass? Fabric
				III	0.62-0.93	0.38	Dark yellowish brown	10YR 3/4	Clay	Massive	-	Abrupt	Alluvial	Intact	-
				IV	0.93+	-	-	-	Limestone	-	100% weathered & decomposing	-	Bedrock	Intact	-
F-4-6	6.00	0.55	Decomposing limestone bedrock	I	0.0-0.14	0.14	Dark reddish brown to brown	Mottled 5YR 3/3 & 10YR 4/3	Sandy clay loam	Loose, unconsolidated	-	Distinct/wavy	Fill	Redeposited	-
				II	0.14-0.36	0.22	Dark brown	10YR 3/3	Clay loam	Massive	-	Abrupt/smooth	Alluvial	Intact	-
				III	0.36-0.55+	-	-	-	Limestone	Weathered	100% weathered & decomposing	-	Bedrock	Intact	-
F-4-7	5.8	1.08	Decomposing limestone bedrock	I	0.0-0.08	0.08	-	-	Vegetation	Structureless	100% grasses	Distinct/wavy	Recent duff	Intact	-
				II	0.08-0.47	0.26	Very dark grayish brown, pale brown & very pale brown	10YR 3/2, 10YR 6/3 & 10YR 7/3	Sandy clay loam	Loose, unconsolidated	2-inch crushed basalt & 10% limestone gravel	Distinct/wavy	Fill	Redeposited	Asphalt fragments & basalt aggregate
				III	0.1-0.3	0.20	Black	10YR 2/1	Intact asphalt layer	-	-	Abrupt/smooth	Asphalt pavement, Site	Intact	Asphalt
				IV	0.2-0.54	0.34	Pale brown to very pale brown	Mottled 10YR 6/3 & 10YR 8/3	Limestone	-	Crushed gravel	Abrupt/wavy	Fill-bedding for OR&L RR grade	Intact	Limestone aggregate
				V	0.45-0.54	0.09	Grayish brown	10YR 5/2	Basalt	-	2-inch crushed gravel	Abrupt/wavy	Fill-bedding RR	Intact	Basalt aggregate
				VI	0.52-1.03	0.51	Dark brown	7.5YR 3/3	Clay	Massive	-	Abrupt	Alluvial	Intact	-
				VII	0.81-1.08	-	-	-	Limestone	Weathered	100% weathered & decomposing	-	Bedrock	Intact	-
F-4-8	5.00	0.31	Decomposing limestone bedrock	I	0.0-0.25	0.25	Brown	10YR 4/3	Sandy loam	Very fine, friable; unconsolidated	20% limestone gravel and pebbles	Distinct/wavy	Fill	Redeposited	Plastic garbage
				II	0.25-0.31	0.06	Dark yellowish brown	10YR 3/4	Clay	Very fine, friable	50% limestone gravel	Distinct/wavy	Alluvial	Intact	-
				III	0.31+	-	-	-	Limestone	Weathered	100% weathered & decomposing	-	Bedrock	Intact	-

Test Area F Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
F-4-9	5.70	0.52	Decomposing limestone bedrock	I	0.0-0.36	0.36	Dark grayish brown	10YR 4/2	Sandy clay loam	Very fine, friable; unconsolidated	50% limestone gravel, pebbles and cobbles	Distinct/wavy	Push pile fill	Redeposited	Black sheet plastic fragments
				II	0.36-0.52	0.16	Dark yellowish brown	10YR 4/4	Clay	Massive	-	Distinct/wavy	Alluvial	Intact	-
				III	0.52+	-	-	-	Limestone	Weathered	-	-	Bedrock	Intact	-
F-5-1	5.20	1.65	Decomposing limestone bedrock	I	0.0-0.4	0.40	Dark brown	7.5YR 3/2	Clay loam	Loose, unconsolidated	Many roots; 10% limestone gravel and pebbles	Distinct/wavy	Recent duff	Intact	Plastic coated wire
				II	0.4-1.5	1.10	Dark brown to very dark brown	Mottled 7.5YR 3/2 & 7.5YR 2.5/2	Clay loam	Loose, unconsolidated	Few roots; 30% limestone cobbles, pebbles and gravel	Distinct/wavy	Push pile	Redeposited	-
				III	1.5-1.65	0.15	Dark brown	7.5YR 3/2	Clay	Massive, compacted	10% weathered limestone gravel	Abrupt/wavy	Alluvial	Intact	-
				IV	1.65+	-	-	-	Limestone	-	100% weathered & decomposing	-	Bedrock	Intact	-
F-5-2	5.20	0.95	Decomposing limestone bedrock	I	0.0-0.6	0.60	Dark brown	7.5YR 3/2	Clay loam	Fine, friable crumb; loose, unconsolidated	Moderate roots; 15% limestone gravel and pebbles	Distinct/wavy	Alluvium	Intact	-
				II	0.6-0.95	0.35	Brown	7.5YR 4/2	Clay	Massive, compacted	10% limestone gravel and pebbles	Abrupt/wavy	Alluvial	Intact	-
				III	0.95+	-	-	-	Limestone	-	100% weathered & decomposing	-	Bedrock	Intact	-
F-5-3	5.00	1.10	Water table	I	0.0-0.4	0.40	Very dark gray	7.5YR 3/1	Clay loam	Very fine, friable crumb; unconsolidated	15% limestone gravel and pebbles	Distinct/wavy	Alluvium	Intact	-
				II	0.4-075	0.35	Brown	7.5YR 4/3	Clay loam	Very fine, friable crumb;	15% limestone gravel and pebbles	Abrupt/smooth	Alluvial	Intact	-
				III	0.75-1.1	0.35	Brown	10YR 5/3	Gley	Non-sticky,	-	-	Anaerobic Alluvial	Intact	-
F-5-4	5.50	1.30	Decomposing limestone bedrock	I	0.0-0.73	0.73	Very dark grayish brown & dark reddish brown	Mottled 10YR 3/2 & 5YR 3/3	Clay loam	Fine, friable crumb	25% limestone gravel, pebbles and cobbles	Abrupt/wavy	Fill	Redeposited	-
				II	0.73-1.3	-	-	-	Limestone	Weathered	100% weathered & decomposing	-	Bedrock	Intact	-
F-5-5	7.00	1.40	Decomposing limestone bedrock	I	0.0-0.07	0.07	Very dark brown	7.5YR 2.5/2	Humus	Structureless	Ironwood detritus	Distinct/wavy	Recent duff	Intact	-
				II	0.07-0.25	0.18	Very pale brown	10YR 7/4 & 10YR 8/4	Beach Sand	Super fine, unconsolidated	-	Distinct/wavy	Fill? Tsunami?	Redeposited fill? Intact tsunami?	-
				III	0.25-0.42	17.00	Very dark grayish brown	10YR 3/2	Clay loam	Fine, friable crumb	Sparse limestone gravel and pebbles	Abrupt/wavy	Fill?	Redeposited?	-
				IV	0.42-1.4	0.96	Very pale brown & white	10YR 7/4 & 10YR 8/1	Limestone	Weathered	100% weathered & decomposing limestone	-	Bedrock	Intact	-
F-5-6	6.00	0.64	Decomposing limestone bedrock	I	0.0-0.09	0.09	-	-	Concrete slab	Rough concrete aggregate w/finished surface	-	Abrupt	Surface feature Site 7265	Intact	Concrete aggregate
				II	0.09-0.33	0.24	Pale brown	10YR 6/3	Limestone	-	100% crushed gravel	Abrupt/smooth	Fill-concrete bedding, Site 7265	Secondary Deposit	Limestone aggregate
				III	0.33-0.46	0.13	White	10YR 8/1	Limestone	Weathered	100% weathered & decomposing	Abrupt/smooth	Bedrock over void	Intact	-
				IV	0.46-0.64	0.18	Dark yellowish brown	10YR 3/4	Clay	Compacted, massive	-	Abrupt/wavy	Alluvial fill in void	Intact	-
				V	0.64+	-	-	-	Limestone	Weathered	100% weathered & decomposing	-	Bedrock	Intact	-
F-5-7	6.20	0.52	Decomposing limestone bedrock	I	0.0-0.07	0.07	Very dark brown	7.5YR 2.5/2	Humus	Structureless	100% organic material & roots	Distinct/wavy	Recent duff	Intact	-
				II	0.07-0.35	0.28	Dark brown	10YR 3/3	Clay loam	Fine, friable	25% limestone gravel and pebbles	Distinct/smoot	Alluvial	Intact	-
				III	0.35-0.52	0.17	Dark yellowish brown	10YR 4/4	Clay	Massive	10% limestone gravel and pebbles	Abrupt/wavy	Alluvial	Intact	-
				IV	0.52	-	-	-	Limestone	Weathered	100% weathered & decomposing	-	Bedrock	Intact	-
F-5-8	4.80	0.60	Decomposing limestone bedrock	I	0.0-0.36	0.36	Dark grayish	10YR 4/2	Sandy clay loam	Unconsolidated	10% limestone gravel and pebbles	Distinct/wavy	Alluvium	Intact?	-
				II	0.36-0.55	0.19	Dark brown	7.5YR 3/3	Sandy clay loam	Massive	20% limestone gravel and pebbles	Distinct/wavy	Alluvial	Intact	-
				III	0.55-0.6	-	-	-	Limestone	Weathered	100% weathered & decomposing	-	Bedrock	Intact	-

Test Area F Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
F-5-9	5.70	1.23	Decomposing limestone bedrock	I	0.0-0.54	0.54	Dark grayish	10YR 4/2	Sandy loam	Unconsolidated	10% limestone gravel and pebbles	Abrupt/wavy	Fill	Redeposited	-
				II	0.54-0.74	0.20	Brown	10YR 4/3	Sandy clay loam	Fine, friable	60% limestone gravel and pebbles	Distinct/wavy	Fill	Redeposited	Amber bottle glass
				III	0.72-1.2	0.48	Brown to dark grayish brown	Mottled 10YR 4/2 to 10YR 4/3	Sandy loam & sandy clay loam (Mix of Layers I-II)	Fine, friable crumb; unconsolidated	60% limestone gravel and pebbles	Abrupt/smooth	Pipeline trench fill	Secondary Deposit	Bell junction cast iron sewage pipe
				IV	0.74-1.23	-	-	-	Limestone	Weathered	100% weathered & decomposing	-	Bedrock	Intact	-
F-5-10	7.50	1.15	Water table	I	0.0-0.13	0.13	Very dark gray	10YR 3/1	Humus	Structureless	Organic material; 1-in crushed basalt	Distinct/wavy	Recent duff	Intact	Modern trash; basalt
				II	0.13-0.4	0.27	Brown to dark yellowish brown	10YR 5/3 & 10YR 4/4	Limestone	Unconsolidated	100% crushed gravel	Distinct/wavy	Fill	Secondary Deposit	Steel wire bundle; limestone aggregate
				III	0.4-0.58	0.18	Very dark grayish brown & dark grayish brown	10YR 3/2 & 10YR 4/2	Clay loam	Fine, friable crumb	10% limestone gravel	Distinct/wavy	Alluvial	Intact	-
				IV	0.58-0.75	0.17	Light gray & grayish brown	10YR 7/2 & 10YR 5/2	Limestone	Weathered	100% weathered & decomposing limestone	Distinct/smoot h	Bedrock over void	Intact	-
				V	0.75-0.9	0.15	Gray	10YR 5/1	Clay	Massive	-	Diffuse/smooth	Alluvial fill in void	Intact	-
				VI	0.9-1.15	0.25	Brown	10YR 4/3	Clay	Massive	-	Unexcavated	Alluvial fill in void	Intact	-
F-6-1	5.50	0.65	Decomposing limestone bedrock	I	0.0-0.3	0.30	Brown	7.5YR 4/2	Clay loam	Fine, friable	45% limestone gravel and pebbles	Diffuse/wavy	Road fill	Secondary Deposit	-
				II	0.3-0.65	0.35	Brown	10YR 5/3	Sand	Loose	20% weathered limestone gravel, pebbles & cobbles	Diffuse	Residual	Intact	-
				III	0.65+	-	-	-	Limestone	-	100% weathered & decomposing	-	Bedrock	Intact	-
F-6-2	5.60	0.60	Decomposing limestone bedrock	I	0.0-0.25	0.25	Dark reddish brown to dark brown	Mottled 5YR 3/3 & 7.5YR 3/2	Clay loam	Loose	20% limestone gravel and pebbles and crushed basalt	Distinct/wavy	Road fill	Redeposited	Basalt aggregate
				II	0.25-0.6	0.35	Dark gray	7.5YR 4/1	Clay	Non-sticky,	10% limestone gravel and pebbles	Abrupt/wavy	Alluvial	Intact	-
				III	0.6+	-	-	-	Limestone	-	100% weathered & decomposing	-	Bedrock	Intact	-
F-7-1	5.00	0.55	Decomposing limestone bedrock	I	0.0-0.3	0.30	Dark brown	7.5YR 3/2	Clay loam	Loose	10% limestone gravel and pebbles	Gradual	Alluvial	Intact	-
				II	0.3-0.55	0.25	Gray	7.5YR 5/1	Gley	Non-sticky, super plastic	-	Abrupt	Anaerobic Alluvial	Intact	-
				III	0.55+	-	-	-	Limestone	-	100% weathered & decomposing	-	Bedrock	Intact	-
F-7-2	5.00	1.25	Water table	I	0.0-0.3	0.30	Brown	7.5YR 4/4	Clay loam	Loose	Roots; 70% limestone boulders, cobbles, pebbles and gravel	Diffuse/wavy	Road disturbance	Redeposited	-
				II	0.3-0.4	0.10	Very dark gray	7.5YR 3/1	Clay loam	Fine, friable	10% limestone gravel and pebbles	Diffuse/wavy	Alluvial	Intact	-
				III	0.4-0.95	0.55	Brown	7.5YR 4/2	Clay	Super-plastic	Sparse limestone gravel	Gradual/wavy	Alluvial	Intact	-
				IV	0.95-1.25	0.3+	Light gray	7.5YR 7/1	Gley	Sticky, super-plastic	-	-	Anaerobic Alluvial	Intact	-
F-8-1	4.70	0.55	Decomposing limestone bedrock	I	0.0-0.35	0.35	Very dark gray	7.5YR 3/1	Clay loam humus	Unconsolidated	Moderate roots; 30% limestone cobbles, pebbles and gravel	Diffuse/wavy	Alluvium	Intact?	-
				II	0.35-0.55	0.20	Dark brown	7.5YR 3/3	Clay loam	Very fine friable crumb; unconsolidated	60% limestone cobbles and pebbles	Abrupt/wavy	Alluvial	Intact	-
				III	0.55+	-	-	-	Limestone	-	-	-	Bedrock	Intact	-
F-8-2	5.20	1.65	Water table	I	0.0-0.55	0.55	Dark brown	7.5YR 3/2	Clay loam	Loose	60% limestone cobbles, pebbles and	Abrupt/smooth	Berm fill	Redeposited	-
				II	0.55-0.85	0.30	Yellowish brown	10YR 5/4	Sandy loam	Loose	80% weathered limestone cobbles, pebbles and gravel	Diffuse/wavy	Fill	Redeposited	-
				III	0.85-1.65	0.80	Brown	7.5YR 4/3	Clay loam & small pockets of gley	Friable crumb; saturated & compacted	-	Unexcavated	Alluvial & Anaerobic Alluvial	Intact	-
F-9-1	5.00	0.45	Decomposing limestone bedrock	I	0.0-0.2	0.20	Very dark gray & brown	Mottled 7.5YR 3/1 & 7.5YR 4/4	Clay loam	Unconsolidated	70% limestone cobbles, pebbles and gravel	Diffuse/wavy	Fill associated w/ foundation, Site 7284, Feature A	Secondary Deposit	2-in threaded galvanized pipe
				II	0.2-0.45	0.25	Dark brown & light yellowish brown	7.5YR 3/2 (loam) & 10YR 6/4	Sandy clay loam & pockets of beach sand	Fine, friable crumb	1% crushed basalt	Abrupt/wavy	Pipeline trench fill; Site 7284 Feature A	Secondary Deposit	Basalt aggregate
				III	0.45+	-	-	-	Limestone	-	100% weathered & decomposing	-	Bedrock	Intact	-

Test Area F Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
F-9-2	4.50	0.90	Decomposing limestone bedrock	I	0.0-0.7	0.70	Dark brown & dark reddish brown	Mottled 7.5YR 3/2 & 5YR 3/2	Clay loam	Unconsolidated, loose	1% limestone boulders, cobbles, pebbles and gravel	Distinct/wavy	Berm fill	Redeposited	Basalt aggregate
				II	0.7-0.9	0.20	Dark brown	7.5YR 3/2	Clay	Compacted	50% limestone gravel and pebbles	Abrupt/wavy	Alluvial	Intact	-
				III	0.9+	-	-	-	Limestone	-	100% weathered & decomposing	-	Bedrock	Intact	-
F-10-1	4.30	0.60	Decomposing limestone bedrock	I	0.0-0.15	0.15	Very dark gray	7.5YR 3/1	Clay loam humus	Moderately compacted	10% limestone cobbles, pebbles and gravel	Distinct/wavy	Alluvium	Redeposited	Plastic switch cover, beer glass bottle
				II	0.15-0.6	0.45	Brown	10YR 5/3	Sandy clay loam	Unconsolidated	80% weathered limestone cobbles, pebbles and gravel	Abrupt/wavy	Imported fill for slab, Site 7284 Feature C	Secondary Deposit	-
				III	0.6+	-	-	-	Limestone	-	100% weathered & decomposing	-	Bedrock	Intact	-
F-10-2	4.70	1.40	Water table	I	0.0-0.45	0.45	Dark brown & dark reddish brown	Mottled 7.5YR 3/2 & 5YR 3/3	Sandy clay loam	Unconsolidated	30% limestone gravel and pebbles	Diffuse/wavy	Fill	Redeposited	2" metal pipe (gate post)
				II	0.45-0.6	0.15	Yellowish brown & light yellowish brown	Mottled 10YR 5/4 & 10YR 6/4	Calcareous sand	Fine, single grain	-	Abrupt/wavy	Pipeline trench fill	Secondary Deposit	4" metal sewer pipe
				III	0.6-0.95	0.35	Dark brown	7.5YR 3/2	Clay	Compacted	10% weathered limestone gravel	Diffuse/wavy	Alluvial	Intact	-
				IV	0.95-1.4	0.45	Gray	10YR 5/1	Gley	Compacted	-	-	Anaerobic Alluvial	Intact	-
F-11-1	6.00	1.50	Water table	I	0.0-0.5	0.50	Dark brown	7.5YR 3/4	Clay loam	Loose	Roots; 50% limestone gravel, pebbles and cobbles	Distinct/wavy	Fill	Redeposited	-
				II	0.5-0.95	0.45	Dark brown	7.5YR 3/4	Clay loam	Fine, friable	25% limestone gravel and pebbles	Distinct/smoot	Waterline fill	Redeposited	Two 5" iron pipes
				III	0.95-1.5	0.55	Light yellowish brown	10YR 6/4	Sand	Coarse	100% weathered & decomposing limestone	Unexcavated	Residual	Intact	-
11-2	6.10	2.30	Water table	I	0.0-1.1	1.10	Dark reddish	5YR 3/3	Clay loam	Fine, friable	Roots; 10% limestone cobbles and	Abrupt/smooth	Push pile fill	Redeposited	Recent golf ball
				II	1.0-1.35	0.35	Brown & dark brown	Mottled 7.5YR 4/2 & 7.5YR 3/2	Sandy clay loam	Loose	20% limestone gravel and pebbles	Distinct/wavy	Push pile fill	Redeposited	Steel cable, plastic irrigation hose, tire
				III	1.25-1.77	0.52	Very dark brown	10YR 2/2	Sandy clay loam	Compacted, fine friable crumb	Light roots & < 10% limestone gravel	Diffuse/smooth	Alluvium	Intact	-
				IV	1.73-2.3	0.57	Dark gray & gray	Mottled 10YR 4/1 & 10YR 5/1	Gley	Non-sticky, super plastic	-	Unexcavated	Anaerobic Alluvial	Intact	-
F-12-1	6.30	1.60	Decomposing limestone bedrock	I	0.0-0.05	0.05	Black	10YR 2/1	Intact asphalt layer	Compacted	-	Abrupt/smooth	Asphalt pavement, Site	Intact	asphalt aggregate
				II	0.05-0.3	0.25	Very pale brown & light yellowish brown	Mottled 10YR 7/4 & 10YR 6/4	Limestone	Weathered	Root mat; 100% limestone gravel & pebbles	Abrupt/smooth	Fill/bedding for asphalt surface, Site 5791	Secondary Deposit	-
				III	0.3-0.35	0.05	Dark grayish	10YR 4/2	Clay loam	Compact	30% limestone gravel and pebbles	Abrupt/wavy	Fill- Site 5791	Secondary Deposit	-
				IV	0.35-1.2	0.85	Very pale brown	10YR 7/4	Weathered limestone	Compact	100% limestone boulders, cobbles, pebbles, gravel	Abrupt/wavy	Limestone fill for OR&L RR Site 5791	Secondary Deposit	Railroad grade
				V	1.2-1.6	0.40	Dark gray	10YR 4/1	Gley	Compact	-	Unexcavated	Anaerobic Alluvial	Intact	-
F-12-2	6.30	1.35	Water table	I	0.0-0.4	0.40	Dark brown	7.5YR 3/3	Clay loam	Fine, friable	Roots & 50% limestone gravel & pebbles	Abrupt/wavy	Fill	Redeposited	-
				II	0.4-0.95	0.55	Dark brown	7.5YR 3/3	Clay loam	Fine, friable	-	Abrupt/wavy	Alluvial	Intact	-
				III	0.95-1.35	0.40	Dark gray	7.5YR 4/1	Gley	Compact, saturated	-	Unexcavated	Anaerobic Alluvial	Intact	-
F-13-1	6.50	0.12	Decomposing limestone bedrock	I	0.0-0.12	0.10	Very dark gray	7.5YR 3/1	Silty clay loam	Fine, friable crumb	25% limestone gravel & pebbles; roots & 50% decomposing organics	Abrupt/wavy	Alluvium	Intact	transfer printed ceramics, bottle glass
				II	0.12+	-	-	-	Limestone	-	-	-	Bedrock	Intact	-
F-13-2	6.00	2.13	Decomposing limestone bedrock	I	0.0-1.25	1.25	Dark brown	7.5YR 3/3	Clay loam	Loose, friable crumb	30% limestone gravel, pebbles and cobbles; roots	Distinct/wavy	Fill	Redeposited	-
				II	1.25-1.75	0.50	Dark reddish brown	5YR 3/3	Clay	Compacted, massive	-	Distinct/wavy	Alluvial	Intact	-
				III	1.75-2.13	0.38	Dark gray	10YR 4/1	Gley	Non-sticky,	-	Abrupt/smooth	Alluvial	Intact	-
				IV	2.13	-	-	-	Limestone	-	-	-	Bedrock	Intact	-

Test Area F Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
F-14-1	6.00	0.10	Decomposing limestone bedrock	I	0.0-0.10	0.10	Dark brown	7.5YR 3/2	Clay loam	Fine, friable crumb	20% limestone gravel & pebbles; roots & 20% decomposing organics	Abrupt/smooth	Alluvium	Intact	-
				II	0.10+	-	-	-	Limestone	-	100% weathered & decomposing limestone	-	Bedrock	Intact	-
F-14-2	4.60	0.63	Decomposing limestone bedrock	I	0.0-0.18	0.18	Dark reddish	5YR 3/3	Clay loam	Fine, friable	20% limestone gravel and pebbles	Abrupt/wavy	Push pile fill	Redeposited	-
				II	0.18-0.45	0.27	Yellowish brown	10YR 5/4	Sandy loam	Loose	80% limestone gravel and pebbles	Distinct/wavy	Push pile fill	Redeposited	-
				III	0.45-0.63	0.18	Very dark grayish brown	10YR 3/2	Sandy loam	Loose	30% limestone gravel and pebbles	Abrupt/wavy	Push pile fill	Redeposited	Asphalt fragments, bottle glass
				IV	0.63+	-	-	-	Limestone	-	100% weathered & decomposing	-	Bedrock	Intact	-
F-15-1	6.40	0.61	Decomposing limestone bedrock	I	0.0-0.13	0.12	Black	7.5YR 2.5/1	Clay loam	Loose	roots; 50% organic material	Clear/wavy	Alluvium	Intact	-
				II	0.12-0.55	0.41	Dark grayish	10YR 4/2	Clay loam	Fine, friable	10% limestone gravel and pebbles	Clear/wavy	Alluvial	Intact	-
				Pipe Trench	0.06-0.55	0.50	Very pale brown	10YR 7/3	Beach Sand	Loose	-	Abrupt/wavy	Pipe trench fill	Secondary Deposit	8-inch iron pipeline
				III	0.37-0.61	0.10	Dark gray	10YR 4/1	Gley	Non-sticky,	-	-	Anaerobic Alluvial	Intact	-
				IV	0.61+	-	-	-	Limestone	-	100% weathered & decomposing	-	Bedrock	Intact	-
F-15-2	5.00	1.20	Decomposing limestone bedrock	I	0.0-0.3	0.30	Dark brown	7.5YR 3/3	Silty loam	Fine, friable	10% limestone gravel and pebbles	Abrupt/wavy	Fill	Redeposited	-
				II	0.3-0.75	0.45	Pale brown to brown	Mottled 10YR 6/3 & 10YR 4/3	Limestone	Crushed	100% crushed gravel, pebbels & cobbles	Distinct/wavy	Fill	Secondary Deposit	Limestone aggregate; concrete fragments
				III	0.75-0.87	0.12	Yellowish brown	10YR 5/4	Silty sand	Single grain	70% limestone gravel and pebbles	Distinct/wavy	Fill	Secondary Deposit	-
				IV	0.87-1.2	0.33	Dark reddish	5YR 3/3	Clay	Blocky	-	Abrupt/wavy	Alluvial	Intact	-
				V	1.2+	-	-	-	Limestone	-	100% weathered & decomposing	-	Bedrock	Intact	-

Test Area G Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
G-2-1	5.00	2.30	Subsoil	I	0.0-0.5	0.50	Dark brown	7.5YR 3/2	Clay loam	Loose	weathered organic debris; dense roots	Diffuse/wavy	Reworked	Plow zone	-
				II	0.5-0.86	0.35	Dark brown	7.5YR 3/3	Clay	Blocky	< 5% weathered limestone gravel	Smooth/abrupt	Alluvial	Intact	-
				IIIa	0.86-0.98	0.12	Dark brown	7.5YR 3/2	Clay loam	Compacted	< 5% weathered limestone gravel	Smooth/abrupt	Alluvial	Intact	-
				IIIb	0.93-0.98	0.05	Dark brown	7.5YR 3/3	Gravelly clay loam	Compacted	50% weathered limestone gravel; lens	Smooth/abrupt	Alluvial	Intact	-
				IV	0.98-2.3	1.32	Dark brown	7.5YR 3/4	Clay	Compacted, Massive	-	Unexcavated	Alluvial	Intact	-
G-2-2	5.00	2.70	Subsoil	I	0.0-0.45	0.45	Very dark brown	7.5YR 2.5/2	Clay loam	Loose	Roots common	Diffuse/wavy	Reworked	Plow zone	-
				II	0.45-0.78	0.33	Dark brown	7.5YR 3/2	Clay	Blocky	< 5% limestone gravel, pebbles; few	Diffuse/wavy	Alluvial	Intact	-
				III	0.78-2.7	1.92	Dark brown	7.5YR 3/4	Clay	Compacted, Massive	speckled w/ weathered limestone fragments	Unexcavated	Alluvial	Intact	-
G-2-3	4.50	2.20	Subsoil	I	0.0-0.4	0.40	Very dark brown	7.5YR 2.5/2	Clay loam	Loose	Few roots, basalt crushed gravel	Distinct/wavy	Reworked	Plow zone	Basalt aggregate, Marconi Rd
				II	0.4-1.0	0.60	Dark brown	7.5YR 3/4	Clay	Blocky	-	Distinct/wavy	Alluvial	Intact	-
				III	1.0-2.2	1.20	Dark brown	7.5YR 3/4	Clay	Compacted, Massive	sparse weathered limestone fragments	Unexcavated	Alluvial	Intact	-
G-3-1	5.20	2.20	Subsoil	I	0.0-0.4	0.40	Dark brown	7.5YR 3/3	Clay loam	Loose	Roots common	Abrupt/wavy	Reworked	Plow zone	-
				II	0.4-0.46	0.60	Dark brown	7.5YR 3/4	Clay	Compacted	< 5% weathered limestone gravel	Abrupt/smooth	Alluvial	Intact	-
				III	0.46-0.65	0.19	Dark brown	7.5YR 3/3	Clay loam	Loose	-	Abrupt/wavy	Reworked	Plow zone	-
				IV	0.65-2.2	1.55	Dark brown	7.5YR 3/4	Clay	Compacted, Massive	-	Unexcavated	Alluvial	Intact	-
G-3-2	5.00	2.35	Subsoil	I	0.0-0.4	0.40	Very dark brown	7.5YR 2.5/2	Clay loam	Loose	-	Diffuse/wavy	Reworked Alluvium	Plow zone	-
				II	0.4-2.35	1.95	Dark brown	7.5YR 3/4	Clay	Massive	-	Unexcavated	Alluvial	Intact	-
G-4-1	5.90	2.30	Decomposing limestone bedrock	I	0.0-0.55	0.55	Dark brown	7.5YR 3/3	Clay loam	Loose	> 5% sparse weathered limestone, roots	Diffuse/wavy	Reworked	Plow zone	-
				II	0.55-0.95	0.40	Dark brown	Mottled 7.5YR 3/3 and 7.5YR	Clay loam	Blocky	-	Abrupt/wavy	Alluvial	Possible plow zone	-
				III	0.95-2.3	1.35	Dark brown	7.5YR 3/3	Clay	Compacted, Massive	1% very sparse limestone	Abrupt/wavy	Alluvial	Intact	-
				IV	2.3+	-	-	-	Limestone	-	100% decomposing limestone	-	Bedrock	Intact	-
G-4-2	6.40	2.00	Decomposing limestone bedrock	I	0.0-0.6	0.60	Mottled Dark brown & Dark reddish brown	5YR 3/3 and 7.5YR 3/4	Clay loam	Loose	10% weathered limestone; roots	Abrupt/wavy	Reworked Alluvium	Plow zone	-
				II	0.6-2.0	1.40	Dark brown	7.5YR 3/4	Clay	Compacted, Massive	-	Abrupt	Alluvial	Intact	-
				III	2.0+	-	-	-	Limestone	-	100% decomposing limestone	-	Bedrock	Intact	-
G-4-3	5.20	1.50	Subsoil	I	0.0-0.4	0.40	Dark brown	7.5YR 3/3	Clay loam	Loose	-	Abrupt/wavy	Reworked	Plow zone	Modern debris
				II	0.4-1.45	1.05	Dark brown	7.5YR 3/3	Clay	Massive	-	Abrupt/wavy	Alluvial	Intact	-
				III	1.45-1.5	0.05	Yellowish red	5YR 4/6	Sand	Very Friable, coarse	100% decomposing limestone	-	Residual	Intact	-
				IV	1.5+	-	-	-	Limestone	-	100% decomposing limestone	-	Bedrock	Intact	-
G-5-1	5.90	2.30	Decomposing limestone bedrock	I	0.0-0.35	0.35	Dark reddish	5YR 3/3	Silty clay loam	Loose	< 5% limestone, roots common	Diffuse	Reworked	Plow zone	-
				II	0.35-0.95	0.60	Dark reddish	5YR 3/2	Clay loam	Compacted	10% weathered limestone	Diffuse	Alluvial	Intact	-
				III	0.95-1.55	0.60	Dark reddish brown	5YR 3/3	Clay	Compacted, Massive	< 5% weathered limestone	Distinct	Alluvial	Intact	-
				IV	1.55-2.3	0.75	Brown	Mottled 7.5YR 4/4 & 7.5YR 5/4	Clay	Moderately Compacted	30% weathered limestone	Alluvial	Alluvial	Intact	-
				V	2.3+	-	-	-	Limestone	-	100% decomposing limestone	-	Bedrock	Intact	-

Test Area G Trench Stratigraphy

Backhoe Trench	Trench length (m)	Max. Trench Depth (m)	Reason for termination	Layer	Depth of Layer (m bs)	Average thickness of layer (m)	Soil color	Munsell	Matrix	Structure	Inclusions	Lower boundary	Deposit type	Integrity	Cultural material
G-5-2	5.30	2.10	Decomposing limestone bedrock	I	0.0-0.5	0.50	Dark brown	7.5YR 3/3	Clay loam	Loose	10% limestone gravel	Abrupt/smooth	Reworked	Plow zone	-
				II	0.5-0.85	0.35	Very dark brown	7.5YR 2.5/2	Clay loam	Compact	-	Abrupt/smooth	Alluvial	Intact	-
				III	0.85-1.95	1.10	Reddish brown	5YR 3/3	Clay	Compact	5% limestone gravel	Distinct/wavy	Alluvial	Intact	-
				IV	1.95-2.1	0.15	Brown	Mottled 7.5YR 4/4 & 7.5YR 5/4	Clay	Compact	30% weathered limestone	Abrupt/wavy	Alluvial, Residual	Intact	-
				V	2.1+	-	-	-	Limestone	-	100% decomposing limestone	-	Bedrock	Intact	-
G-5-3	5.60	2.40	Decomposing limestone bedrock & Water table	I	0.0-0.5	0.50	Dark brown	7.5YR 3/3	Clay loam	Loose	sparse weathered organic material	Gradual/wavy	Reworked	Plow zone	-
				II	0.5-1.3	0.80	Dark brown	7.5YR 3/4	Clay	Compacted, Massive	< 10% weathered limestone pebbles	Gradual/wavy	Alluvial	Intact	-
				III	1.3-1.6	0.30	Brown	7.5YR 4/4	Silty clay loam	Compacted	50% weathered subangular basalt pebbles & cobbles	Distinct	Alluvial	Intact	-
				IV	1.6-2.0	0.40	Dark brown	7.5YR 3/3	Clayey silt	Moderately Compacted	< 5% limestone pebbles	Distinct	Alluvial	Intact	-
				V	2.0-2.4	0.40	Reddish yellow	7.5YR 6/6	Clay	Loose	50% weathered subangular limestone	Abrupt/wavy	Alluvial, Residual	Intact	-
				VI	2.4+	-	-	-	Limestone	-	100% decomposing limestone	-	Bedrock	Intact	-
G-6-1	5.15	2.10	Subsoil	I	0.0-0.38	0.38	Dark reddish	5YR 3/3	Silty loam	Unconsolidated	15% weathered limestone; few roots	Diffuse/wavy	Reworked	Plow zone	steel cable, wine bottle
				II	0.38-0.9	0.52	Dark reddish brown and reddish brown	Mottled 5YR 3/3 & 5YR 4/4	Silty clay loam	Slightly consolidated	30% weathered limestone	Gradual/wavy	Alluvial	Intact	-
				III	0.9-1.43	0.53	Dark reddish	5YR 3/3	Clay	Compacted	sparse weathered limestone	Diffuse/wavy	Alluvial	Intact	-
				IV	1.43-2.1	0.67	Brown & Dark brown	7.5YR 4/4 & 7.5YR 3/4	Clay	Coarse	20% weathered limestone	Unexcavated	Alluvial	Intact	-

APPENDIX D - Accession Record for Haun & Associates TBR SAIS

HAUN & ASSOCIATES ACCESSION RECORD FOR TBR SAIS

Acc.No.	SIHP Site No.	Test Area	Transect	Trench	Layer	Depth cm below surface	Specimen	Material	TNF	Weight (grams)	Comment	Recorder	Date
1.001		A	1	2	II	80-125	Core	Volcanic Glass	1	1.7	multidirectional; L=15.4mm, W=12.0mm, T=11.4mm	JK	1/27/2012
2.001		A	5	1	IV	110-156	Handle	Metal	1	97.6	chromed handle of indeterminate type, could be historic or modern; L=78.2mm, W=39.5mm, T=27.0mm	JK	1/30/2012
3.001		C	Sand Pit 1	Profile 2	II	5-240+	*Felis catus*	Bone	7	13.5	tibia, radius, 2 vertebrae, 3 phalanges	JK	1/4/2012
4.001		C	7	1	III	6-40	Unidentified Mammal	Bone	1	1.2	probable *Sus scrofa*	TG	1/17/2012
4.002		C	7	1	III	6-40	Poritidae *Porites* sp. pebble	Coral	1	0.4	manuport	TG	1/17/2012
5.001		C	8	1	Pit- IIIa	16-53	Charred Wood	Charcoal	3	0.3		TG	1/17/2012
6.001		C	8	2	IV a	84-117	Conidae *Conus* sp.	Gastropod Shell	1	1.1	waterworn	TG	1/19/2012
6.002		C	8	2	IV a	84-117	Neritidae *Nerita picea*	Gastropod Shell	2	0.4	waterworn	TG	1/19/2012
6.003		C	8	2	IV a	84-117	Indeterminate Gastropod	Gastropod Shell	2	0.8	waterworn	TG	1/19/2012
6.004		C	8	2	IV a	84-117	*Heterocentrotus mammillatus*	Urchin Spine	1	0.4	waterworn	TG	1/19/2012
7.001	4488	C	Sand Pit 6	Profile 1	II	36-180	Earthenware Vessel Fragments	Ceramic	3	6.8	light green slip	TG	1/17/2012
7.002	4488	C	Sand Pit 6	Profile 1	II	36-180	Avian	Bone	1	0.1		TG	1/17/2012
7.003	4488	C	Sand Pit 6	Profile 1	II	36-180	Unidentified Mammal	Bone	2	109.9	probable *Sus scrofa* , *Bos taurus* or *Equus ferus*	TG	1/17/2012
7.004	4488	C	Sand Pit 6	Profile 1	II	36-180	Charred Wood	Charcoal	1	0.1		TG	1/17/2012
8.001		D	9	3	IV	118-200	Indeterminate Bivalve	Bivalve Shell	1	< 0.1		TG	1/16/2012
8.002		D	9	3	IV	118-200	Crustacea	Exoskeleton	1	0.3	crab claw	TG	1/16/2012
9.001		D	8	3	I	0-65	Cypraeidae *Cypraea caputserpentis*	Gastropod Shell	2	0.5		JK	1/11/2012
9.002		D	8	3	I	0-65	Mytilidae	Bivalve Shell	1	0.1		JK	1/11/2012
9.003		D	8	3	I	0-65	Echinometridae	Exoskeleton	1	0.1		JK	1/11/2012
9.004		D	8	3	I	0-65	Crustacea	Exoskeleton	1	0.1	crab claw	JK	1/11/2012
9.005		D	8	3	I	0-65	Waterworn Marine Shell	Mixed	9	3.0		JK	1/11/2012
10.001	7289	D	2	1	III	38-45	Debitage	Basalt	4	5.6		JK	1/10/2012
10.002	7289	D	2	1	III	38-45	Patellidae *Cellana* sp.	Gastropod Shell	1	1.1		JK	1/10/2012
11.001	7289	D	2	1B	III	30-54	Neritidae *Nerita polita*	Gastropod Shell	1	1.8		JK	1/20/2012
11.002	7289	D	2	1B	III	30-54	Crustacea	Exoskeleton	1	0.1	crab claw	JK	1/20/2012
11.003	7289	D	2	1B	III	30-54	Waterworn Marine Shell	Gastropod Shell	1	0.1		JK	1/20/2012
12.001	7289	D	2	1B	III	30-54	Conidae *Conus* sp.	Gastropod Shell	1	0.4		JK	1/20/2012
12.002	7289	D	2	1B	III	30-54	Indeterminate Bivalve	Bivalve Shell	5	0.6		JK	1/20/2012
12.003	7289	D	2	1B	III	30-54	Echinometridae	Exoskeleton	1	0.1		JK	1/20/2012
12.004	7289	D	2	1B	III	30-54	Unidentified Mammal	Bone	2	0.6		JK	1/20/2012
12.005	7289	D	2	1B	III	30-54	*Aluerites moluccana*	Nutshell	1	0.1	*Kukui* , burned	JK	1/20/2012
12.006	7289	D	2	1B	III	30-54	Charred Wood	Charcoal	74	8.7		JK	1/20/2012
12.007	7289	D	2	1B	III	30-54	Waterworn Marine Shell	Gastropod Shell	7	1		JK	1/20/2012
13.001	7289	D	2	1D	IV	56-80	*Sus scrofa*	Bone	15	19.5	juvenile pig	TG	1/23/2012
13.002	7289	D	2	1D	IV	56-80	Charred Wood	Charcoal	1	0.1		TG	1/23/2012
14.001	7290	D	5	1	IV	35-53	Charred Wood	Charcoal	1	0.1		TG	1/10/2012
14.002	7290	D	5	1	IV	35-53	Waterworn Marine Shell	Mixed	12	3.4		TG	1/10/2012
15.001	7290	D	5	1	VI	42-90	Core	Volcanic Glass	1	3.1	multidirectional; L=20.2mm, W=16.6mm, T=12.3mm	TG	1/10/2012
15.002	7290	D	5	1	VI	42-90	Trochidae *Trochus intextus*	Gastropod Shell	1	2.3		TG	1/10/2012
15.003	7290	D	5	1	VI	42-90	Charred Wood	Charcoal	3	0.2		TG	1/10/2012
15.004	7290	D	5	1	VI	42-90	Waterworn Marine Shell	Mixed	8	2.2		TG	1/10/2012
16.001	7290	D	6	1	II	17-43	Conidae *Conus* sp.	Gastropod Shell	1	0.7		JK	1/10/2012
16.002	7290	D	6	1	II	17-43	Tellinidae *Tellina palatam*	Bivalve Shell	2	0.6		JK	1/10/2012
16.003	7290	D	6	1	II	17-43	Indeterminate Bivalve	Bivalve Shell	1	0.6		JK	1/10/2012
16.004	7290	D	6	1	II	17-43	Charred Wood	Charcoal	3	0.1		JK	1/10/2012
17.001	7290	D	6	1	IV	46-86	Cypraeidae *Cypraea caputserpentis*	Gastropod Shell	1	1.6		JK	1/10/2012
17.002	7290	D	6	1	IV	46-86	Charred Wood	Charcoal	1	0.5		JK	1/10/2012
17.003	7290	D	6	1	IV	46-86	Waterworn Marine Shell	Mixed	2	0.6		JK	1/10/2012
18.001	7290	D	7	1	IV	33-85	Cypraeidae *Cypraea caputserpentis*	Gastropod Shell	1	2.7		JK	1/11/2012
18.002	7290	D	7	1	IV	33-85	Indeterminate Faunal	Bone	3	0.5	probable avian	JK	1/11/2012
18.003	7290	D	7	1	IV	33-85	Waterworn Marine Shell	Mixed	2	1.4		JK	1/11/2012
19.001		D	10	3	III	48-77	Waterworn Marine Shell	Gastropod Shell	1	0.2		TG	1/13/2012
20.001	7291	D	12	2	II	38-105	Conidae *Conus abbreviatus*	Gastropod Shell	1	0.2		TG	1/13/2012
20.002	7291	D	12	2	II	38-105	Neritidae *Nerita picea*	Gastropod Shell	1	0.7		TG	1/13/2012
20.003	7291	D	12	2	II	38-105	*Aluerites moluccana*	Nutshell	4	2.8	*Kukui* , not burned	TG	1/13/2012
20.004	7291	D	12	2	II	38-105	Charred Wood	Charcoal	4	0.6		TG	1/13/2012
20.005	7291	D	12	2	II	38-105	Poritidae *Porites* sp. pebble	Coral	1	3.2	manuport	TG	1/13/2012
20.006	7291	D	12	2	II	38-105	Waterworn Marine Shell	Mixed	32	17.4		TG	1/13/2012
21.001	7291	D	12	2	Pit--III	73-117	Neritidae *Nerita picea*	Gastropod Shell	2	1.6		TG	1/13/2012
21.002	7291	D	12	2	Pit--III	73-117	Charred Wood	Charcoal	8	0.7		TG	1/13/2012
21.003	7291	D	12	2	Pit--III	73-117	Waterworn Marine Shell	Mixed	15	7.1		TG	1/13/2012

HAUN & ASSOCIATES ACCESSION RECORD FOR TBR SAIS

Acc.No.	SIHP Site No.	Test Area	Transect	Trench	Layer	Depth cm below surface	Specimen	Material	TNF	Weight (grams)	Comment	Recorder	Date
1.001		A	1	2	II	80-125	Core	Volcanic Glass	1	1.7	multidirectional; L=15.4mm, W=12.0mm, T=11.4mm	JK	1/27/2012
2.001		A	5	1	IV	110-156	Handle	Metal	1	97.6	chromed handle of indeterminate type, could be historic or modern; L=78.2mm, W=39.5mm, T=27.0mm	JK	1/30/2012
3.001		C	Sand Pit 1	Profile 2	II	5-240+	*Felis catus*	Bone	7	13.5	tibia, radius, 2 vertebrae, 3 phalanges	JK	1/4/2012
4.001		C	7	1	III	6-40	Unidentified Mammal	Bone	1	1.2	probable *Sus scrofa*	TG	1/17/2012
4.002		C	7	1	III	6-40	Poritidae *Porites* sp. pebble	Coral	1	0.4	manuport	TG	1/17/2012
5.001		C	8	1	Pit- IIIa	16-53	Charred Wood	Charcoal	3	0.3		TG	1/17/2012
6.001		C	8	2	IV a	84-117	Conidae *Conus* sp.	Gastropod Shell	1	1.1	waterworn	TG	1/19/2012
6.002		C	8	2	IV a	84-117	Neritidae *Nerita picea*	Gastropod Shell	2	0.4	waterworn	TG	1/19/2012
6.003		C	8	2	IV a	84-117	Indeterminate Gastropod	Gastropod Shell	2	0.8	waterworn	TG	1/19/2012
6.004		C	8	2	IV a	84-117	*Heterocentrotus mammillatus*	Urchin Spine	1	0.4	waterworn	TG	1/19/2012
7.001	4488	C	Sand Pit 6	Profile 1	II	36-180	Earthenware Vessel Fragments	Ceramic	3	6.8	light green slip	TG	1/17/2012
7.002	4488	C	Sand Pit 6	Profile 1	II	36-180	Avian	Bone	1	0.1		TG	1/17/2012
7.003	4488	C	Sand Pit 6	Profile 1	II	36-180	Unidentified Mammal	Bone	2	109.9	probable *Sus scrofa* , *Bos taurus* or *Equus ferus*	TG	1/17/2012
7.004	4488	C	Sand Pit 6	Profile 1	II	36-180	Charred Wood	Charcoal	1	0.1		TG	1/17/2012
8.001		D	9	3	IV	118-200	Indeterminate Bivalve	Bivalve Shell	1	< 0.1		TG	1/16/2012
8.002		D	9	3	IV	118-200	Crustacea	Exoskeleton	1	0.3	crab claw	TG	1/16/2012
9.001		D	8	3	I	0-65	Cypraeidae *Cypraea caputserpentis*	Gastropod Shell	2	0.5		JK	1/11/2012
9.002		D	8	3	I	0-65	Mytilidae	Bivalve Shell	1	0.1		JK	1/11/2012
9.003		D	8	3	I	0-65	Echinometridae	Exoskeleton	1	0.1		JK	1/11/2012
9.004		D	8	3	I	0-65	Crustacea	Exoskeleton	1	0.1	crab claw	JK	1/11/2012
9.005		D	8	3	I	0-65	Waterworn Marine Shell	Mixed	9	3.0		JK	1/11/2012
10.001	7289	D	2	1	III	38-45	Debitage	Basalt	4	5.6		JK	1/10/2012
10.002	7289	D	2	1	III	38-45	Patellidae *Cellana* sp.	Gastropod Shell	1	1.1		JK	1/10/2012
11.001	7289	D	2	1B	III	30-54	Neritidae *Nerita polita*	Gastropod Shell	1	1.8		JK	1/20/2012
11.002	7289	D	2	1B	III	30-54	Crustacea	Exoskeleton	1	0.1	crab claw	JK	1/20/2012
11.003	7289	D	2	1B	III	30-54	Waterworn Marine Shell	Gastropod Shell	1	0.1		JK	1/20/2012
12.001	7289	D	2	1B	III	30-54	Conidae *Conus* sp.	Gastropod Shell	1	0.4		JK	1/20/2012
12.002	7289	D	2	1B	III	30-54	Indeterminate Bivalve	Bivalve Shell	5	0.6		JK	1/20/2012
12.003	7289	D	2	1B	III	30-54	Echinometridae	Exoskeleton	1	0.1		JK	1/20/2012
12.004	7289	D	2	1B	III	30-54	Unidentified Mammal	Bone	2	0.6		JK	1/20/2012
12.005	7289	D	2	1B	III	30-54	*Aluerites moluccana*	Nutshell	1	0.1	*Kukui* , burned	JK	1/20/2012
12.006	7289	D	2	1B	III	30-54	Charred Wood	Charcoal	74	8.7		JK	1/20/2012
12.007	7289	D	2	1B	III	30-54	Waterworn Marine Shell	Gastropod Shell	7	1		JK	1/20/2012
13.001	7289	D	2	1D	IV	56-80	*Sus scrofa*	Bone	15	19.5	juvenile pig	TG	1/23/2012
13.002	7289	D	2	1D	IV	56-80	Charred Wood	Charcoal	1	0.1		TG	1/23/2012
14.001	7290	D	5	1	IV	35-53	Charred Wood	Charcoal	1	0.1		TG	1/10/2012
14.002	7290	D	5	1	IV	35-53	Waterworn Marine Shell	Mixed	12	3.4		TG	1/10/2012
15.001	7290	D	5	1	VI	42-90	Core	Volcanic Glass	1	3.1	multidirectional; L=20.2mm, W=16.6mm, T=12.3mm	TG	1/10/2012
15.002	7290	D	5	1	VI	42-90	Trochidae *Trochus intextus*	Gastropod Shell	1	2.3		TG	1/10/2012
15.003	7290	D	5	1	VI	42-90	Charred Wood	Charcoal	3	0.2		TG	1/10/2012
15.004	7290	D	5	1	VI	42-90	Waterworn Marine Shell	Mixed	8	2.2		TG	1/10/2012
16.001	7290	D	6	1	II	17-43	Conidae *Conus* sp.	Gastropod Shell	1	0.7		JK	1/10/2012
16.002	7290	D	6	1	II	17-43	Tellinidae *Tellina palatam*	Bivalve Shell	2	0.6		JK	1/10/2012
16.003	7290	D	6	1	II	17-43	Indeterminate Bivalve	Bivalve Shell	1	0.6		JK	1/10/2012
16.004	7290	D	6	1	II	17-43	Charred Wood	Charcoal	3	0.1		JK	1/10/2012
17.001	7290	D	6	1	IV	46-86	Cypraeidae *Cypraea caputserpentis*	Gastropod Shell	1	1.6		JK	1/10/2012
17.002	7290	D	6	1	IV	46-86	Charred Wood	Charcoal	1	0.5		JK	1/10/2012
17.003	7290	D	6	1	IV	46-86	Waterworn Marine Shell	Mixed	2	0.6		JK	1/10/2012
18.001	7290	D	7	1	IV	33-85	Cypraeidae *Cypraea caputserpentis*	Gastropod Shell	1	2.7		JK	1/11/2012
18.002	7290	D	7	1	IV	33-85	Indeterminate Faunal	Bone	3	0.5	probable avian	JK	1/11/2012
18.003	7290	D	7	1	IV	33-85	Waterworn Marine Shell	Mixed	2	1.4		JK	1/11/2012
19.001		D	10	3	III	48-77	Waterworn Marine Shell	Gastropod Shell	1	0.2		TG	1/13/2012
20.001	7291	D	12	2	II	38-105	Conidae *Conus abbreviatus*	Gastropod Shell	1	0.2		TG	1/13/2012
20.002	7291	D	12	2	II	38-105	Neritidae *Nerita picea*	Gastropod Shell	1	0.7		TG	1/13/2012
20.003	7291	D	12	2	II	38-105	*Aluerites moluccana*	Nutshell	4	2.8	*Kukui* , not burned	TG	1/13/2012
20.004	7291	D	12	2	II	38-105	Charred Wood	Charcoal	4	0.6		TG	1/13/2012
20.005	7291	D	12	2	II	38-105	Poritidae *Porites* sp. pebble	Coral	1	3.2	manuport	TG	1/13/2012
20.006	7291	D	12	2	II	38-105	Waterworn Marine Shell	Mixed	32	17.4		TG	1/13/2012
21.001	7291	D	12	2	Pit--III	73-117	Neritidae *Nerita picea*	Gastropod Shell	2	1.6		TG	1/13/2012
21.002	7291	D	12	2	Pit--III	73-117	Charred Wood	Charcoal	8	0.7		TG	1/13/2012
21.003	7291	D	12	2	Pit--III	73-117	Waterworn Marine Shell	Mixed	15	7.1		TG	1/13/2012

APPENDIX D:

CULTURAL IMPACT ASSESSMENT

D

Pacific Legacy

Historic Preservation

FINAL

CULTURAL IMPACT ASSESSMENT OF THE TURTLE BAY RESORT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT LANDS DISTRICT OF KOʻOLAU LOA, OʻAHU ISLAND HAWAIʻI

[TMK 5-6-003:001 por., 010 por., 016 por., 017 por., 026 por., 033, 040-044, 046 por., 048, -049; 5-7-001:001, 001, 016, 017, 020, 022, 030, 031, 033; 5-7-003:072; and 5-7-006:001, 002, 022, 023]

Pacific Legacy: Exploring the past, informing the present, enriching the future.

CULTURAL RESOURCES CONSULTANTS

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Arnold
Berkeley
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Lancaster

FINAL

CULTURAL IMPACT ASSESSMENT OF THE TURTLE BAY RESORT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT LANDS DISTRICT OF KOʻOLAU LOA, OʻAHU ISLAND HAWAIʻI

[TMK 5-6-003:001 por., 010 por., 016 por., 017 por., 026 por., 033, 040-044, 046 por., 048, -049; 5-7-001:001, 001, 016, 017, 020, 022, 030, 031, 033; 5-7-003:072; and 5-7-006:001, 002, 022, 023]

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ABSTRACT

Pacific Legacy, Inc., under contract to Lee Sichter LLC for Replay Resorts, conducted a Cultural Impact Assessment (CIA), as part of the Supplemental Environmental Impact Statement (SEIS) for the Turtle Bay Resort, LLC (TBR) for the proposed expansion. TBR SEIS Lands, which are the subject of this CIA, consist of 767.714 acres located in *makai* portions of the following *ahupuaʻa* (traditional Hawaiian land division): ʻŌpana, Kawela, Hanakaʻoe, ʻŌʻio, Ulupehupehu, Punalau, and Kahuku in the District of Koʻolau Loa, Oʻahu Island, Hawaiʻi. The SEIS Lands include Turtle Bay Resort properties located in the following TMKs: 5-6-003:001 por., 010 por., 016 por., 017 por., 026 por., 033, 040-044, 046 por., 048, -049; 5-7-001:001, 001, 016, 017, 020, 022, 030, 031, 033; 5-7-003:072; and 5-7-006:001, 002, 022, 023 that include approximately 11.3 acres of Marconi Road right-of-way, but exclude the existing Turtle Bay Hotel, the Kuilima Estates, and the Ocean Villas.

TBR SEIS Lands are known for their natural resources and *wahi pana* (storied places). Many localities on TBR SEIS Lands have intriguing traditional place names that allude to the richness of marine and terrestrial resources as well as *moʻolelo* (stories) attributed to the area. Upholding the richness of the area are numerous Land Commission Awards applied for and awarded as well as descriptions of these properties as being highly cultivated in a variety of crops. These lands are also steeped in Native Hawaiian legend and associated with many gods, goddesses, and other fabled beings as well as mystical and historical events.

In recognition of the area's rich *moʻolelo* and traditional land uses, great lengths were taken to contact and invite as many local *kūpuna* (elders) and cultural informants as possible from varied backgrounds and interests on the subject of traditional, customary, and contemporary use of TBR SEIS Lands and surrounding areas. Concerted attempts were made to identify and locate persons knowledgeable about traditional practices that took place in the past or that are currently taking place on or near SEIS Lands, as recommended by the Office of Environmental Quality Control (OEQC) Guidelines. Earlier CIA reports written about the Kahuku area, OEQC list of Cultural Assessment Providers, Office of Hawaiian Affairs (OHA), Neighborhood Boards No. 27 & 28, numerous North Shore civic clubs, and other North Shore community associations were consulted for a listing of *kūpuna,* cultural practitioners, and cultural informants willing to share their *manaʻo* (knowledge and opinion).

A total of 16 interviews were conducted between 4 May and 11 April 2012. All interviewees had a personal association with TBR SEIS Lands and/or surrounding areas, many of whom were highly recommended by various sources in the community. Most informants are active in the local community and well respected for their leadership, expertise in Hawaiian cultural practices, and knowledge of the project area and its history. The results of all interviews, with the exception of one interview, are submitted in this CIA.

As a result of archival research and community consultations, it was found that TBR SEIS Lands and surrounding areas contain an array of cultural resources that are currently being used for traditional cultural practices, including marine food sources, medicinal plants, plants used in crafts, wood for woodcarving, and salt for various uses. Further, the land and sea are currently used for a variety of traditional and non-traditional sports and recreational activities. The presence of *iwi kūpuna*, or human burials, as well as archaeological sites on the property has also been established, which continues to be a point of concern in the community in terms of past and/or potential disturbances related to the resort. Furthermore, supernatural and/or divine phenomenon in the project area experienced by a few informants and acknowledged by others, suggests that there is still cultural significance and spiritual connection for those with ancestral ties to the land.

In examining TBR's five proposed development options, consisting of the Proposed Action, Full Build-Out (Alternative), Resort Residential Only (Alternative), Conservation Partner (Alternative), and No Action (Alternative) Plans, each option will have some future impact to cultural resources and activities on the property - save for the No Action Plan. The more extensive the build-out and density of the resort, the more potential for project related impacts. However, none of the cultural resources or activities identified in this report as potentially being impacted by the development options occur only on this property. Thus, the development is not expected to significantly obstruct the continuation or enhancement of cultural practices on a regional level. Yet, narrowing project related impacts to a local level reveals that impacts would be significant to local stakeholders, including Native Hawaiian and non-Native Hawaiian cultural practitioners.

Therefore, it is recommended that TBR embrace the role of *konohiki* (*ahupuaʻa* regent) of "Tomorrow's Ahupuaʻa;" to proactively *mālama* (care for) the *ʻāina* (land), *kai* (ocean) *iwi kūpuna* (ancestral remains), *kaiāulu* (local community), and *ʻoihana Hawaiʻi* (traditional Hawaiian practices). Recommendations to do so are as follows:

- **Consult** with the ʻAha Kiole Advisory Committee (AKAC) to ensure that Tomorrow's Ahupuaʻa is in keeping with Hawaiian tradition. Furthermore, TBR, as *konohiki*, should consult with local *kūpuna* for guidance, specifically, in identifying the needs and concerns of the *kaiāulu*.

- **Implement** a *mauka-makai* (upland to ocean) and inter-*ahupuaʻa* resource distribution system to make Tomorrow's Ahupuaʻa concept a leader in cultural and natural resource management. TBR should prioritize commerce for resort operations between themselves and local agriculturists, horticulturalist, aquaculturists, craftsmen, tradesmen and other goods or service providers over providers of goods and services from outside areas when economically viable.

- **Initiate** an integrated Marine Resources Management Plan, with the goal of creating an enforceable management program. It is advised that TBR be guided by the *mana'o* of a committee comprised of local *kūpuna* with expertise in marine based cultural practices as well as marine wildlife management groups and appropriate governmental agencies. TBR and/ or committee(s) could host town hall meetings to facilitate open discourse with the local community regarding the precious marine resources and how to mitigate potential impacts to TBR's coastal waters. A program such as this would also be consistent with the ancient *kapu* (control) system that helped to maintain the balance between the human population and resources within the *ahupua'a* in ancient times. It was, perhaps, the most important role of the *konohiki*.

- **Organize** multi-media and multi-faceted Education Programs including designated learning area(s) and/or ethnobotanical garden(s) on TBR SEIS Lands as venue(s) for teaching and sharing cultural practices, which center on values of *e mana'o pono aku* (respect) and *kuleana* (responsibility) to the *'āina, kai,* and *kaiāulu*. Programs such as these could also educate the local community and resort visitors about the importance of coastal resources to a traditional Native Hawaiian lifestyle. TBR should work with the local *kūpuna* and cultural practitioners to teach a variety of Hawaiian cultural practice workshops to help preserve cultural practices and values as well as allowing non-Hawaiian peoples the opportunity to learn from their host culture. This learning center should not set a stage for the objectification of cultural practitioners or reduce the cultural practices to tourist entertainment.

- **Submit** an Archaeological Monitoring Plan (AMP) prior to the commencement of construction to *mālama* the history and archaeological resources *o*f these lands. If significant archaeological sites are encountered during ground disturbing activities during development, a cultural interpretive display is recommended using artifacts (to the extent possible and feasible), archival photos, artistic renderings, as well as traditional and/or oral accounts to represent the area of origin.

- **Continue** to consult with the Kahuku Burial Committee (KBC) over the best treatment of *iwi kūpuna* that have already been displaced and *iwi kūpuna* that may be disturbed in the future. A Burial Treatment Plan (BTP), using the *mana'o* of the KBC is planned to be submitted for review to the State Historic Preservation Division (SHPD) as well as the O'ahu Island Burial Council (OIBC).

- **Respect** the spiritual connections that people have with the *'āina*, as it is documented and widely known as a *wahi pana* (legendary place), where *nā kūpuna* (ancestors) lived and worshiped, and is known as the final resting place for the ancestors of many local people. Therefore, it is recommended that any major event or construction related activity be preceded with a traditional Hawaiian Blessing ceremony performed by a *kahuna* (priest or priestess) or *kahu pule* (minister/preacher).

- **Provide** alternative access routes for contemporary cultural activities during and after project related construction, should current routes be blocked.

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1.0 INTRODUCTION

As part of the Supplemental Environmental Impact Statement (SEIS) for Turtle Bay Resort, LLC (TBR), Pacific Legacy, Inc. conducted a Cultural Impact Assessment (CIA) under contract to Lee Sichter LLC for Replay Resorts, Inc. The subject area, heretofore referred to as "SEIS Lands" are situated on nearly 767.714 acres of land located *makai* of Kamehameha Highway and are positioned approximately 13 miles east of Haleʻiwa, four miles west of Kahuku, and 21 miles north of Wahiawā (Figure 1) (TMK 5-6-003:001 por., 010 por., 016 por., 017 por., 026 por., 033, 040-044, 046 por., 048, -049; 5-7-001:001, 001, 016, 017, 020, 022, 030, 031, 033; 5-7-003:072; and 5-7-006:001, 002, 022, 023). These lands are situated in the *kula* and *makai* portions of the following *ahupuaʻa*: ʻŌpana, Kawela, Hanakaʻoe, ʻŌʻio, Ulupehupehu, Punalau, and Kahuku in the District of Koʻolau Loa, Oʻahu Island, Hawaiʻi. However, under the proposed Comprehensive Plan these *ahupuaʻa* have been condensed into three major *ahupuaʻa*, consisting of: Ahupuaʻa o ʻŌpana-Kawela (ʻŌpana 1, ʻŌpana 2, and Kawela), Ahupuaʻa o Hanakaʻoe (ʻŌʻio 1 and Hanakaʻoe), and Ahupuaʻa o Kahuku (ʻŌʻio 2, Ulupehupehu, Punalau, and Kahuku). The SEIS Lands include Turtle Bay Resort properties located in the following that include approximately 11.3 acres of Marconi Road right-of-way, but exclude the existing Turtle Bay Hotel, the Kuilima Estates, and the Ocean Villas (Figure 2; Sichter 2011:vi).

According to the *Turtle Bay Resort Environmental Assessment & Supplemental Environmental Impact Statement Preparation Notice* (SEISPN) (Sichter 2011:15), the Proposed Action, referred to in that document as "Revised Master Plan," is an expansion project that has a reduced density outcome, roughly 60% less density from the density proposed in the original expansion project as formalized under the 1985 Unilateral Agreement. This Proposed Action concentrates higher density development in Hanakaʻoe Ahupuaʻa, which is the resort's existing core area, with two new hotel sites and a new community Gathering Place in proximity to the existing Turtle Bay Hotel. The sites originally proposed for hotel development in the *ahupuaʻa* of ʻŌpana-Kawela (to the west) and Kahuku (to the east) will be developed with resort-residential units and limited to much lower density developments. At ʻŌpana-Kawela, density will be reduced by over 75% of what is allowable under existing zoning. Similarly, the Kahuku Ahupuaʻa is planned for affordable community housing and resort-residential units with 65% less density than is allowed under existing entitlements. The result is the concentration of development in the central core of the SEIS Lands and the general preservation of a rural character to the east and west. Furthermore, the Proposed Action provides for two hotel sites, rather than the five approved in the current land use entitlements and the number of hotel units is reduced from 2,500 to a range between 625 and 1,000. By implementing greater voluntary generous shoreline setbacks, this development concept achieves public access to the entire shoreline intended in the Unilateral Agreement and further enhances the pedestrian experience, affording unencumbered coastal access (Sichter 2011).

The original EIS for the Turtle Bay Expansion was written in 1985 and approved; however, not all components of the expansion plan were implemented. Development was to resume in 2005, but was blocked by a lawsuit ending in a court order to supplement the EIS with additional studies including a CIA, as any EIS prepared prior to 1997 was not required to provide a CIA. The main objective of a CIA is to promote and protect cultural beliefs, practices, and resources of Native Hawaiians, other ethnic groups, as well as other collective groups associated with the subject area and surrounding areas (OEQC 2011:3-4).

1.1 Project Background

In 1969, INSCON, a Del E. Webb Corporation and Prudential Insurance Company joint venture, signed an agreement with Campbell Estate to build a resort at Kuilima Point, consisting of a 500 room hotel, a 368 unit condominium complex, and an 18-hole golf course (Group 70 1985:7-8). The Hotel and first golf course was completed in 1972, followed by Kuilima Estates a couple years later. At that time, the resort was managed by the Del E. Webb Corporation until Kuilima Development Company (KDC) took over in 1976. Resort management was then contracted to the Hyatt Corp and renamed Turtle Bay Hilton. Years later, the second golf course was completed.

In 1977, the City and County of Honolulu issued an official General Plan outlining Oʻahu's growth, which allowed for further resort expansion in several areas including Kuilima. Subsequently, KDC began a program to upgrade the existing hotel amenities and infrastructure as well as a reassessment of undeveloped KDC lands in the resort vicinity for potential development. In 1985, the Mayor of Honolulu approved a "Development Plan Land Use Amendment Map" illustrating the proposed usage of resort lands (Group 70 1985:8). An Environmental Impact Statement (EIS) for the proposed Kuilima Resort Expansion was then created for KDC to rezone resort properties to agree with the Koʻolau Loa Development Plan's Land Use Map and apply for a Special Management Area Use Permit (Group 70 1985:1). The proposed expansion plan consisted of adding hotels, resort condominiums, a commercial area, an Arnold Palmer golf course, a club house, public beach parks, a private beach park, a wildlife park, five public right-of-ways to the shoreline, an equestrian area, a wildlife preserve, and associated infrastructure and existing golf course improvements.

According to the 1985 EIS, a new visitor population, averaging nearly 4,800 persons per day, would be expected to use the expanded and upgraded resort (Group 70 1985:1). Impacts were predicted by this study to negatively affect the lessees of 39 east Kawela Bay parcels and six agricultural parcels. Adverse effects also included occasional golf course and marsh flooding, dust and noise from construction, loss of agricultural lands, as well as increases in traffic, potable water consumption, solid waste, marsh drainage input, electrical power plant emissions, and demand for public protection from the County. However, the study envisaged the proposed expansion to provide benefits to the community, such as resort jobs, increased ocean access, business, and economic growth (Group 70 1985:2).

The resort was granted all needed discretionary permits and approvals to put the expansion plan into action in the late 1980s and early 1990s. In 2005, arrangements were made to resume development, as until this point, the extent of development was solely the 18-hole golf course and a provisional site for the stable. However, development was blocked by a lawsuit brought forth by several opposition groups, ending in a court order mandating the resort to supplement the EIS with additional studies before continuing with the development. Supplemental studies included traffic and marine life studies as well as a CIA, due to the fact that any EIS prepared prior to 1997 was not required to provide a CIA.

1.2 PURPOSE

In keeping with Articles IX and XII of the state constitution, the goal of a CIA is to promote and protect cultural beliefs, practices, and resources of Native Hawaiians as well as other ethnic groups and collective groups (OEQC 2011: 3-4). The general purpose of this CIA is to protect and preserve all cultural practices and resources within the SEIS Lands and surrounding areas that may be impacted by the Proposed Action (Sichter 2011). To do so, cultural practices, features, and practitioners must be identified and assessed for potential impacts by the Proposed Action and alternative options. Finally, recommendations are provided to mitigate the potential impacts.

In the State of Hawai‘i, under Chapter 343 HRS, and Act 50, SLH 2000, a CIA is required as part of the EIS process, and has the stated purpose to:

1) require that environmental impact statements include the disclosure of the effects of a proposed action on the cultural practices of the community and State; and

2) amend the definition of “significant effect” to include adverse effects on cultural practices.

According to these guidelines, types of cultural practices and beliefs may include those relating to subsistence, commercial, residential, agricultural, access-related, recreational, as well as religion and spirituality. The guidelines further state that cultural resources subject to a CIA may include: “traditional cultural properties or other types of historic sites, both manmade and natural, including submerged cultural resources, which support such cultural practices and beliefs” (OEQC 2011:4). To determine the effects of the proposed development on cultural practices, resources, and beliefs, the following tasks are undertaken:

1) identify and consult with individuals and organizations knowledgeable about cultural practices that may have taken place in the area;

2) conduct archival research about traditional practices that may have been conducted in the area;

3) describe the cultural practices that took place within the potentially affected area;

4) assess the impact of the proposed development on the cultural practices that may have taken place within the potentially affected area; and;

5) prepare a report on the findings resulting from the above investigations.

Appendix A provides a copy of the Guidelines for Assessing Cultural Impacts, adopted by the State of Hawai‘i Environmental Council in 1997 and amended in 2000 (OEQC 2011).

Additionally, this CIA is in accord with Ka Pa‘akai, which is the Hawai‘i Supreme Court’s analytical framework designed to protect Native Hawaiian rights over cultural, historical or natural resources (*Hawai‘i Land Use Commission v. Ka Pa‘akai*, 94 Hawai‘i at 52, 7 P.3d. at 1089). This framework was designed to ensure that traditional and customary Native Hawaiian rights are preserved and protected by suggesting the following guiding principles:

1) To identify and define the scope of ‘valued cultural, historical or natural resources’ in the project area, including the extent to which traditional and customary native Hawaiian rights are exercised in the project area.

2) The extent to which those resources – including traditional and customary native Hawaiian rights – will be affected or impaired by the proposed action;

3) The feasible action, if any to be taken to reasonably protect native Hawaiian rights if they are found to exist.

1.3 METHODS

According to the Office of Environmental Quality Control (OEQC) Guidelines for Assessing Cultural Impacts (OEQC 2011), it is recommended that preparers of CIA implement the following protocol:

1. identify and consult with individuals and organizations with expertise concerning the types of cultural resources, practices and beliefs found within the broad geographical area, e.g., district or *ahupua‘a*;

2. identify and consult with individuals and organizations with knowledge of the area potentially affected by the proposed action;

3. receive information from or conduct ethnographic interviews and oral histories with persons having knowledge of the potentially affected area;

4. conduct ethnographic, historical, anthropological, sociological, and other culturally related documentary research;
5. identify and describe the cultural resources, practices and beliefs located within the potentially affected area; and
6. assess the impact of the proposed action, alternatives to the proposed action, and mitigation measures, on the cultural resources, practices and beliefs identified.

These methods were strictly adhered to in the subject assessment. A rigorous effort was made to identify and locate persons knowledgeable about traditional practices that took place in the past or that are currently taking place in the SEIS Lands and broader geographical area that could potentially be impacted by the expansion project. In addition to prior CIA reports written about the Kahuku area (Collins and Nees 2006; Hammatt 2008), the State Office of Environmental Quality Control (OEQC) and Office of Hawaiian Affairs (OHA) were consulted for a listing of Cultural Assessment Providers. Various Neighborhood Boards, civic clubs, and other North Shore community associations were also contacted to obtain cultural informants. Appendix C provides a listing of potential cultural informants and their detailed contact history. Of the 68 individuals recommended by others informants or identified through research as potential cultural informants, contact information was found for 52 individuals and organizations, all of which were solicited for participation. While no response was received from 15 of those asked to participate, 37 individuals responded and 16 interviews were secured.

A total of 16 individuals representing a variety of cultural practices of the SEIS Lands and surrounding areas were interviewed for this CIA, the testimonies of 15 are represented in this report. Transcripts of interviews were not attempted in this assessment; however, audio recordings of numerous interviews were obtained and are kept on file at Pacific Legacy office in Kailua, Hawai‘i.

2.0 PROJECT AREA DESCRIPTIONS

SEIS Lands are located on the northern tip of O‘ahu and roughly spread from the mid-point of Kawela Bay to Marconi Road. These lands are bound by the Pacific Ocean to the north and the Kamehameha Hwy. to the south and situated on nearly 767.714 acres of land *makai* of Kamehameha Hwy. and are positioned approximately 13 miles east of Hale‘iwa, four miles west of Kahuku, and 21 miles north of Wahiawā (Figure 1). These lands are situated in the *kula* and *makai* portions of the following *ahupua‘a*: ‘Ōpana, Kawela, Hanaka‘oe, ‘Ō‘io, Ulupehupehu, Punalau, and Kahuku in the District of Ko‘olau Loa, O‘ahu Island, Hawai‘i. However, under the current Proposed Action these *ahupua‘a* have been condensed into three major *ahupua‘a*, consisting of: ‘Ōpana-Kawela (‘Ōpana 1, ‘Ōpana 2, and Kawela), Hanaka‘oe (‘Ō‘io 1 and Hanaka‘oe), and Kahuku (‘Ō‘io 2, Ulupehupehu, Punalau, and Kahuku). SEIS Lands are comprised of all lands covered by the 1985 EIS and approximately 11 acres adjacent to the existing hotel, the Marconi Road right-of-way (ROW) lands, as well as a former *kuleana* of approximately 4 acres at the northeastern edge of the Turtle Bay lands (Figure 2), However, the OEQC Guidelines recommend that the “broader geographical area” be the subject unit (OEQC 2011).

2.1 GEOLOGY, HYDROLOGY, AND SEDIMENTS

Several geological processes including shield-building volcanism, subsidence, weathering, erosion, sedimentation, followed by rejuvenated volcanism created the island of O‘ahu. Generally, the island is made up of heavily eroded remnants of the Pliocene era Wai‘anae and Ko‘olau shield volcanoes. The SEIS Lands are located at the foot of the Ko‘olau Mountains, which were created by shield-building volcanism about 2.2 to 2.5 million years ago (Lau and Mink 2006). These mountains are mostly comprised of Ko‘olau Basalt, a shield lava as well as basalt from later volcanic stages (Juvik and Juvik 1998).

Topography, stratigraphy, and hydrology of the general subject area result from a series of complex geological processes. Ko‘olau Basalt lava flows ranging from 1.8 to 3 million year old underlie the majority of the vicinity. After these basalts were laid, they were subject to periods of erosion as well as periods of deposition of eroded upland sediment that occurred in the area. In the mid-to-late Quaternary period (ca 120,000 years ago), mean sea levels rose globally over seven meters higher than what they are today, permitting a coral reef system to build up along the coast in the area that now lies inland of the current coastline. After the sea level receded, these coral reefs were exposed and over time encapsulated in alluvium, becoming the *karstic* limestone of the Kahuku Plain (Ku et al. 1974; Stearns 1978; Gillespie et al. 2004 *passim*). These deposits of terrestrial and marine sediments along the coast form a relatively impermeable wedge of sedimentary material known as caprock, which extends from Punalu‘u to Kahuku Point (Group 70 2009: 2-7, 2-9). Generally, most high elevation water in Ko‘olau Loa is

controlled by volcanic dikes that prevent groundwater from flowing freely to coastal areas from the upper elevations of the watershed (ibid.:2-9). The Kahuku area contains several large marshes, which are a result of seepage that arises at the caprock. There is also a dike zone between Kawela and Waiale‘e upland watersheds all the way to the coast that limits the percolation of water to coastal areas west of the Turtle Bay Resort property (ibid.:2-9).

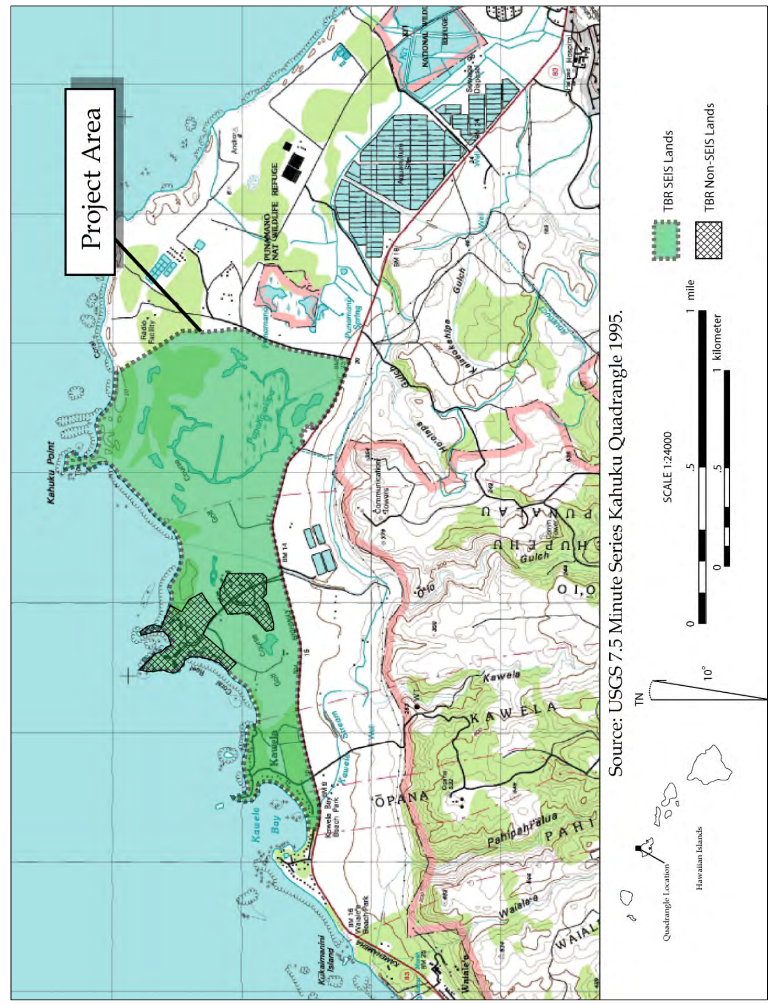

Figure 1. Project location.

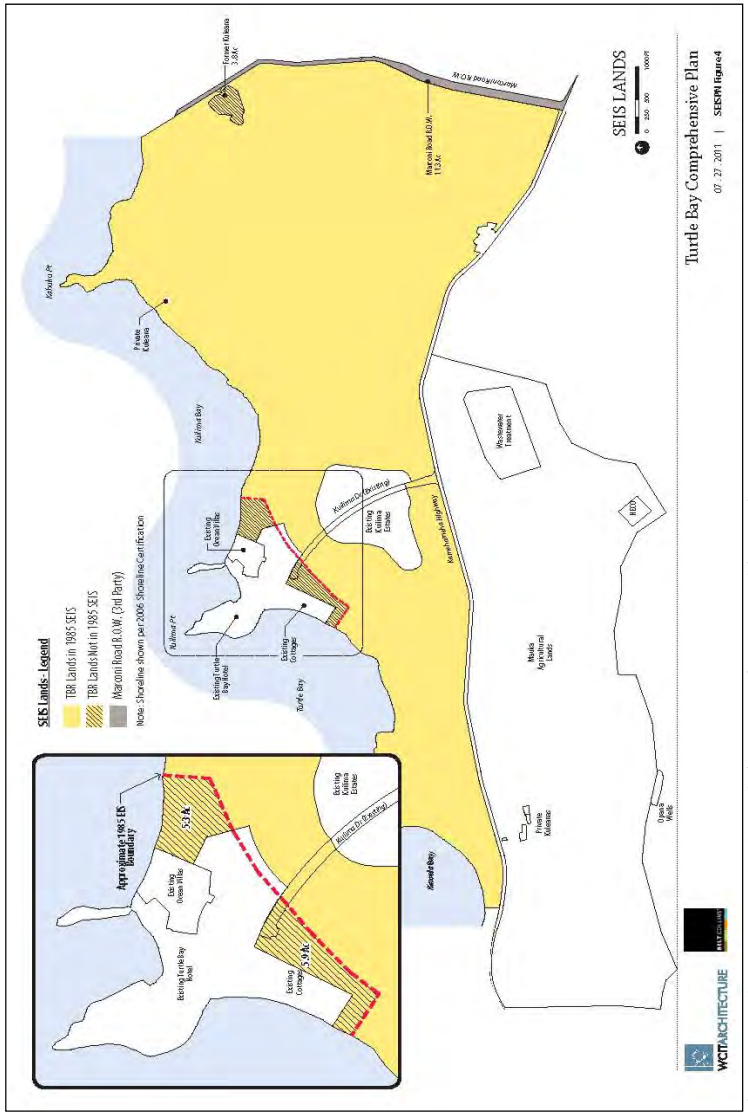

Figure 2. Turtle Bay Resort SEIS Lands (courtesy of WCTT Architecture).

The SEIS Lands are flanked on the south by the northern foothills of the Ko'olau Range. Three prominent peaks are identified along the ridge *mauka* of the project area. Coulter (1935) lists Pu'u Kauweweole (Lā'ie quad.; 21.40n 158.01w), Pu'u Kī (Lā'ie quad.; 21.40n 157.59w), and Kawela Mountain (Lā'ie quad.; 21.40n 158.00w).

According to the United States Department of Agriculture (USDA) and Natural Resources Conservation Service (NRCS) *Custom Soil Resource Report for Island of Oahu, Hawaii: Turtle Bay Resort* (USDA/NRCS 2011a:10), the SEIS Lands, *makai* of Kamehameha Highway, is composed primarily of Jaucas sand (JaC; 0 to 15% slopes), followed by Pearl Harbor clay (Ph), Waialua silty clay (WkA; 0 to 15% slopes), Kaloko clay (Kfa), Coral outcrop (CR), Lahaina silty clay (LaC; 7 to 15% slopes), Beaches (BS), and a minor amount of Mokuleia loam (Ms), Mokuleia clay loam (Mt), Kaena clay (KaB; 2-6% slopes), and Waialua silty clay (WkB; 3-8% slopes)(Figure 3). The customized USDA/NRCS reports for the SEIS Lands are available upon request.

2.2 CLIMATE

While seasonal variability is relatively mild, the climate of the Hawaiian Islands exhibits warm temperatures, dry conditions, and persistent trade winds that originate from the northeast during the summer season (May through September). Hawai'i's winter season (October through April) is typically characterized by cooler temperatures, elevated precipitation, and variable winds, including Kona (southerly) winds and storms (Juvik and Juvik 1998).

The climatic conditions of the subject area are characteristic of lowland and coastal areas of O'ahu's windward side, having relatively consistent temperatures as well as persistent northeast trade winds. While the annual average maximum temperature is 81 degrees Fahrenheit (°F), the Kahuku area has daily maximum temperatures in the range from the high 70s (˚F) during the winter to the low-to-mid 80s (˚F) during the summer. Average temperature lows range from the mid-to-high 60s (˚F) during the winter to the low-to-mid 70s (˚F) during the summer, with an annual minimum temperature of 70 °F (WRCC 2011).

In general, rainfall is heaviest in October and April for the entire state of Hawai'i. However, rainfall averages are greatly affected by terrain. Further, great variation in rainfall can occur over small distances with extreme topographical changes. In the subject area, rainfall is relatively moderate, with a median annual rainfall of approximately 36 inches. Approximately two-thirds of the rainfall in the subject area occurs between October and April. Annual rainfall also varies significantly from year-to-year in the area (WRCC 2011).

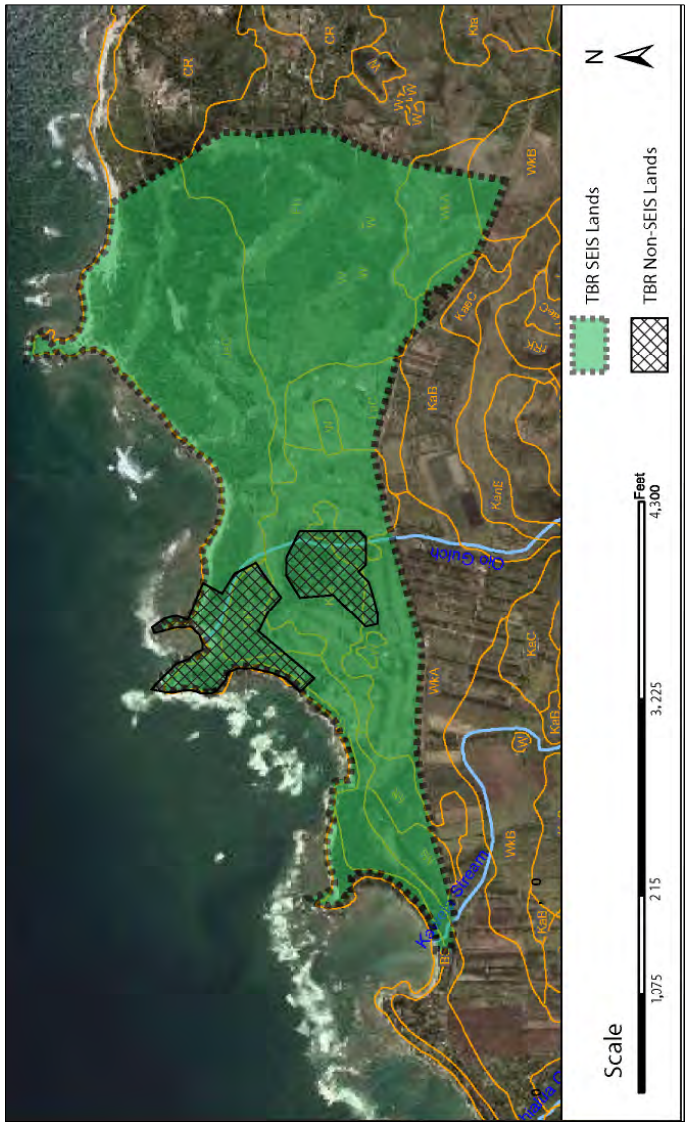

Figure 3. Soil map of TBR SEIS Lands (soil data courtesy of USDA).

2.3 Vegetation

There are several distinct ecosystems in the subject area, each having a distinct array of flora (Group 70 1985). Starting at the west end of the property, the coast of Kawela and Turtle Bays are dominated by mature ironwood trees (*Casuarina equisetifolia*) and *hau* (*Hibiscus tiliaceus*), with some coconut palms (*Cocos nucifera*), *naupaka* (*Scaevola* spp.), and various exotic plants. On the *mauka* side of the Kawela Bay portion of Turtle Bay Resort is overgrown with California grass (*Urochloa mutica*) and elephant grass (*Pennisetum purpureum*), but also contains a number of juvenile *koa haole* (*Leucaena leucocephala*) (AECOS 2006). Further east along Kamehameha Highway are the golf course grounds, which are heavily landscaped with exotic grasses, shrubs, and trees. *Makai* of the golf course are the horse ranch grounds and the land fronting Turtle Bay, which are also heavily landscaped with ironwood, palms, various lawn grasses, and exotic plants. The resort grounds, located in the *makai*/central portion of the project area, are very manicured and landscaped in a variety of ornamentals, including both exotic and native Hawaiian plants. Exotic plants include date palms (Phoenix spp.), oleander (*Nerium oleander*), bougainvillea (*Bougainvillea* spp.), wedelia (*Wedelia trilobata*), and plumeria (Apocynaceae spp.). Native and Polynesian introduced plants include *naupaka* (*Scaevola spp.*), *hala* (*Pandanus tectorius*), coconut palms (*Cocos nucifera*), *hau* (*Hibiscus* spp.), and at one time *wiliwili* (*Erythrina sandwicensis*), prior to the gall wasp infestation, which killed all of the resort's *wiliwili* trees. Further to the east are dune lands that are home to beach *naupaka* (*Scaevola taccada*), *koa haole* (*Leucaena leucocephala*), Christmas berry (*Schinus terebinthifolius*), and lantana (Lantana spp.). The coastal dunes contain tree heliotrope (*Heliotropium foertherianum*), *hinahina (Heliotropium anomalum)*, *koko* (*Euphorbia degeneri*), beach morning glory (*Ipomoea pes-caprae*), *pōhuehue* and *pōhinahina* (*Vitex ovata*), as well as seashore dropseed (*Sporobolus virginicus*), many of which are native species. The *mauka*/east area is Punaho'olapa Marsh, which is largely outlined with Indian pluchea (*Pluchea indica*) and Christmas berry (*Schinus terebinthifolius*). The interior marshlands are dominated by bulrush (*Scirpus validus*), native sawgrass (*Cladium leptostachyum*), and other exotic grasses. On the far east coast are patches of ironwood groves, intermingled with golf course grounds and coastal dunes with respective flora.

2.4 Current State of Project Area

SEIS Lands can generally be described as disturbed, being subject to intermittent development and redevelopment for nearly two centuries (Figures 4 and 5). The coastal areas *makai* of the sand dunes fronting the bays are much less disturbed by man, but have experienced a variety of natural disturbances, such as storm surges and the 1946 tsunami.

Kahuku Ranch was located in the vicinity of the SEIS Lands in the 1870s, the remains of which have been found in the Punaho'olapa Marsh vicinity. The ranch was succeeded by the Kahuku Sugar Plantation by the 1880s. During the plantation era, construction of the O'ahu Railway and Land Company's (OR&L Co.) railroad began in 1889 and was completed in 1899, connecting Kahuku to other areas of the island. The OR&L Co. ROW

is shown on historic maps passing through the center of SEIS Lands and a portion of Punahoʻolapa Marsh. Several small plantation camps were also situated near Kawela Bay and Kuilima Point.

Various construction activities carried out by the U.S. Military during World War II forever changed the landscape in the vicinity of Kahuku Point. The military erected numerous barracks, bunkers, communication towers, runways, revetments, and other buildings for potential air attacks or coastal invasions.

Following the war, the construction of private beach cottages spread along the coast, primarily in the Kawela Bay vicinity, on leased lands. In 1972, the Kuilima Development Company (KDC) opened the current Turtle Bay Hotel, which included 81 beach cottages, as well as an 18-hole golf course, clubhouse tennis courts, swimming pools, and numerous outbuildings. Shortly thereafter, KDC constructed the Kuilima Estates condominium/townhome residential complexes. In the next decade, the residential cottages near Kawela Bay were demolished and construction of a new multi-story hotel was initiated. The hotel's construction never made it past the foundation phase and the remains of the foundation lie in place to this day. The second 18-hole golf course was developed in 2002 (Figure 5).

2.5 Turtle Bay Resort Revised Master Plan

The TBR Revised Master Plan involves additional modifications to the subject area to deal with the needs and resources of the TBR property with the added goal of honoring traditional Hawaiian values. The Revised Master Plan is molded around the concept of "Tomorrow's Ahupuaʻa," which according to Sichter (2011:7) is based upon "… the successes and challenges, the elements found within each *ahupuaʻa*, and the needs and resources that are available…" as well as the following traditional Hawaiian concepts:

> … understanding and maintaining lands from *mauka* to *makai*; recognizing and stewarding the unique elements and resources of each *ahupuaʻa* in order to strive for self-sustenance; and creating a management framework inspired by the traditional *ahupuaʻa* to care for the lands, resources, people, and culture.
> …
> *Tomorrow's Ahupuaʻa* focuses not only on the lands within the Comprehensive Plan area, but also the interconnected *kula* and *mauka* lands. This broader approach opens up opportunities to make strategic and interrelated improvements throughout the lands of the Comprehensive Plan (Sichter 2011:6).

Under the Revised Master Plan, TBR also proposes to reconfigure the nine *ahupuaʻa* of ʻŌpana (1 & 2), Kawela, Hanakaʻoe, ʻŌʻio (1 & 2), Ulupehupehu, Punalau, and Kahuku into three: ʻŌpana-Kawela, Hanakaʻoe, and Kahuku (Figure 6). This change is in keeping with the ever-changing configuration of *ahupuaʻa* throughout the recorded history of the area (Figures 7-14).

Figure 4. Aerial view of Turtle Bay Resort Lands in 2007 (courtesy of Google Earth).

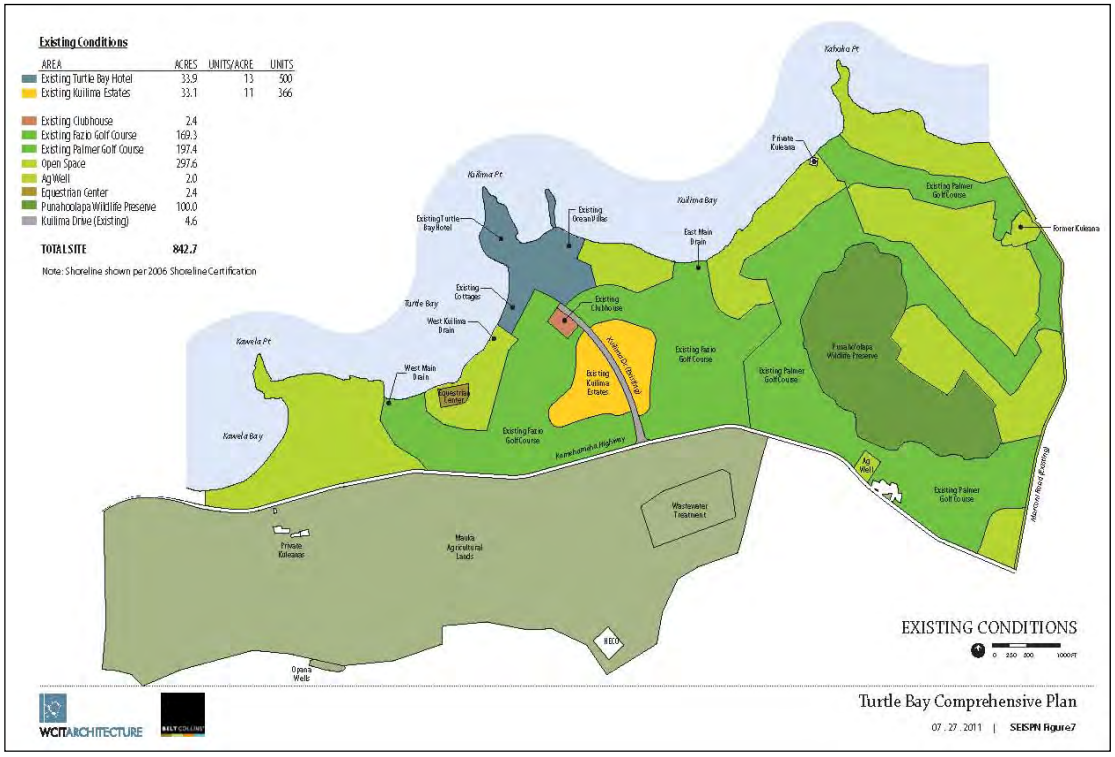

Figure 5. Existing conditions on Turtle Bay Lands (courtesy of Lee Sichter LLC).

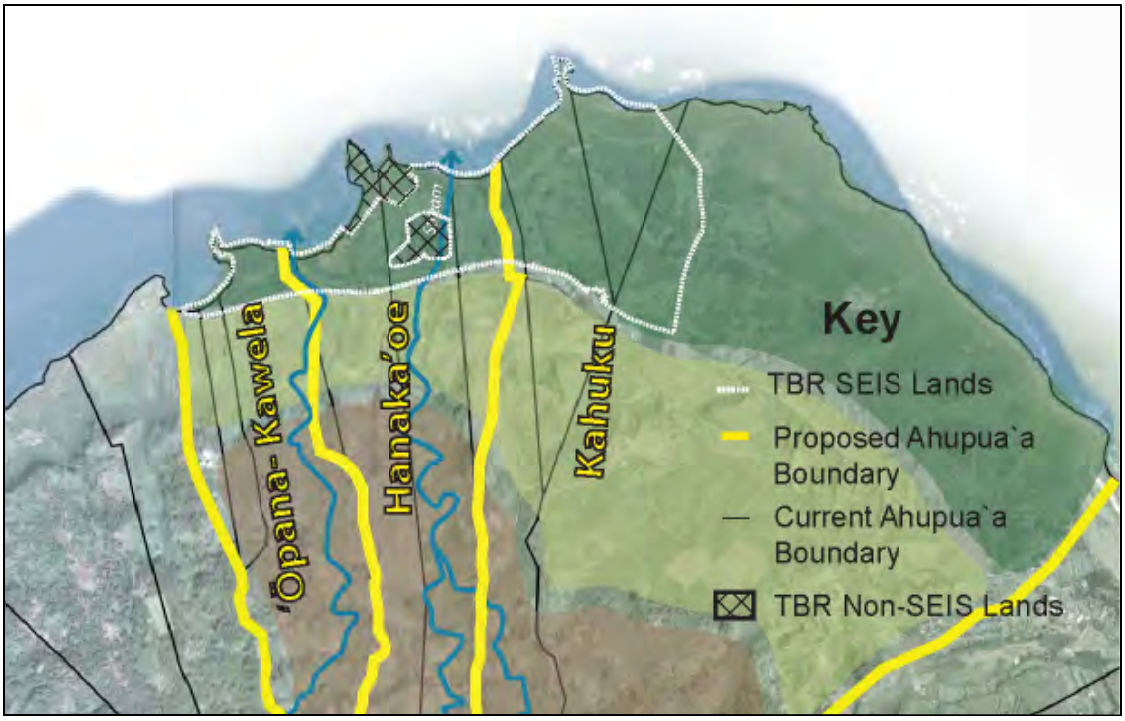

Figure 6. Proposed *ahupua'a* configuration for TBR lands (adapted from Sichter 2011: Figure 5).

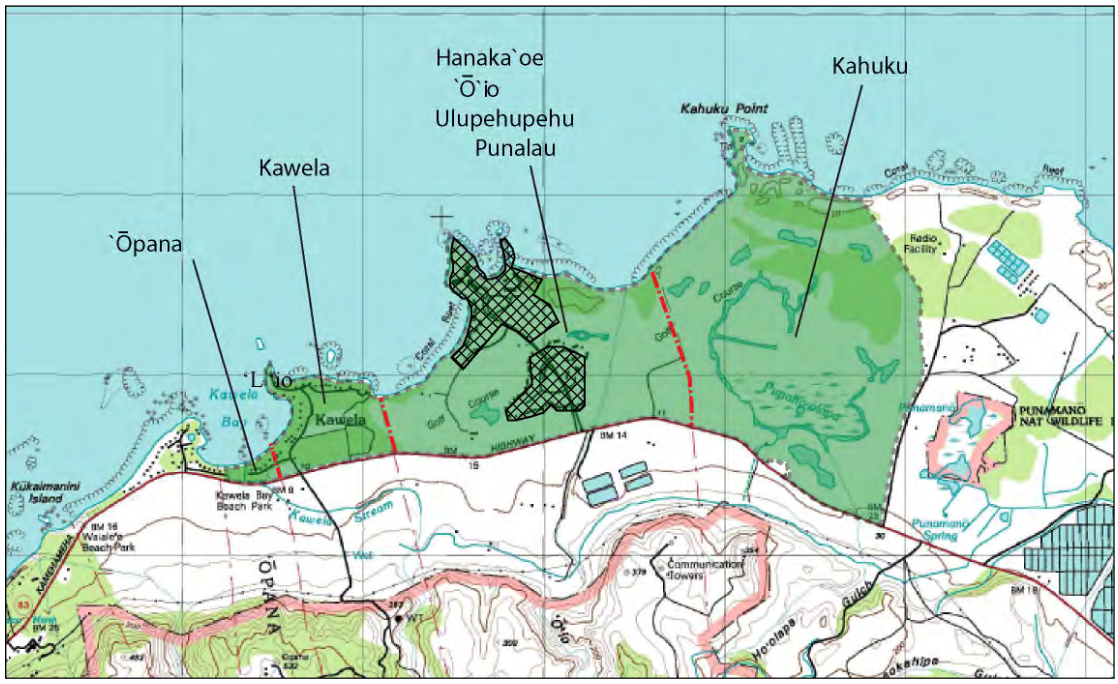

Figure 7. Current configuration of *ahupua'a* in TBR lands (adapted from USGS Kahuku Quadrangle Map).

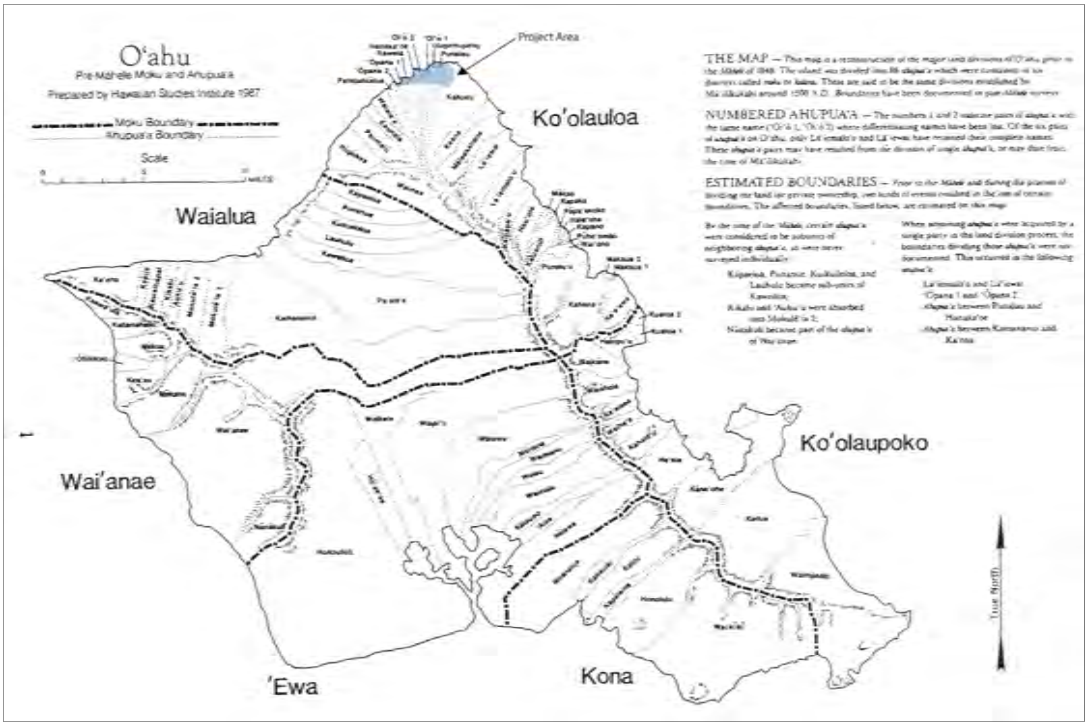

Figure 8. Map of O'ahu, showing pre-Mahele *moku* and *ahupua'a* (courtesy of Hawaiian Studies Institute 1987).

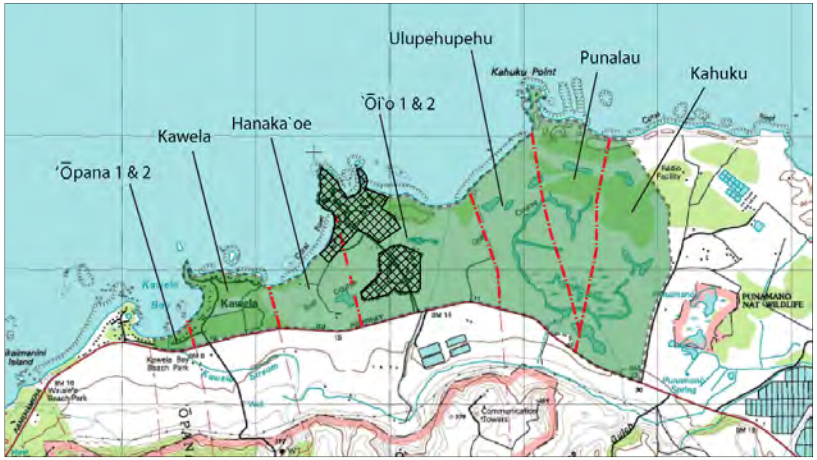

Figure 9. Hawaiian Studies Institute (1987) arrangement and spelling of *ahupua'a* in SEIS Lands (adapted from USGS Kahuku Quadrangle Map).

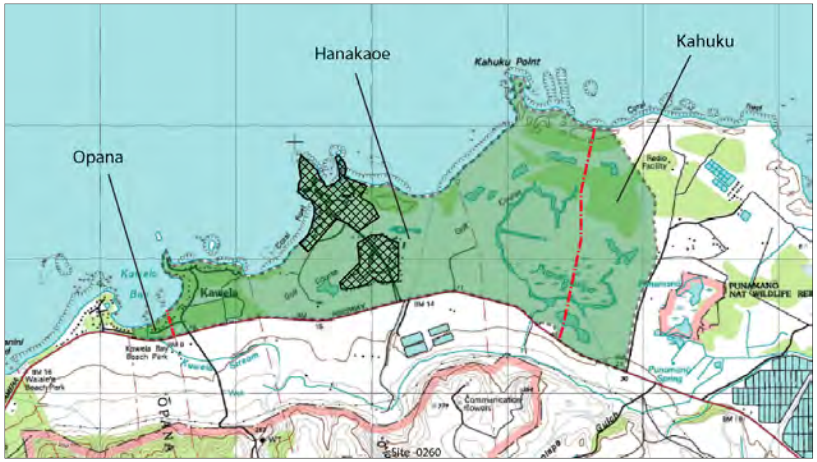

Figure 10. Sterling and Summers (1978) arrangement and spelling of *ahupua'a* in SEIS Lands (adapted from USGS Kahuku Quadrangle Map).

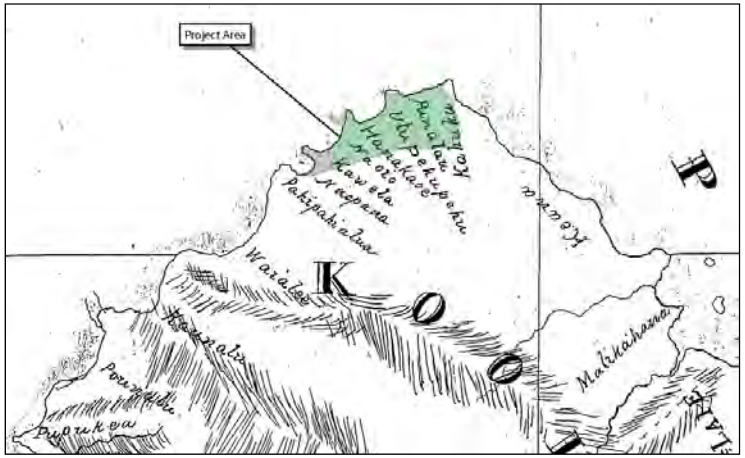

Figure 11. Portion of 1833 Emerson Map of O'ahu with approximate project area location.

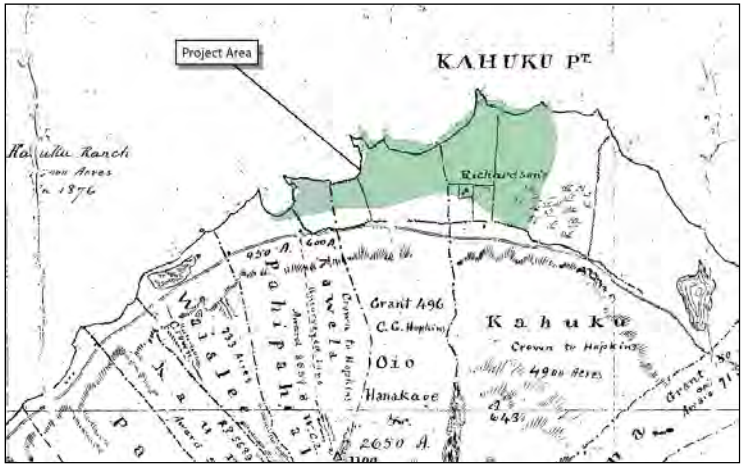

Figure 12. Portion of 1878 Lyons O'ahu Government Survey map of with approximate project area location.

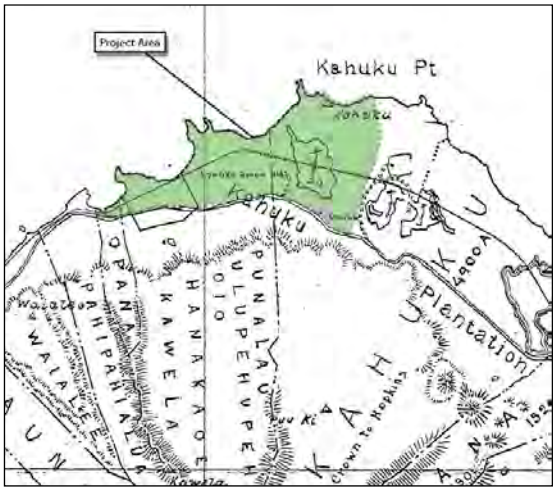

Figure 13. Portion of 1906 Donn map of O'ahu with project area location.

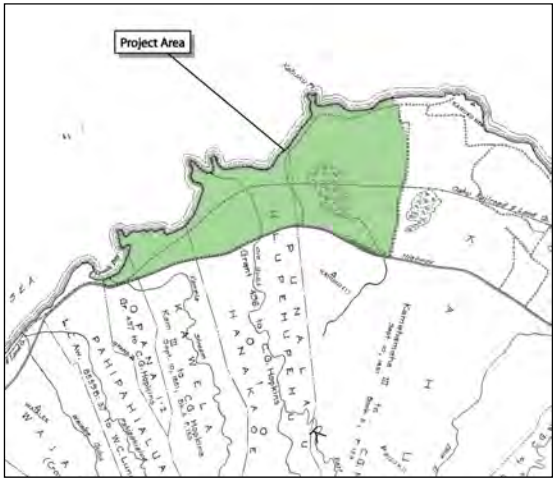

Figure 14. Portion of 1933 King map of Kahuku Forest Reserve with project area location.

3.0 ARCHIVAL RESEARCH SUMMARY

This section is a synthesis of records documenting traditional and mythological accounts associated with the SEIS Lands and surrounding areas as well as Historical documentation and archaeological record. The names and locations of *ahupua'a* used in this section of the report are largely derived from information in the *O'ahu Pre-Mahele Moku and Ahupua'a* map created by Kamehameha School's Hawaiian Studies Institute in 1987 (Figure 8). According to this map, SEIS Lands span an area that incorporates the *makai* sections of nine *ahupua'a*, including: 'Ōpana 1(1and 2), Kawela, Hanaka'oe, 'Ō'io (1 and 2), Ulupehupehu, Punalau, and Kahuku. However, as evidenced by numerous historic maps, there have been many configurations and spellings of these *ahupua'a* (Emerson 1833; Lyons 1878; Donn 1906; King 1933; Sterling and Summers 1978, Hawaiian Studies Institute 1987, and USGS 1998 Kahuku Quadrangle Map; Figures 8-14). At the end of this section, traditional accounts will be discussed by individual *ahupua'a* as defined by the Hawaiian Studies Institute in 1987 pre-Mahele map. Interestingly, some *ahupua'a* in this area, specifically Kahuku, are extensively covered in traditional accounts and/or *mo'olelo*, while some are barely mentioned at all.

The subject *ahupua'a* are located within the district, or *moku*, of Ko'olau Loa, within which the SIES Lands are located, extends from the *ahupua'a* of Ka'a'awa on the central east side of O'ahu, rounding the northern tip of the island to Pūpūkea. In *Sites of O'ahu* (Sterling and Summers 1978:142), writer for *Ka Nūpepa Kuokoa*, S. M. Kaui, holds that Ko'olau Loa District stretches from Keahu-o-Hapu'u to the Point of Ka'ō'io, which is between Kualoa and Ka'a'awa. The name of this district, Ko'olau Loa, as spelt by Pukui et al. (1974:117) literally translates to "long Ko'olau" (ibid.), Ko'olau being the windward mountain range that runs along the entire eastern side of O'ahu.

3.1 PRE-EUROPEAN CONTACT CULTURAL LANDSCAPE

In general, traditional and mythological accounts from pre-European contact Hawai'i represent a belief system explaining all aspects of the physical universe and spirit realm, the origin and nature of mankind, and the history of the community, as well as collectively remembering the heroic adventures, exceptional feats, and cautionary tales of the ancestors. These traditional accounts are contained in the hearts and minds of cultural practitioners and customarily passed on through oration. Throughout the passage of time, figures transcend earthly legends into the cosmic, divine, and fearsome realm of the gods that is only separated from the mundane world by a thin veil and have the power to interact with and cast influence on the mundane. To this day, a sense of respect, reverence, and fear is still held on to by cultural practitioners and those indoctrinated in these traditions, as it is believed that the very landscape is imbued with the *mana* (life force or supernatural energy) of the divine.

3.1.1 Traditional Names of Topographical Features

The natural landmarks within the project area possessed Hawaiian names in the pre-Contact era, which were based on distinguishing characteristics, *mo'olelo*, or traditional use of the area. These traditional names are seldom used to refer to these landmarks in the modern era.

> … I was born in the Marconi area on May 10, 1887. My maiden name was Kainanui, and my father was a former chief of the village. The only good swimming area at Kahuku was Kalokoiki, the cove next to the hotel. All of the old-timers went there. The point the hotel is on is called Kuilima Point now, but Kuilima is an inland name for the plains area around the highway bridge that says "Kuilima." The correct name of the point is Kalaeokaunu. The smaller point on the other side of the cove is Kalaeokamanu. I composed a song entitled "Kuilima" that mentions some of the special places in Kahuku, including Kalokoiki, but it hasn't been recorded. *Kuilima* means "to walk hand-in-hand." (John Clark 2003:201)

A map distinguishing the locations of these and other coastal landmarks by their traditional names is provided in Figure 15.

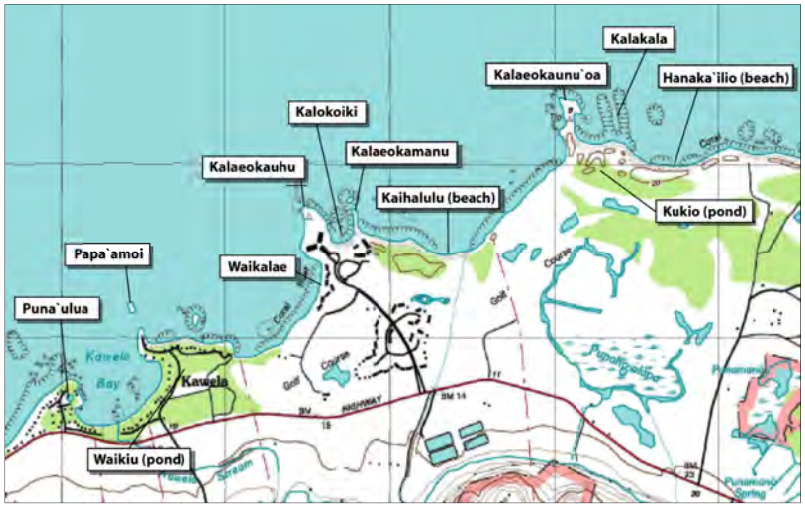

Figure 15. Traditional names of landmarks on the Turtle Bay Resort property.

3.1.2 The Natural World

Conversely, the mundane, or lifeways and land use, of pre-European contact Hawaiians are also part of the cultural landscape and are interpreted through archaeological research in conjunction with oral histories and recorded traditional accounts. Handy

and Handy (1972) provide some commentary on general land use patterns of ancient Hawaiians that are applicable to the general Kahuku area. As marine resources represent the main source of protein in the traditional Hawaiian diet, Handy and Handy (ibid.) suggest that upland agriculture was typically preceded by or correlated with the productiveness of an area's coastal fishing grounds. *Mauka* lands were intensively developed in areas where coastal fishing grounds were easily accessed. On O'ahu, sweet potatoes were cultivated to supplement taro, the main starch of the Hawaiian diet, when soils were too sandy or dry to grow taro. Further, sweet potato cultivation, typically grown inland, appeared to correlate with high population densities in general.

Traditionally in Hawai'i, environmental zones were perceived and determined by various natural features and resource criteria (Handy and Handy 1991:54-56). The following describes the terrestrial environmental zones:

1. *Ko Kaha Kai*: Land by the sea, or coastal region providing marine resources (fish and other marine animals, seaweed and salt). "Kaha was a special term applied to areas facing the shore but not favorable for planting.
2. *Kula*: The plains or sloping lands (without trees) above the coastal region.
   a) *Kula kai:* Seaward plains.
   b) *Kula uka*: Inland or upland slopes (towards the mountains).
3. *Kahawai:* The place (having) water. The area beyond or intersecting the *kula* lands. This upland zone provided suitable agricultural sites and abundant naturally occurring resources which were used for religious, domestic, and economic purposes.
4. *Wao:* Wilderness
   a) *Wao kanaka:* Region of man. Lower forest, providing hard wood (*koa*) for spears, utensils, and logs for canoes; *lau hala* (pandanus leaves) for thatch and mats; *māmaki* for bark cloth (*tapa*); *kukui* (candlenut) for oil; wild yams, roots, and sandalwood.
   b) *Wao akua*: Region of deities. …remote, awesome, seldom penetrated, source of supernatural influences, both evil and beneficent.
   c) *Wao ma'ukele*: Rain forest. Here grew giant trees and tree ferns (*'ama'u*) under almost perpetual cloud and rain.

The Turtle Bay Resort is located in the following environmental zones: *Ko Kaha Kai*, and *Kula Kai*. Numerous traditional accounts, *mo'olelo*, and Land Claim Native Testimonies allude to the cultivation of lands, varying in intensity, from *kula* to *wao* (Hall 1839; Fornander 1917; Thrum 1919; Handy 1940, 1972; Sterling and Summers 1978; Silva 1984; Maly and Maly 2003).

Traditionally in ancient Hawaiian culture, marine zones were also distinguished by various natural features and resource criteria. The following describes the marine environmental zones (Handy and Handy 1991:56-57):

1. Neritic zone: Near-shore waters, extending from the upper reaches of the tidal edge to about 200m in depth. Contains the most resources for human use. (Midden remains from Hawaiian sites show a preponderance of species from neritic habitats [Jeffery Clark 1986:34]). Corresponding to the Hawaiian marine habitats of:
   a) *Kai pu'e one*: (heaps [of] sand) the sandy edge of the sea, inshore dunes, or outer sand bar;
   b) *Kai po'i*: (sea-breaking) out to where the wave breaks;
   c) *Kai kohola*: the lagoon, the shallow sea inside the reef;
   d) *Kai pualena*: the yellowish sea, where the streams flow in and roil the waters;
   e) *Kai 'ele*: the dark sea; and
   f) *Kai uli*: the deep blue-sea.

2. Pelagic zone: the open ocean, waters lying beyond or exceeding the depth of 200 meters.
   a) *Kai-pōpolohua-mea-a-Kāne:* the far reaches of the open sea (Jeffery Clark 1986:34).

Marine environments were subject to the traditional resource management system as well, supported by the *kapu* (religious law) system in ancient Hawai'i, which preserved *lōkahi* (balance) on many levels between humans and these resources. Various marine resources were key to pre-Contact era Hawaiian lifeways for various uses, such as *i'a* (fish), *he i'a mea iwi mawaho* (shellfish), *he'e* (squid/octopus), *limu* (seaweed), *pa'akai* (salt), *'āko'ako'a* (coral), *pōhaku* (stones), *manu* (bird), and *honu* (turtle). These resources were used for sustenance, tool making, medicine, trade, architecture, and ceremony. *Pa'akai* was one of the most important marine resource for its many applications, including food preservation, seasoning, medicine, and ceremonial use (Malo 1898:132; Brigham 1908; Westervelt 1915).

3.1.3 Traditional Hawaiian Land Divisions

The pre-Contact economy of the Hawaiian Islands was based upon agricultural production that worked within a tiered system of land divisions (Lyons 1875; Malo 1951; Handy and Handy 1972; Kirch 1985; AKAC 2010). In 1875, Curtis J. Lyons, the distinguished surveyor published an article in *The Islander* on land issues, which identified the *ahupua'a* as the principal subdivision in a *moku*. In this article, he states:

> ...Its name is derived from the *Ahu* or altar; (literally, pile, *kuahu* being the specific term for altar) which was erected at the point where the boundary of the land was intersected by the main road, *alaloa,* which circumferenced each of the islands. Upon this altar at the annual progress of the *akua makahiki* (year god) was deposited the tax paid by the land whose boundary it marked, and also an image of a hog, *puaa,* carved out of kukui wood and stained with red ochre. How long this was left on the altar, I do not know, but from this came the name, *ahupua'a,* of the pile of stones, which title was also given to the division of land marked thereby…(Lyons 1875:103-104).

The islands are divided into several sections called *moku* (districts), in which are particular subdivisions referred to as *'okana* (a portion) or *kalana* (a division) (Lyons 1868:67-68; Malo 1951:16-17). According to Curtis J. Lyons (1868) in *Nūpepa Kuakoa*, these units are further divided into *ahupua'a*, which are the main units of traditional Hawaiian land division. Within *ahupua'a* are *'ili*, followed by *'ili pa'a, 'ili kūpono, 'ili lele, lele, mo'o, mo'o 'āina, paukū, kīhāpai, kō'ele,* and *kuleana* (Pukui and Elbert 1986). However, in some cases, the *'ili kūpono* or *kū* were a type of sovereign *'ili* within an *ahupua'a* that were not made to pay tribute to the chief (Thrum 1890:106). Within the *paukū* are dry land patches, referred to as *kō'ele*, *hakuone*, and *kuakua* (cultivated specifically for the chief; listed from smallest to largest). In general, high elevations or mountains are called *mauna,* but mountains or mountain summits located centrally on the island are termed *kuahiwi*, while the peaks or ridges on top of the *kuahiwi* are called *kualono.* In 1868, Lyons continues to describe the geography of the typical *ahupua'a* as well as the Hawaiian names for these geological features, stating:

> The place where trees are small below the fern belt is termed kuahea (hillock section); below it is the wao (wild place), also called waonahele (wilderness) and wao eiwa (ninth wilderness). The place where trees grew taller below the wao eiwa is the wao maukele, and a little below it again is the waoakua (spirit region) ; next below that is where voices increase and, hence, called wao kanaka (people's sphere), because there the people cultivate food. Below that is apaa, and next is ilima (where this plant of the Sida genus is found), and below it is pahu (stake or land mark). Below pahu is kula (open country) adjoining habitations, and seaward of the village is the shore, where it joins the sea. Such was the island divisions by the ancient people of Hawaii.
>
> …Places that stand high up in this and that locality are called puu (mounds or peaks) ; if they stand in a row they are a lalani puu, or pae puu (a line or range of peaks or hills)…High places of the earth lying narrow is a lapa (ridge), or kua lapa (shoulder ridge). If the ridges are many they are called olapalapa (rough protuberances). Deep places lying lengthwise are called kahawai, awawa, or owawa (streams, valleys or ditches). Lengthy, solitary places are called alanui (roads), and kuamoo (paths), and if it continues circuiting the island it is a highway. In places where the path is steep it is called piina or hoopiina (ascending path), kooku (hill slope), and auku (up hill road). Descending paths are termed ihona, alu, kalua, and hooihona, and the place where men would rest is oioina (a resting place). Places where water flows continually are streams (kahawai). Inland places are kumu (source) and seaward places are called nuku (point or outlet). Where water is led to places of cultivation, that is called an auwai (watercourse) ; where the water joins the sea is a muliwai (river) ; waters borne within the land are lokos (lakes or ponds) (C.J. Lyons 1868 as cited in Thrum 1921:67-68).

Perhaps the ancient Hawaiians created names for an array of topographical features and slight variations within the *ahupua'a* as a way to help keep the dynamic *mauka-makai* economic structure organized.

3.1.4 Life in the Ahupuaʻa

With great variations of geological features, each *ahupuaʻa* had its own dynamic resource management system that was based on traditional customs upheld by the *kapu* system, or ancient religious law. The *ahupuaʻa* typically extended form the coast to the nearest mountain top or ridge and resources from the land and sea were equally distributed within the *ahupuaʻa*. Lyons (1875) describes the geographic nature of the *ahupuaʻa* as well as the movement of resources from mountain to sea and vice versa, stating:

> The Ahupuaa ran from the sea to the mountain, theoretically. That is to say the central idea of the Hawaiian division of land was emphatically central, or rather radial. Hawaiian life vibrated from *uka,* mountain, whence came wood, kapa, for clothing, olona, for fish line, ti-leaf for wrapping paper, *ie* for rattan lashing, wild birds for food, to the *kai,* sea, whence came *ia*, fish, and all connected therewith. Mauka and makai therefore fundamental ideas to the native of an island (Lyons 1875: 104).

The *ahupuaʻa* was also an important socio-political unit in the pre-Contact era, each unit with its own hierarchy. Kirch (1985) holds that *moku* were independent chiefdoms, divided into a number of radial land divisions, referred to as *ahupuaʻa,* with subdivisions of *ʻili* and *moʻo* within. According to Kirch (1985),

> Each ahupuaʻa was controlled by a lesser chief, who in turn appointed one or more stewards to oversee production, organize work parties, collect tribute, and in other ways represent the chief. Ahupuaʻa were economically self-sufficient to some degree, although differences in the local resource base (agricultural land, water resources, stone for tools, and so on) resulted in differences in the production patterns of individual land sections. Within the ahupuaʻa, there were yet smaller sections and divisions, especially the ʻili and moʻo, which were held and worked by extended households or groups of commoners.

According to Handy and Handy (1972), for the purpose of taxation, the chief political subdivision of the pre-Contact era was the *ahupuaʻa,* which was generally under the management of the *konohiki* (steward or caretaker). The term *ahupuaʻa* itself is derived from the fact that each coastal *ahupuaʻa* boundary was marked with an altar (*ahu*) which held a carved wooden effigy of a pig (*puaʻa*) head during the Makahiki festival, when harvest tributes (taxes) were offered to the god of rain. Handy and Handy (1972) refer to the lower chief who represented the *ahupuaʻa* as *aliʻi ʻai ahupuaʻa*, which translates to English as "chief who eats the ahupuaʻa" (1972:48). Yet, according to Malo (1951:142) the *konohiki* was tasked with collecting levies from the *makaʻāinana* (commoners; literally "people that attend the land") of the *ahupuaʻa* for the king and of the *aliʻi ʻai ahupuaʻa.* The word *konohiki* is defined by Pukui and Elbert (1986) as the, "Headman of an ahupuaʻa land division under the chief; land or fishing rights under control of the konohiki; such rights are sometimes called konohiki rights" (1986:166). Thrum (1924) wrote that the *konohiki* was a local representative or steward of the landlord owner whose privileges and duties were, "…practically those which go with that position in

any land and in common with his brethren today in Russia or Ireland he had his failings and was not always popular among his fellows…" (1924:60).

Handy and Handy (1972) liken the *ahupuaʻa* tenure system to western share cropping, where "sharing between the chief and tenant was comprehensive and reciprocal in benefits" (1972:48). Kirch and Sahlins (1992) delve further into the social dynamics of the *ahupuaʻa* in their historical ethnography, *Anahulu: The Anthropology of History in the Kingdom of Hawaii, Volume One*. Kirch and Sahlins (1992:17) state the following about variations in land use in the ancient *ahupuaʻa*:

> Economically more highly valued, the coastal areas were also generally preferred for chiefly residence. Here were the most extensive wet taro lands, offshore and onshore fish ponds, as well as access to the sea and the fishing and surfing that in Hawaii were sports of kings. Still, the uplands were also necessary for the Hawaiian existence. In addition, to things mentioned by Lyons, people were specifically dependent on the uplands for the timber and thatching of their houses; the materials for their canoes, bowls, weapons, images, agricultural tools, and other objects using hardwoods; rope, line, fishnetting; lighting (form candlenuts); pasture for domestic animals (in the nineteenth century); various fruit trees; and more (Kirch and Sahlins 1992:19).

Thus, resources needed for daily life were best grown in or collected from the habitats that they were best suited for and likely distributed, through trade, gifting, or taxes, from *mauka* to *makai* or vice versa within the *ahupuaʻa*. Further evidence of this is found in the archaeological record, where most upland habitation features in the area contain significant amounts of marine shell and fish bone in midden deposits, which suggests that people inhabiting the *mauka* areas of the *ahupuaʻa* had a steady diet of marine resources (Jensen 1989; Williams and Patolo 1998).

3.1.5 Moʻolelo of ʻŌpana, Kawela, Hanakaʻoe, ʻŌʻio, Ulupehupehu, Punalau, and Kahuku Ahupuaʻa

Each *ahupuaʻa* in the SEIS Lands has a traditional background from the pre-Contact era. Ancient *moʻolelo* for each *ahupuaʻa* helps to explain their traditional names, what kinds of natural resources were found within, what stories and mythological figures are associated with them, as well as the chronicles and conflicts may have occurred there. These facets of the cultural landscape help to provide a connection for modern day cultural practitioners to the land and their ancestors who dwelt in these *ahupuaʻa*. In addition, traditional *moʻolelo* about each *ahupuaʻa* is integral to understanding the cultural, historic, and spiritual significance of these lands.

ʻŌpana Ahupuaʻa

ʻŌpana Ahupuaʻa (1 and 2) are the western most of the nine *ahupuaʻa* making up the project area. The Hawaiian Studies Institute 1987 map of Pre-Mahele Oʻahu shows ʻŌpana as a "numbered *ahupuaʻa*," which indicates that the differentiating names have been lost for the two subdivisions ʻŌpana 1 and 2 (The Hawaiian Studies Institute 1987).

In Pukui et al. (1974), the name ʻŌpana is suggested to be related to *ʻōpā*, which means "to squeeze." According to Andrews (1922:663), Opana, spelled without any diacriticals, translates to "arrow pierced" and is said to be a "name applied to several localities."

According to Handy (1940) a small spring-watered terrace named Kawela extended from the edge of ʻŌpana into Hanakaʻoe, which was used to grow taro. Further, ʻŌpana is one of two areas used for taro cultivation in the stretch from Kahuku Point to Waimea Bay (Handy 1972). Just outside of ʻŌpana Ahupuaʻa on the west side of Kawela Bay is a small freshwater fishpond, referred to as Kāpī or Punaulua (Site 258 in Sterling and Summers 1978:147). However, John Clark (2003:311) states that Punaulua is freshwater spring located on the west shore of Kawela Bay that is connected to the sea by an underwater passage that attracts *ulua* (*Caranx* sp.); hence, the name. This is further upheld by Judge Rathburn, where he states: "…there were no terraces along the Hanakaʻoe, Oio, or Kaalaea stream bed in this ahupuaʻa [Hanakaʻoe]; the only terraces were those watered by the springs mentioned under Opana" (as cited in Sterling and Summers 1978:148). Thus, fresh spring water was available in this locality for agriculture in ancient times and also created an estuarine coast that attracted the prized *ulua*.

There are several legends associated with this *ahupuaʻa*, that include the gods Kāne and Kanaloa. McAllister (1933) states that Kāne and Kanaloa lived in ʻŌpana for a period to utilize a horseshoe-shaped rock alignment just outside of Kawela Bay, known as Papaamui, to catch fish (as cited in Sterling and Summers 1978:147). Another story took place well before European Contact at the fresh-water fishpond near ʻŌpana and Kawela Bay referred to as Kāpī or Punaulua. In this chronicle, the god Kāne approached a mass of people gathered at a beach near the Punaulua Pond to catch what they thought were *ʻōʻio* (bone fish). Kāne kindly informs the people that the fish were *puhi* (eel) rather than *ʻōʻio*. The people, not recognizing Kāne as a god, challenge him in a wager and net all of the fish, which turn out to be *puhi*. Later in the story, as the people wondered who this mysterious man was, Kāne accompanied the group up into the mountains and struck a stone in a serene valley, known as Waikāne, creating a fresh-water spring (ibid.:147-148).

Kawela Ahupuaʻa

Adjacent to the east of ʻŌpana 1 and 2 is Kawela Ahupuaʻa, according to the Hawaiian Studies Institute Oʻahu Pre-Mahele Moku and Ahupuaʻa Map published in 1987. However, in Pukui et al. (1974:99-100) Kawela is not listed as an *ahupuaʻa*, but listed as a bay, land section, gulch, and stream in the Kahuku quadrangle. Further, Sterling and Summers (1978) do not include Kawela as an *ahupuaʻa* in the map of Koʻolau Loa.

According to Pukui et al. (1974:99-100) Kawela translates as "the heat" and was traditionally applied to the coast stretching from Pahipahiʻālua Ahupuaʻa to Kawela Ahupuaʻa. Within Kawela Ahupuaʻa is a spring-fed terrace with the same name (Site 259), which is said extend from ʻŌpana into Hanakaʻoe in Sterling and Summers (1978:147). However, in maps that include pre-Mahele *ahupuaʻa* such as Kawela, this terrace would be located within Kawela Ahupuaʻa. Also within this a coastal pond traditionally named Wākiu, which translates as "northwest wind sound" (John Clark 2003:385). According to John Clark (2003:282), the small reef island located east of Kawela Bay is called Pāpaʻamoi, which translates as scorched thread fish. McAllister's (1933:152) writes about horseshoe shaped rocks named Papaamui located in the same area as the place where Kāne and Kanaloa collected fish. These two localities are likely the same and according to pre-Mahele maps, placed off the coast of Kawela Ahupuaʻa.

In the tradition of Laukaieie, recorded in 1895 by Mose Manu, the celebrated adventurer, Makanikeoe, travelled from Waipiʻo Uka to Waialua before stopping at Kawela during his tour of various springs of Oʻahu (Maly and Maly 2003), which indicates that the spring at Kawela was a significant one for the area. The Waikāne Stone (Site 259) is located on the border of Kawela and Hanakaʻoe Ahupuaʻa and is said to be a large stone located at the foot of the *pali* next to the stream bed on the mountain side of Kawela Bay in Hanakaʻoe. This is the stone that Kāne struck to make the water flow forth freely (McAllister 1933 as cited by Sterling and Summers 1978:148). Thus, a spring provided fresh water for the agricultural terraces in Kawela. Handy (1940:88) upholds the presence of an agricultural terrace named Kawela, which is described as stretching from ʻŌpana to Hanakaʻoe.

Further, McAllister (1933) states that, "Near the beach and in line with Waikane was a fishing shrine called Pahipahialua" (ibid.:148), indicating that the *makai* lands of Kawela Ahupuaʻa were used for ceremonial purposes.

Hanakaʻoe Ahupuaʻa

Although in Sterling and Summers (1978) Hanakaʻoe Ahupuaʻa is one of the only *ahupuaʻa* in the area of concern as well as the largest *ahupuaʻa*, little in the form of traditional accounts are recorded. Further, the exact location of the *ahupuaʻa* boundaries are vague on the 1987 Hawaiian Studies Institute pre-Mahele Oʻahu map, making the task of attributing stories and landmarks to Hanakaʻoe or its adjacent *ahupuaʻa* difficult.

According to Andrews (1922:630), Hanakaʻoe (without the diacriticals) translates to "do you work" and is simply a land section in Koʻolau Loa, Oʻahu. Although, Pukui et al. (1974:40) agrees that Hanakaʻoe (without the diacriticals) is a land division and Sterling and Summers (1978:148) agree that it is an *ahupuaʻa*, neither source offers up an English translation for the meaning. There are other points of interest on the coast and interior of Hanakaʻoe Ahupuaʻa. The most prominent point of the project area was known as Kalaeokaunu, or "the point of the altar," in ancient times (John Clark 2003:101). This point, now called Kuilima Point, is where the Turtle Bay Hotel sits. Another landmark is the sandy beach west of the Turtle Bay Hotel, traditionally known as Waikalae, which translates as "water [of] the point"(ibid.:375).

Handy and Handy (1991:462) hold that there were not sufficient flat lands in Hanakaʻoe for taro cultivation under the old system. Further, Judge Rathburn held that "…there were no terraces along the Hanakaoe, Oio, or Kaalaea stream bed in this ahupuaʻa [Hanakaʻoe]; the only terraces were those watered by the springs mentioned under Opana" (as cited in Sterling and Summers 1978:148). Bordering on Kawela and Hanakaʻoe Ahupuaʻa is the Waikāne Stone (Site 259) is said to be a large stone located at the foot of the *pali* next to the stream bed on the mountain side of Kawela Bay in Hanakaʻoe. This is the stone that Kāne struck to make the water flow forth freely (McAllister 1933 as cited in Sterling and Summers 1978:148). Therefore, fresh spring water was available for the agricultural terraces of Kawela. McAllister (1933) also revealed that, "Near the beach and in line with Waikāne was a fishing shrine called Pahipahialua" (ibid.:148), which suggests that the lands of coastal Kawela Ahupuaʻa were used for ceremonial as well as subsistence purposes.

ʻŌʻio Ahupuaʻa

Not much information exists about this *ahupuaʻa*, however, it existed as an *ahupuaʻa* with two sections, ʻŌʻio 1 and ʻŌʻio 2, in pre-Mahele times according to the Hawaiian Studies Institute 1987map of pre-Mahele Oʻahu. ʻŌʻio 1 and ʻŌʻio 2 are also listed as *ahupuaʻa* in Koʻolau Loa under the Crown, Government, and Fort Lands section of the 1905 *Revised Laws of Hawaii (*Frear et al. 1905:1220*)*.

According to Andrews (1922:662), Oio (with no diacriticals) is a land section in Koʻolau Loa, Oʻahu and translates as a "procession of ghosts." ʻŌʻio, in its varied spellings, is often used synonymously with the Night Marchers. Beckwith (1970) explains the Night Marchers in *Hawaiian Mythology*, stating:

> Family ties in the afterworld remain unbroken, and all Hawaiians believe in the power of spirits to return to the scenes they knew on earth in the form in which they appeared while they were alive. Especially is this true of the processions of gods and spirits who come on certain sacred nights to visit the sacred places, or to welcome a dying relative and conduct him to the aumākua world. "Marchers of the night" (Huakaʻi-pō) or "Spirit ranks" (ʻoiʻo) they are called. Many Hawaiians and even some persons of foreign blood have seen this spirit march or heard the "chanting voices, the high notes of the flute, and drumming so loud as to seem beaten upon the side of the house." Always, if seen, the marchers are dressed according to ancient usage in the costume of chiefs or of gods. If the procession is one of gods, the marchers move five abreast with five torches burning red between the ranks, and without music save that of the voice raised in chant. Processions of chiefs are accompanied by aumākua and march in silence, or to the accompaniment of drum, nose-flute, and chanting. They are seen on the sacred nights of Kū, Lono, Kāne, or Kanaloa, or they may be seen by day if it is a procession to welcome the soul of a dying relative. To meet such a procession is very dangerous. "O-ia" (Let him be pierced) is the cry of the leader and if no relative among the dead or none of his aumākua is present to protect him, a ghostly spears man will strike him dead. The wise thing to do is to "remove all clothing and turn face up and feign sleep. (Beckwith 1970:164)

In another, more recent account of Night Marchers in the area, a retired U.S. Army soldier recounts several stories about supernatural phenomenon in Hawaiʻi, one of which states:

> …Another Army tale comes from a man known to Grant only as C. Taylor, who relayed a story about "choking ghosts" in the 1940s at an airfield in Kahuku. Taylor wrote that the barracks were unknowingly built over a night marcher trail. The night marchers, spirits of ancient Aliʻi (Hawaiian royalty), Hawaiian warriors, and others, have special trails they walk each night on the island. According to other stories Grant collected, they could allegedly kill, assault, or cause illness to those who slept, sat, or stood on their path when they were marching (Wong 2008:B3).

Oio (with no diacriticals) is also mentioned in the 1826 Chamberlain account, "Unstable Land" as being the start of the unstable land that once floated freely off the coast of Oʻahu, typically referred to simply as Kahuku (as cited in Sterling and Summers 1978:149).

Other points of interest on the coast and interior of ʻŌʻio Ahupuaʻa also held traditional names prior to being renamed by its new inhabitants. Kalaeokamanu, which translates as "the point of the bird," is the smaller of two points in the central coast of the project area, just east of Kalaeokaunu (now Kuilima Point) on which the current Turtle Bay Hotel is located (John Clark 2003:148). Between the two points is a cove containing a calcareous sand beach, whose traditional name is Kalokoiki, which literally means "the small pond," but is more commonly referred to as the Keyhole (ibid.:154,188). Also within ʻŌʻio Ahupuaʻa is Kalokoiki Beach, located about 2000 feet east-southeast of, which literally means "roaring sea" (ibid.:142).

Ulupehupehu Ahupuaʻa

Situated between ʻŌʻio 1 and 2 and Punalau Ahupuaʻa is Ulupehupehu Ahupuaʻa, according to the Hawaiian Studies Institute Oʻahu Pre-Mahele Moku and Ahupuaʻa Map published in 1987. Although there is little written about this *ahupuaʻa*, it is referred to as an *ahupuaʻa* relinquished by Leliohoku to the King as government land in the 1848 Mahele Book records. Further, it was one of three *ahupuaʻa* that were sold as part of Hanakaʻoe Ahupuaʻa (Nakamura 1981:5-6). Yet, in Sterling and Summers (1978) Ulupehupehu is not listed as an *ahupuaʻa*.

In Andrews (1922:671), Ulupehupehu means "swollen breadfruit" and is considered a land section rather than *ahupuaʻa*. Within the *ahupuaʻa* are several other landmarks that have traditional names, such as Kauhala, which has no diacriticals nor translation to English according to John Clark (2003:167), but is the name of a beach and fishing spot located just southwest of Kahuku Point. Also, Punapālaha ('slippery spring") is the name of an area just southwest of Kahuku Point where the rocks are made smooth and slippery from the seepage of fresh water (John Clark 2003:311).

Although listed as a site within Kahuku Ahupuaʻa in Sterling and Summers (1978:149), Puʻuʻala Heiau (Site 260) appears to be located just east of the border of Hanakaʻoe and Kahuku Ahupuaʻa in Sterling and Summer's map of Koʻolau Loa District (ibid.), which places the *heiau* roughly within Ulupehupehu Ahupuaʻa according to the Hawaiian Studies Institute (1987) map of Oʻahu Pre-Mahele Moku and Ahupuaʻa. McAllister disclosed that Puʻuʻala Heiau was purported to be situated on the ridge overlooking Kahuku Ranch, but saw no evidence of any structure on the ridge (as cited in Sterling and Summers 1978:149). This site was mentioned again in the Legend of Kamaakamahiʻai, where the story's hero, Keauaʻula, met people playing sports, such as spear throwing and *moa* sliding, and invited him to join them (ibid.). Hence, there are references to an area in or near *mauka* Ulupehupehu that suggest it was used for ceremonial and recreational purposes.

Punalau Ahupuaʻa

There is little written about this *ahupuaʻa*, yet it is referred to in the 1848 Mahele Book records as an unassigned Government, Crown, or Konohiki *ahupuaʻa*. Punalau was one of three *ahupuaʻa* that were sold as part of Hanakaʻoe Ahupuaʻa (Nakamura 1981:5-6). Furthermore, the *ahupuaʻa* was mentioned in a mid-19th Century table of nautical positions as another name for Kahuku Point in *A Directory for the Navigation of the Pacific Ocean* (Findlay 1851:646).

Punalau is a place name for at least two locations, although neither location is on Oʻahu. In Andrews (1922:668) Punalau is the name of land section in Molokaʻi and means "leaf coral." In Pukui et al. (1974:194) it is a place name of several localities in Maui and Molokaʻi, with a different translation ("many springs") and the use of a hyphen between "Puna" and "lau." The names of several landmarks in this *ahupuaʻa* are still known, but not commonly used. The northernmost point on Oʻahu most often referred to as Kahuku Point, was once called Kalaeokaunaʻoa, which literally translates to "the point of the tube snail" (John Clark 2003:148). These shellfish (*kaunaʻoa*) attach themselves to coral and stone and are renowned for being sharp and painful, even life-threatening, to step on (Pukui and Ebert 1986:138). Another point of interest is Kūkiʻo ("standing pools") Pond, located approximately 300 feet south-southeast of Kalaeokaunaʻoa also known as Kahuku Point, which places it in the *ahupuaʻa* of Punalau (Andrews 1922:653; McAllister 1933 as cited by Sterling and Summers 1978:149-150; Hawaiian Studies Institute 1987). Pukui et al. (1974:121) translates Kūkiʻo Pond as, "settled dregs."

According to Native Hawaiian testimonies recorded in land claims and claims to fishing rights, Punalau Ahupuaʻa did contain several features indicating the utilization of natural resources during the Mahele. Punalau was noted as containing a fish pond known as Puekahi and three unnamed shore fisheries, which suggests that inhabitants of this small *ahupuaʻa* likely had access to significant marine resources before European contact (Maly and Maly 2003:282; Silva 1984:19). In land register claims for the area, Punalau was said to have ten taro patches, ten kula plots, gardens of sweet potato, banana, and *noni*, stands of coconut, breadfruit, and canoe trees, as well as eight house lots (Silva 1984:19). Thus, Punalau contained adequate terrestrial resources to support at least eight households during the Mahele and likely supported near to that amount in

the pre-Contact era. In addition, McAllister (1933) states that Kūkiʻo Pond is located 300 feet south of Kahuku Point, which is well within the 1987 Hawaiian Studies Institute pre-Mahele boundaries of Punalau Ahupuaʻa. He further indicates that the pond was larger in earlier times, surrounded by a large Hawaiian community, and contained a wide variety of fish (as cited in Sterling and Summers 1978:149-150).

Kahuku Ahupuaʻa

The name Kahuku appears to be used not only as the name of an *ahupuaʻa* and village, but as a district or place name for the area roughly between ʻŌʻio and Keana Ahupuaʻa. Of the seven *ahupuaʻa* represented in the project area, Kahuku has the most extensive traditional and mythological background.

According to Pukui et al. (1974:67) Kahuku literally translates as "the projection" and is the name of a village, land division, northernmost point, golf course, ranch, schools, forest reserve, as well as surfing beach on Oʻahu. Several other landmarks within the *ahupuaʻa* have traditional names, such as Punamanō, the spring-fed wetland which translates as "shark spring" John Clark (2003:310). Hanakaʻīlio ("work [of] the dog") is a sandy beach located between Kalaeokaunaʻoa and Kalaeuila Points (2003:92). Kalakala ("rough" or "craggy") is the name of the two semi-submerged linear outcrops of limestone that roughly parallel Kahuku Point to the east (ibid.:149).

Traditional accounts of natural resources and environmental conditions are relatively abundant for the *ahupuaʻa* of Kahuku. Traditional land use in Kahuku is also made apparent through legend. The landscape of Kahuku appears to have had several configurations, from the pre-European contact era to the present. During Hawaiian settlement prior to the arrival of Europeans, many parts of the landscape were used for traditional agriculture, habitation, and ceremony, varying from intense to moderate. In the initial Contact period, a good portion of the land lay fallow due to severe population decline and was overgrown in some areas with exotic plant species. Thus, there are several conflicting accounts of what the landscape was like and how it was used prior to European contact. Several themes are tied to Kahuku's landscape, including its abundance of *hala*, or pandanus, and its importance to ancient Kahuku's cultural identity.

Fresh water springs were mentioned in several traditional accounts of the Kahuku area. For instance, in the tale of Makanikeoe, the celebrated adventurer, Makanikeoe stopped at Punahoʻolapa, "a deep spring on the plain of Kahuku," where he found the spring that the legendary kapa anvil fell into and ended up in Waipahu, at ʻEwa (Maly and Maly 2003:91). Subsequently, Makanikeoe "crawled along another path" arriving at another Kahuku spring known as Punamanō (ibid.). A lone rock here, Kū's Rock Spring, was said to give forth pure spring water (Sterling and Summers 1978:153). Further, Handy (1940:88), disclosed that a spring, referred to as Kaainapele Spring, was located *mauka* of the Kahuku Ranch house.

Agricultural terraces were also said to exist in northern Kahuku in the pre-European contact era, which was made possible with the presence of natural springs (Handy

1940:88). There is some debate, however, on the origin of these terraces, where some informants claim that the terraces pre-date European contact and were used in the late 19th Century by the Chinese for rice paddies and some claim that the terraces were built by the Chinese for this purpose (ibid.). On the district of Koʻolau Loa in general, Hall (1839) states that, "…much taro land now lies waste, because the diminished population of the district does not require its cultivation," which upholds the abandonment of taro patches in various locations in Koʻolau Loa due to population decline (as cited in Sterling and Summers 1978:148).

The presence of fish and fishing practices of pre-Contact Kahuku are recalled in legends. In the legend of Kaneaukai, as told by Thrum (1976:254) from April through July, schools of mullet, or *ʻanae-holo*, and surgeonfish, or *kala,* move from Maui to Waimea, passing by Kahuku. Further, in the tale, *Two Fish from Tahiti*, Westervelt (1915:138-140) alludes to *kapu* being placed on the catching and eating of certain species of reef fish associated with the Tahitians that fell victim to cannibalism in this story. The story of Punamanō Spring in Kahuku eludes to locals net fishing at the beach at night, which is telling of traditional fishing methods used in Kahuku (Sterling and Summers 1978:150). The story of Kūkiʻo Pond holds that the pond was once much larger and had contained a variety of fish. This story suggests that these natural ponds were utilized as brackish water fish ponds in ancient times.

Numerous proverbs, prayers, and *mele* about Kahuku in general elude to its abundance of *hala*, or pandanus trees. Pukui (1983:248) recites the proverb, *Nani i ka hala ka ʻōiwi o Kahuku*, which translates to, "the body of Kahuku is beautified by hala trees." In Fornander's translation of the prayer of Kualiʻi, Kahuku is described as a *hala* tree (Fornander 1917:28). Thrum (1919) also associates pandanus with Kahuku in his translation of Comparison of Kualiʻi, in the following lines:

> …Not like the paua [clam or abalone] which cuts the pandanus,
> To weave its blossoms at the social gatherings,
> That was the knife to cut Kahuku's pandanus.
> [He is] Not like these.
> (Thrum 1919:459)

This *mele* compares Kualiʻi with a host of euphemisms that often call upon various localities and objects often associated with them. In a section titled: "Various Heathen Prayers," Fornander (1920:46-51) translates an untitled prayer with a line that states: "He hala o Kahuku…" which Fornander interprets as, "Full of pandanus is Kahuku…" (1920: 50). Intending to win back the affections of his wife, Halemano, composed a chant that referring to the *hala* trees of Kahuku, stating:

Ku au nana I laila,	I stood and gazed, then
Haloiloi Kuu waimaka e uwe,	Tears filled my eyes causing me to weep.
Nani na hala ka oiwi o Kahuku,	How beautiful are the hala, native trees of Kahuku.
I ka lawe a ka makani he mikioi	As they are being fanned by the Mikioi wind.
	(Elbert 1965:281)

Another tearful sentiment about the *hala* of Kahuku comes from the tragic tale of Kaopulupulu, who's failed prophecy sealed his death warrant in the time of Kahahana. According to Thrum (1912:210):

> …In the morning, ascending a hill, they turned and looked back over the sea-spray of Wailua to the swimming halas of Kahuku beyond. Love for the place of his birth so overcame Kaopulupulu for a time that his tears flowed for that he should see it no more (as cited in Silva 1984:C-4).

Further, Apuakehau wrote in the Hawaiian newspaper, *Kuokoa*, in 1922 that "the first Kahuku" was covered by a *hala* grove (as cited in Sterling and Summers 1978:149). The association of *hala* with Kahuku is even repeated in the traditional Hawaiian myth of Pele and Hiʻiaka (Silva 1984). In this portion of the myth, while Hiʻiaka is in Kahuku (Kahipa), she rebukes two bad-mannered individuals, Puna-heʻe-lapa and Pahi-pahi-alua, who did not pay her the proper respects by stating:

> We enter the fragrant groves,
> Hala groves whose heads make a calm,
> Wild growths by the sea of Kahuku,
> But what, indeed are your halas?
> Shall their murmur forbid you speech?
> Make you dumb to my salutation?
> I make this kindly entreaty
> To you who sit in the grove.
> (Emerson 1915:97-8 cited in Silva 1984:C-5)

Silva (1984) adds that Emerson (1915) gathered that there was some word play in the chant, where the word "*hala*" stood for the pandanus tree as well as a fault or a sin. As late as the late 1820s, Chamberlain holds that the Kahuku area was "beautified with lauhala and some other trees" in his manuscript, "Trip Around Oahu in 1826" (as cited in Sterling and Summers 1978:149).

The wearing of *hala*, in the form of plaited *lau* (leaves) *hala* or *leis* made of the *hala* fruit/seed was a way in which the people of Kahuku represented their homeland. In the tale of Kalelealuaka, the strong and brave young warrior who fought for King Kakuhihewa, went to Kahuku and fashioned wreaths of pandanus fruit and sugarcane to disguise himself. He then was able to convince the King's marshal, who was disabled, that he was from Kahuku and that he would carry the marshal to his destination. As a reward, the marshal granted Kalelealuaka the district of Koʻolau for his services (Thrum 1976:100). Cummins (1913) also calls the Kahuku area as "land of the hala tree" and stated that people should not leave Kahuku for Waimea or Waialua without a wreath of Hala-fruit (as cited in Sterling and Summers 1978:149).

Kahuku was infamous for several other landmarks that stand out in Kahuku's cultural and physical landscape. Some legends explain the occurrence of these distinctive natural features, such as the tale relayed by Pukui et al. (1974:67) where, Lono-ka-ʻeho (Lono the stone), who is described as a chief with eight stone foreheads, severed Kahuku

Point from the island. Emerson (1909) translates the verses of a *hula* that describes a few of these landmarks of Kahuku in a rather colorful way. He preludes the translation with the quip, "Whether there is any connection between the name of the hula—breast-beating—and the expression in the first verse of the following mele is more than the author can say." The verses for this *hula* are translated by Emerson into English as:

> 'Tis Kahipa, with pendulous breasts;
> How they swing to and fro, see-saw!
> The teeth of Lani-wahine gape—
> A truce to upper and lower jaw!
> From Lihue we look upon Ewa;
> There swam the monster, Miko-lo-lou,
> His bowels torn out by Pa-pi'-o.
> The shark was caught in grip of the hand.
> Let each one stay himself with wild herbs,
> And for comfort, turn his hungry eyes
> To the rustling trees of Lei-walo.
> Hark! The whistling-plover—her old-time seat,
> As one climbs the hill from Echo-glen,
> And cools his brow in the breeze.
> (Emerson 1909:206)

Emerson goes on to say that, "The thread of interest that holds together the separate pictures composing this mele is slight. It will, perhaps, give to the whole a more definite meaning if we recognize that it is made up of snapshots at various objects and localities that presented themselves to one passing along the old road from Kahuku, on O'ahu, to the high land which gave the tired traveler his first distant view of Honolulu before he entered the winding canyon of Moana-lua" (ibid.). He adds that Kahipa is the name of a fabled female character, which was then applied to a locality in Kahuku where the mountains resemble two female breasts. Further, he describes Lani-wahine as, "A benignant *mo'o*, or water-nymph, sometimes taking the form of a woman, that is said to have haunted the lagoon of 'Uko'a, Waialua, O'ahu" (ibid.).

Another tale of the distinguished promontory, referred to as Kalaeokahipa is as follows:

> Nawai-o-lewa is on the northwest side of the rocky brow of Kalaeokahipa and now only one breast is left to move in the gusty winds of Kuhuku-lewa. The other was broken off by that supernatural son of Ku and Hina…Between Kaleaokahipa and Nawaiolewa, just above is a small round opening to a secret cave…The small secret cave belonged to Kaalae-huapi (Red head mud hen) and others in the first Kahuku that was covered by a hala grove (J.K. Apuakehau, Kuokoa, June 29, 1922 in Sterling and Summers 1978:152).

Sterling and Summers (1978:151-2) list numerous historic references to Kalaeokahipa, most enlisting the use of the word "breast(s)"to describe the peak(s).

Also of note are the harsh currents and surf of Kahuku's coasts, which are mentioned in *The Birth Chant of Princess Bernice Pauahi Bishop,* as translated by Ahuena Taylor, which follows:

> …Who builds the heat, the oven, until the long fires
> Become like a wild sea.
> From "Kama" to "Waialua."
> And comes close the head lands of "Kahuku,"
> And the hawk-like scratching sea of "Kahuku,"
> The night was spent at "Waialua,"
> For a voice was at the sea of "Ewa."
> Listening for the response.
> Respond! Oh Heavenly one…
> (Kanahele 2002: 223-226)

This chant lends a rather rough image to the coast of Kahuku.

Kamakau (1964) tells of a famous hiding cave, referred to as Pohukaina, thought to be a considerable distance *mauka* of the Turtle Bay Resort area. This cave, which had an entrance in Kahuku, is described by Kamakau:

> The mountain peak of Konahuanui was the highest point of the ridgepole of this burial cave "house," which sloped toward Kahuku. Within the cave are pools of water, streams, creeks, and decorations by the hand of man (*hana kinohinoh'ia*), and in some places level land (Kamakau 1964:38)

The great cave of Pohukaina is also said have been the refuge and storage place of "much wealth" for O'ahu's chiefs (ibid.).

Although Kahuku lacked physical evidence of taro terraces along Kahuku Stream, informants interviewed by Handy and Handy in 1991 claimed that there was taro cultivation in ancient times (Handy and Handy 1972).

Hawaiian legend holds that Kahuku was once a floating island blown here and there by the trade winds and is recounted by many sources in several different ways. Pukui (1983) writes of the traditional proverb, *Kahuku 'āina lewa,* which translates as "Kahuku, an unstable land…" and later writes that, "O'ahu, according to legend, was once two islands that grew together. Kahuku is the part that bridges the gap" (Pukui 1983:144). Yet, there are many variations to this legend. In one version, the people of Kahuku grew tired of the moving island bumping against O'ahu, so they fastened Kahuku to O'ahu with fishhooks. McAllister (1933:155) retells this story in great detail:

> A story is told that Kahuku was once a land afloat, wafted about by the winds, drifting over the ocean. Just how it came to Oahu is not told, but old Hawaiians point out to Polou, the place where Kahuku is fastened to Oahu. Formerly it was possible to dice into the pool and when a depth of 40 fathoms was reached, a shelf of rock was found upon which to rest.

> Forty fathoms deeper Punakea (white line from coral) was reached and on looking toward Malaekahana, the hook by which Kahuku was made fast could be seen. This hook was intricately fashioned of Kawila (Alphitonia excelsior). Seaward of the Waialee Industrial School, in another pool of water, known as Kalou, is the spot where Kahuku is attached to Waialee… (McAllister 1933:155).

In addition, when McAllister (1933) relays the story about Kāne and Kanaloa, one line repeats the common tale that Kahuku was not attached to Oʻahu in ancient times, stating that "Kane and Kanaloa lived in the vicinity of the ridge (Kalaiokahipa ridge); but that was at the time when the Kahuku plain was still under water, and the waves lapped about Kaliokahipa" (as cited by Wong-Smith 1989:A-2).

Silva (1984) lists several stories of how Kahuku was reattached to Oʻahu. One colorful account holds that the floating island of Kahuku belonged to the *menehune*, stating as follows:

> Ka-hu-ku section of Oʻahu was once a separate island…It was an islet whose people were the Mene-hune, or Dwarfs as they are called today. Many stories are told about the miraculous feats performed by the Little People of ancient Hawaiʻi. It is known, that they always worked from just after sunset until just before dawn.
>
> Legend tells us that Kahuku was a floating island situated several miles out to sea. For a long time, the people of Oʻahu had planned to make the island part of their land, for they saw it come close to Oʻahu's shores. The floating island of the Menehune did not have any fresh water springs because there were no high mountains covered with verdure and trees to capture the rains. So, the Little Folk used to paddle their islet into the bays of Oʻahu at night to haul water from the springs of the large island.
>
> One day, a resident of Kahuku suggested that all the people gather together to make strong hooks of whalebone and attach them to a stout rope made of sacred olonā fibers. This was done.
>
> The Menehune came to take water as usual, then the residents of Oʻahu attached the large hooks to the floating isle while the Menehune started to paddle off again, but they could not move their islet or free it from the ivory hooks and olonā ropes.
>
> Today, many people who travel Kahuku section of Oʻahu and see the many islets seeming to float off shore, and hear the sea singing its songs, they say, 'Listen to the Menehune grumbling while they try to move their island that used to float!'
>
> The rumbling and grumbling is heard only at night, for that is the time for the Menehune to be working at Kahuku. (Paki 1972:53 as cited in Silva 1984:2-3)

Another account of Kahuku being an island was provided by Silva (1984), which also links the locality with a legendary princess, named Lāʻieikawai, and reads as follows:

> Kahuku District, according to legend, was once a floating island blown about by the winds. As it banged against Oʻahu, it made noises which disturbed the old women guarding the princess Laieikawai. The old women grappled the island with fishhooks and attached it securely to Oʻahu. Polou pool on the sea side of the Kahuku mill is one spot where the hook was fastened. The other end was fastened at Kūkiʻo pond 300 feet inland at Kahuku Point (Boswell 1958:68 as cited in Silva 1984:2).

Other versions provide a political motive for uniting the two islands. A portion of the tale of "The Hole of Kahipa and Nawaiuolewa" was told to Mary Pukui by a one-hundred and five year old woman named, Kanui, who described how two ruling chiefs united Kahuku with Oʻahu. In this tale, "the two were brother and sister. In order to make it one, the two sat down and hooked their fingers together and drew them together. The hole marks the place where they sat (Kamakau Part II, Moolelo o Hawaii, Note 4, Chap 12, as cited by Sterling and Summers 1978:151). Kamakau (1991:38-9) holds that Oʻahu was a floating island, rather than Kahuku. However there are some consistencies with the previously mentioned versions. He writes:

> According to traditions of some people, Oʻahu was said to have once been a floating land, *he ʻāina lewa o Oʻahu*. The Kahuku side was a wide open gap (*puka hāmama*) and this was called *Ka Puka o Kahipa a me Nawaiuolewa*, "The opening of Kahipa and Nawaiuolewa." The piece of land that closed it up was called Kahuku, and the hooks that made fast the piece of land and joined it to the island were called Kilou and Polou (Kamakau 1991:38-39).

Another variation of the story told holds that there was an underground canal or tunnel where the two islands joined. In 1828, Levi Chamberlain, a missionary accountant, tells of a 5-7 mile long by 1-2 mile wide underground canal leading from the sea inland at the convergence of the two islands (Chamberlain 1957:35-36). He reiterated the following in regards to this legend:

> The natives tell a marvelous story respecting the origin of this destrict [sic], which they say floated in from the sea, and attached itself to the ancient shore of the island, that there was a subterranean communication between the sea and the ancient shore, by which a shark used to pass, and make depredations up on the land. The basis of the tract, which is from five to seven miles in length, and from one to two miles in breadth, appears to be of coral; and it was evidently redeemed from the sea, as a good deal of land, in many places along the shore around the whole circuit of the island, evidently has been (Chamberlain 1957:35-6).

McAllister (1933) relays a story about a secret underwater passage way marked by two stones off of Kahuku Point that led to another land referred to as Ulukaa or Kahuna Moku. The story is as follows:

> Two stones known as Kahoa in water about 250 ft. from the beach just opposite from Kalaehila heiau, Kahuku Point. Many years ago a woman who lived on this beach was frequently seen to swim to these stones and disappear. At times she would be gone for as much as a week. Sometimes she was seen to put her clothes in a watertight calabash and swim away. When she returned she usually wore a kou lei. It was finally discovered that this was the entrance to another land, known as Ulukaa or Kahuna Moku (as cited by Silva 1984:A-5).

The theme of an underground canal is echoed in Thrum's (1911) "Legend of the Tapa Log," which largely takes place in Punahoolapa Marsh, located in the southeast corner of the Turtle Bay Resort property and currently a wildlife preserve. Thrum's story is as follows:

> A kapa-beating log of peculiar sound, unlike any other known on the island, which was placed in its waters at the close of the kapa-making season to keep it smooth and free from cracks that would impart an impression to the cloth in its manufacture, was missed, and, believing it to have been stolen, search was made all through the Koolau, Waialua and other districts 'til at last it was found in use at Waipahu. Recognizing it by its resonant tone, it was claimed by the searching owner, and right thereto by those in possession was vigorously maintained. To test the truth of ownership as claimed, the 'Ewa people accompanied the claimant back to Kahuku to visit the scene and witness a test of the underground stream theory. A bundle of ti leaves were gathered, which was wrapped together and consigned to the waters of Punahoolapa. In the course of a few days they were lost to sight, whereupon the party set out for 'Ewa, and after careful watching, as predicted, the bundle of ti leaves came forth on the bosom of the waters of the Waipahu stream. The kapa log was thereupon recognized as the rightful property of the Kahuku claimant (Thrum 1911:130 as cited in Sterling and Summers 1978:149).

Associated with Kahuku's underground canal are several legends of man-eating sharks, where a shark once traversed to consume people (Chamberlain 1957:35-36). In Handy (1922:111), Manō-niho-kahi (shark with one tooth) is a man who had the power to shape-shift into a shark. This version of the tale presents him as normal looking, except for the shark mouth on his back that he always covered with a cloak of *tapa*. When Manō-niho-kahi found out that people, specifically women, were going to the sea to fish or collect *limu*, he would rush out to where they were and bite them with his single shark tooth, killing them. When the killings became too regular, the chief of the region and his *kahuna* gathered all of his people and ordered them all to disrobe. When Manō-niho-kahi refused to take off his *tapa* cloak, he was stripped, revealing the shark mouth on his back. At once, he was put to death, ending the streak of deaths of women in those

waters. Another, albeit less gruesome, tale about man-eating sharks associated with Kahuku is told by McAllister (1933), where a shark was caught and kept as a pet in Punamanō marsh, which is located just east of Turtle Bay Resort lands. The story, as reiterated from an informant's testimony is as follows:

> One time when the people of Kahuku were fishing they caught a small shark. Putting him in a calabash of water they carried him to their houses near the beach. Here he was cared for and put in larger and larger calabashes as he grew bigger. Finally haven outgrown even the largest calabash that could be found, it was decided to place him in one of the pools of brackish water which came to be known as Punamanō. A man and woman living near the pool became guardians. They had lived in their grass huts with a breadfruit tree near the pool and taro and potato patches near the mountains for several years when the brother of the woman came to live with them. Sometime after, the man and his wife went to the mountains to gather taro and potatoes. The brother, who was staying at home, thought that he would like to have some food prepared when the sister and her husband returned. He climbed the breadfruit tree and gathered several, throwing the fruit into the water instead of on the ground, where it would have been bruised in the fall. After picking enough for a few days he descended the tree and gathered most of the fruits from the bank. Two had floated to the middle of the pond and he could not reach them. Now this man knew of the shark that lived in the pool, but he had frequently bathed in the pool and no thought of fear crossed his mind as he swam to the breadfruit. He did not know, however, that his sister and her husband had warned the shark not to allow anyone to steal breadfruit when they were gone. When the sister and her husband returned they could not find brother. Neither was the shark to be found, but they saw the breadfruit floating in the pool and the reddish color to the water. They guessed what had occurred. For nearly a mile they followed the bloody trail until they came to a spring known as Punahoolapa. Not only was the brother never seen, but the shark has never been seen to this day (as cited in Wong-Smith 1989:A-7).

In this case, it appears that the shark was simply looking out for its keeper's interests. Kuapuu (1861) wrote a very similar account of the Punamanō man-eating shark in the *Ka Hae Hawaii* newspaper (as cited in Sterling and Summers 1978:151).

Other supernatural beings and demigods associated with Kahuku are mentioned in Beckwith (1940). On a quest to find his brother, Lono-ka-ehu brought his "great dog" or the dog-man, Kū-'īlio-loa (Kū long dog), to O'ahu from Kahiki. In the search, Kū-'īlio-loa "pierced the hill Kāne-hoa-lani at Kualoa, cleft Kahuku and Kahipa apart, and broke Ka-pali-ho'oku'i at Kailua" according to Beckwith (1940:321). She later describes Kū-'īlio-loa as "a dog with a human body and supernatural power, 'a great soldier and famous warrior,' who terrorizes Kahiki" (Beckwith 1940:321).

Kahuku is also a place where the manifestation of ancient *kapu* law had become a permanent part of the landscape in the form of two stone outcrops. According to Beckwith (1970:48), Kamakau mentioned the story of two stones in the cave of Ke-ana at

Kahuku that are said to be the bodies of two boys who disobeyed their mother's injunction to keep silence during a thunderstorm. Kāne-hekili, the god of thunder, is associated with several gods whose names are also suggestive of the phenomenon experienced during thunderstorms, such as Kāne-wawahi-lani (Kāne breaking through heaven) and Ka-uila-nui-maka-keha'i-i-ka-lani (Lightning flashing in the heavens). The gods in their humpbacked forms can be seen flying through the air during storms with Na-kolo-i-lani, who are the humpbacked brothers of Pele. According to the ancient *kapu* laws, all containers should be turned bottom side up and people should lie face down without any outcry, for silence is the law of Kāne-hekili (Beckwith 1970:48).

Another well known *mo'olelo* is the Legend of Kamapua'a, a supernatural being and a deity attributed to agriculture, rain, and fertility (Elbert 1965:200-1; Maly and Maly 2003:9). While he had the ability to shape-shift into multiple bodily forms (*kino lau*), Kamapua'a was most noted for his pig-like appearance. In one of his many exploits, Kamapua'a was caught stealing chickens from Olopana, the head chief of O'ahu at the time. To catch Kamapua'a, Olopana enlisted the residents of Kahuku, who capture him, bind him to a pole, and carry him towards Punalu'u. Upon seeing this, his grandmother, Kamaunuaniho, recited a chant that gave him the power to kill the captors from Kahuku.

In *The Hawaiian Romance of Laieikawai,* the people of Waianae on O'ahu offered their version of the story, which mentions the high chief who ruled Kahuku named, Kaho'ali'i. In this account, Kaho'ali'i instructs his son to, "Fly about O'ahu while I chew the *'awa;* before I have emptied it into the cup return to me and rehearse to me all that you have seen" (Beckwith 1918:30). The tale goes on to list the places his son passed on his journey. Further, Kahuku is mentioned in the chant of Kuali'i as one of the major landmarks of O'ahu for those travelling to the island from Kaua'i (Beckwith 1918:30).

In the tale, *Two Fish from Tahiti*, Westervelt (1915:142-144) recounts two great canoes filled with men from Tahiti, referred to as two "fish," journeyed to O'ahu. The purpose of the journey was to "find the wonderful fire-land of Hawaii about which they had been taught in the stories of returned travelers…" and "…find an appropriate location for a settlement. Possibly they planned to make a permanent home or hoped to meet some good community into which they might be absorbed" (Westervelt 1915:140). Upon their arrival on the shores of Makapu'u, the travelers found an "unfriendly coast" and decided to separate and circle the island, with one canoe going north and one going south. Westervelt continues:

> The boat which sailed toward the north found no good resting-place until it came to the fishing-village of Hauula…Evidently there, was dissension and at last a battle. The whole story is summed up by the Hawaiian legend in the saying: "The fish from Tahiti was caught by the fishermen of Hauula. They killed it and cut it up into pieces for food." Thus the visitors found death instead of friendship, and cannibalism was thereby veiled by calling the victims "fish" and the victory a "catch…"

> …The second fish from Tahiti had gone on southward in its journey around the island of Oahu. It passed the rough and desolate craters of Koko Head on the eastern end of the island. It swam by Diamond Head and the beautiful Waikiki Beach. Either the number of the inhabitants was so large that they were afraid to make any stay or else they preferred to make the complete circuit of the island before locating, for they evidently made only a very short stay wherever they landed, and then hurried on their journey. By the time they reached Kaena, the northwestern cape of Oahu, they were evidently anxious concerning their missing companions. Not a boat on the miles of water between Kaena and Kahuku, the most northerly point on the island. The legend says that the fish changed itself into a man and went inland to search the coast for its friend, but the search was unsuccessful. It was now a weary journey from point to point, watching the sea and exploring all the spots on the beach where it seemed as if there was any prospect of finding a trace of their expected friends. Where a break in the coral reef permitted their boat to approach the land they forced their way to shore. Then when the thorough search failed again, the boat was pushed out over the line of white in rolling breakers to the great sea until at last the Tahitians came to Kahuku.
>
> Now they appeared no longer as "fish," but went to the village at Kahuku as men. They made themselves at home among the people and were invited to a great feast. They heard the story of a battle with a great fish at Hauula and the capture of the monster. They heard how it had been cut up and its fragments widely distributed among the villages on the northwest coast. Evidently provision had been made for several great feasts. The people of Kahuku, although several miles distant from Hauula, had received their portion. The friendly strangers must share this great gift with them. But the men from Tahiti with heavy hearts recognized the fragments as a part of their companion. They could not partake of the feast, but by kindliness and strategy they managed not only to decline the invitation, but also to secure some portions of the flesh to carry down to the sea. These were thrown into the water, and immediately came to life. They had the color of blood as a reminder of the death from which they had been reclaimed. Ever after they bore the name "Hilu-ula," or "the red Hilu."
>
> Then the "fish" from Tahiti went on around to Hauula. They went up to the tabu land back of Hauula. They pulled up the tabu flags. Then they dammed up the waters of the valley above the village until there was sufficient for a mighty flood. The storms from the heavy clouds drove the people into their homes. Then the Tahitians opened the flood-gates of their mountain reservoir and let the irresistible waters down upon the village. The houses and their inhabitants were swept into the sea and destroyed. Thus vengeance came upon the cannibals.
>
> The Tahitians were "fish," therefore they went back into the ocean to swim around the islands. Sometimes they came near enough to the haunts of fishermen to be taken for food. They bear the name "hilu." But

> there are two varieties. The red hilu is cooked and eaten, but never eaten without having felt the power of fire. The trace of the cannibal feast is always over its flesh. Therefore it has to be removed by purification of the flames over which it is prepared for food. The blue hilu, the natives say, is salted and eaten uncooked. Thus the legend says the two fish came from Tahiti, and thus they became the origin of some of the beautiful fish whose colors flash like the rainbow through the clear waters of Hawaii (ibid.:142-144).

This account calls attention to the political control of resources, *kapu* systems, variations in conduct with outsiders as well as warfare and cannibalism in pre-European contact Kahuku and Hauʻula.

3.1.6 Supplemental Legendary and Historical Background
Two previously written reports (Silva 1984; Wong-Smith 1989) provide excellent summaries of the legendary and historical background of the project area. As a component of the 1985 Kuilima Resort Expansion Revised Environmental Impact Statement, Silva (1984) compiled mythological and historical records for the *ahupuaʻa* of ʻŌpana, Kawela, Hanakaʻoe, ʻŌʻio, Ulupehupehu, Punalau, and Kahuku (Group 70:1985). Another noteworthy historic research document was composed by Wong-Smith (1989) on the lands of Kahuku. This document was intended as a component of the Archaeological Inventory Survey, Punamanō and Malaekahana Golf Courses (Jensen 1989). Both Silva (1984) and Wong-Smith (1989) manuscripts are provided in Appendix B.

3.2 Post European Contact Cultural Landscape

3.2.1 European Contact
At European Contact and shortly thereafter, the general Kahuku area was commented on by several maritime officials, with observations that point to a drastic change in land use from initial contact in the mid 1780s to the mid 1830s.

Approximately two weeks after the death of British Captain James Cook, Charles Clerke took over the helm of the H.M.S. Resolution. As the ship rounded the northern point of Oʻahu, Captain Clerke provided the first post-Contact account of the Kahuku area. Clerke wrote On February 28, 1779:

> SUNDAY 28th. . . Winds E^{t}erly [Easterly]. fresh breezes with open Cloudy Weather. Run round the N^{o}ern [Northern] Extreme of the Isle which terminates in a low Point rather projecting; off it lay a ledge of rocks extending a full Mile into the Sea, many of them above the surface of the Water; the Country in this neighborhood is exceedingly fine and fertile; here is a large Village, in the midst of it is run up a high Pyramid doubtlessly part of a Morai. I stood into a Bay just to the Westward of this point the Eastern Shore of which was far the most beautifull [sic] Country we have yet seen among these Isles, here was a fine expanse of

> Low Land bounteously cloath'd with Verdure, on which were situated many large Villages and extensive plantations; at the Water side it terminated in a fine sloping, sandy Beach. . . (Beaglehole 1967:I:572 in Silva 1984:C-10).

This description paints a pleasant picture of Kahuku, with a thriving community and large ceremonial structures. At about the same period, H.M.S. Resolution Lieutenant, James King, described this northern tip of Oʻahu, writing:

> WOA'HOO. . . We saw this Island the beginning of last year, but only just as a high lump, We this Time sailed along its NE & NW sides but say nothing of its Soern [Southern] part. What we did see of this Island was by far the most beautiful country of any in the Groupe; particularly the Neck that Stretches to the N^{o} ward [Northward] and its NW side. Nothing could exceed the verdure of the hills, nor the Variety which the face of the Country display'd. It /s north-eastern/ parts were cliffy, & rugg'd to the Sea side, but the Valley look'd exceedingly pleasant, near the N point we were charmed with the narrow border full of Villages, & and Moderate hills that rose behind them (Beaglehole 1967:I:610 in Silva 1984:C-10-11).

This is yet another testimony to the beauty and lushness North Shore during the early Contact period. In contrast, Captain George Vancouver visited the northern tip of Oʻahu later in 1794, discovering that the Kahuku coast had significantly changed in terms of cultivation and population, writing:

> …In every other respect our examination confirmed the remark of Capt. King excepting that in point of cultivation or fertility, the country did not appear in so flourishing a state, nor to be so numerously inhabited, as he represented it to have been at that time, occasioned most probably by the constant hostilities that had existed since that period (Vancouver 1798, Vol.3:71).

Wong-Smith (1989) suggests that regular hostilities and the scourge of Western diseases caused the severe decline of the Hawaiian population in Kahuku. It was likely Captain Cook's 1778 expedition that brought venereal disease to Hawaiʻi and spread rapidly between the initial and secondary contact events (Lind 1938; Kuykendall 1938; Beaglehole 1967). By the time the first missionaries conducted a census of the islands in the early 1820s, they estimated that the entire population had been reduced by nearly a third (Schmitt 1968:10 in Wong-Smith 1989:A-10) . This population crash created a wasteland out of the once verdant fields and lively villages of Kahuku.

3.2.2 Historic Era
The focus of this section will remain on events that greatly shaped the modern character of the Turtle Bay Resort area as well as any occurrences that help paint a picture of what Hawaiian cultural practices were like during this period (see Figures 16-18).

Cultural Practices

Although the spread of Western ideals and lifestyles was rampant at this time, there are several instances of Hawaiian traditional practices taking place in Kahuku. *Hula* and *mele* performances held in Kahuku in 1844 and 1849 were described by Emerson (1998). The first performance, a *hula*, called the Hula O-Niu, which took place in 1844 was described by Emerson (1998) as such:

> The so-called hula *o-niu* is not to be classed with the regular dances of the halau. It was rather a popular sport, in which men and women capered about in an informal dance while the players engaged in a competitive game of top-spinning. The instrument of sport was made from the lower pointed half of an oval coconut shell, or from the corresponding part of a small gourd. The sport was conducted in the presence of a mixed gathering of people amid the enthusiasm and boisterous effervescence which betting always greatly stimulated in Hawaii.
>
> The players were divided into two sides of equal number, and each player had before him a plank, slightly hollowed in the center—like the board on which the Hawaiians pounded their poi—to be used as the bed for spinning his top. The naked hand, unaided by whip or string, was used to impart to the rude top a spinning motion and at the same time the necessary projectile force—a balancing of forces that called for nice adjustment, lest the whirling thing reel too far to one side or run wild and fly its smooth bed. Victory was declared and the wager given to the player whose top spun the longest.
>
> The feature that most interests us is the singing, or cantillation, of the oli. In a dance and game of this sort, which the author's informant witnessed at Kahuku, Oahu, in 1844, one contestant on each side, in turn, cantillated an oli during the performance of the game and the dance (Emerson 1998:248).

The later performance, a *mele* about Kāne, recorded by Emerson (1998) took place in 1849 was viewed by King Kamehameha III's during his circuit around the island of Oʻahu. Emerson (1998) wrote:

> The author has already hinted at the form and character of the entertainments with which hula-folk sometimes beguiled their professional interludes. Fortunately the author is able to illustrate by means of song the very form of entertainment they provided for themselves on such an occasion. The following mele, cantillated with an accompaniment of expressive gesture, is one that was actually given at an awa-drinking bout indulged in by hula-folk. The author has an account of its recital at Kahuku, island of Oahu, so late as the year 1849, during a circuit of that island made by King Kamehameha III. This mele is reckoned as belonging to the ordinary repertory of the hula; but to which particular form of the dance it was devoted has not been learned…(Emerson 1989:129-130)

The fact that this performance was part of King Kamehameha III's circuit and recorded with such detail and contemplation by Emerson (1998), suggests that this unnamed *hula hālau* was no ordinary one. It is possible that this Kahuku *halau* has a long, but unrecorded history.

Land Court Awards

Private land ownership was established in Hawaiʻi with the Mahele ʻĀina, also known as the Great Mahele of 1848. Crown and *aliʻi* lands were awarded in 1848 and *kuleana* titles were awarded to the general populace in 1850 (Chinen 1958). Awarded lands in this process are referred to as Land Commission Awards (LCAs). Over time, government lands were sold off to pay government expenses. The purchasers of these lands were awarded Grants or Royal Patent Grants (Chinen 1958). LCA's offer the native and foreign testimonies recorded during the claiming process, which shed light on what the land use of the area was in the early historic period. This information can be used to predict the types of resources may still be present in the project area.

According to Silva (1984) a total of 88 Land Court Awards (LCA) are known to have awarded out of 101 claims in the *ahupuaʻa* of ʻŌpana, Kawela, Hanakaʻoe, ʻŌʻio, Ulupehupehu, Punalau, and Kahuku, 30 of which are located within the Turtle Bay Resort property (Table 1). Details and maps of each LCA as well as the Native Register records and Foreign Testimonies for each LCA as compiled by Silva (1984) are provided in Appendix B. Silva (1984) has also compiled a detailed listing of LCA parcels in the project area, complete with quantities of traditional features attributed to agriculture, horticulture, irrigation, aquaculture, fishing, salt collecting, and habitation (Table 2 and Appendix B). The totals in Table 2 reflect all of the LCA features in each *ahupuaʻa*, not just the LCA's that are located in the project area. As each *ahupuaʻa* was traditionally self-sustained, the very sustainability hinged upon the balance and fitness of *mauka*, *kula*, and *makai* resources for the flow of resources from *mauka* to *makai*, and vice versa. Thus, examining the components of an *ahupuaʻa* individually may create a skewed understanding of what resources were available at this time period.

Figure 16. Loebenstein 1890 Kahuku Plantation Map, Kawela Bay with LCAs defined (courtesy of Hawai'i State Survey Office – Reg. No. 1506 - 4).

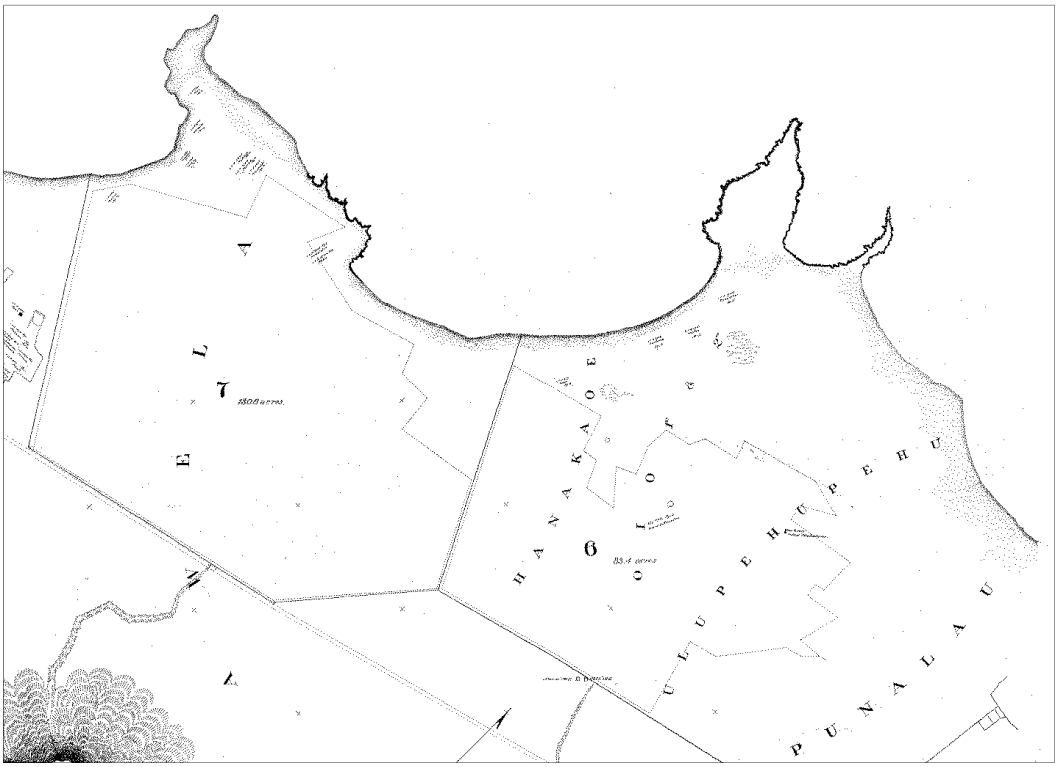

Figure 17. Loebenstein 1890 Kahuku Plantation Map, Kawela and Kuilima Points (Reg. no. 1506 - 3A).

Figure 18. Loebenstein 1890 Kahuku Plantation Map, Kahuku Point (Reg. no. 1506, map 3B).

Table 1. Land Court Awards (LCA) within the Turtle Bay Resort Project Area

LCA Parcel No.	Ahupua'a	In or Near TBR	Awardee	Native Register No.
2897:2	'Ōpana		Kookoo	v.3:683
2734:3	'Ōpana	Yes	Paukoa	v.3:612
2835:2	'Ōpana	Yes	Kuheleloa	v.3:657
2897:2	Kawela	Yes	KooKoo	v.3:683
2837:2	Kawela	Yes	Kamakai	v.3:658
3815:1	Kawela	Yes	Pailalau	v.4:176
2784	Kawela	Yes	Moo	v.3:634
5850	Kawela		Kawi	v.3:663
2770:2	Kawela	Yes	Makaino	v.3:628
2878:2	Kawela		Kekua	v.3:676
2734:3	Kawela		Paukoa	v.3:612
2838:2	Kawela		Kauwahi	v.3:658
2724:3	Kawela	Yes	Paku	v.3:608
2835:3	Kawela		Kuheleloa	F.T. v10:157
2682	Kawela		deceased	v.3:588
2837	Hanaka'oe		Kamakai	v.3:658
3815	Hanaka'oe	Yes	Pailalau	v.4:176
235 M	Hanaka'oe		Kaili	F.T. v11:239
2744:2	'Ō'io	Yes	Pakanaka	v.3:617-8
2936:2	'Ō'io	Yes	Kauaihikai	v.3:701
2716:2	'Ō'io	Yes	Hoolau	v.3:601-2
2935	'Ō'io		Kekauli	v.3:700
2698:2	Ulupehupehu	Yes	Waanui	v.3:595-6
2781:1	Punalau	Yes	Manukeokeo	v.3:632-3
2913:2	Punalau	Yes	Kekua	v.3:600-1
2861:2	Punalau		Kaohele	v.3:667-8
2869	Punalau		Kaopupahi	v.3:671
2864:2	Punalau		Ioeua Kiha	v.3:669
2909	Punalau		Kamalama	v.3:668-9
2892:2	Punalau		Kainalu	v.3:681
2885	Punalau		Kupihea	F.T. v10:181
2771	Punalau		Maulua	v.3:629
2928:2	Kahuku	Yes	Kauihawale	v.3:697
2679:2	Kahuku	Yes	Umeume	v.3:679
2775:2	Kahuku	Yes	Malailua	v.3:630
2698:1,3	Kahuku	Yes	Waanui	v.3:595-6
3809	Kahuku		Lokea	v.4:174
2706:2	Kahuku	Yes	Holoaia	F.T. v10:186
4341:2	Kahuku	Yes	Kaukaha	v.4:266
2779:2	Kahuku	Yes	Makilo	v.3:632
3958:2	Kahuku	Yes	Nauluhao	v.4:200
2738:3	Kahuku	Yes	Palu	v.3:614
2960:2	Kahuku	Yes	Luiki	v.3:591-2
2880:2	Kahuku		Kauaihikai	v.3:675
2861:1	Kahuku	Yes	Kaohele	v.3:667-8
2744:1	Kahuku	Yes	Pakanaka	v.3:617-8
2868:2	Kahuku	Yes	Kapaiaala	v.3:670
2850	Kahuku	Yes	Kupau	

Table 2. Quantification of Features within LCA by Ahupuaʻa

ʻŌpana Ahupuaʻa (1 and 2)	
7	Taro patches, some is cultivated *kula* lands
1	Cultivated *kula* plot
1	Cluster *hala* trees
Kawela Ahupuaʻa	
28	Taro patches
11	Houselots
10	Upland gardens planted with noni, sweet potatoes, gourds, bananas, sugar cane, and *wauke*
17	Kula plots and gardens planted with *wauke*, noni, *ulu*, sweet potatoes, sugar cane, bananas, and *ʻōhiʻa*
1	Fishery
2	Watercourses
1	Salt land
5	Clusters of *hala* trees
1	*Ulu* tree
Hanakaʻoe Ahupuaʻa	
1	Fishery
1	Salt bed
1	Salt pool
1	Hala grove
	Several gardens and *kula* plots planted with noni, onions, and sweet potatoes
1	Cultivated upland plot
ʻŌʻio Ahupuaʻa	
15+	Gardens and *kula* plots planted w/*ʻawa*, taro, banana, noni, *wauke*, sugar cane, sweet potato, gourd, and edible fruits
36	Koa canoe trees
5	Houselots
4	Taro patches
3	Groves of *hala*
3	Salt bed lands
1	Sweet potato patch cultivated upon cliffs
4	Cultivated upland plots planted with banana, *ʻawa*, sugar cane, *wauke*, sweet potato, and gourd
Ulupehupehu Ahupuaʻa	
15+	*Kula* plots and gardens planted w/ *wauke*, sweet potato, gourd, banana, edible fruits
7	koa canoe trees
2	Cultivated upland plots planted w/ *wauke*, banana, and orange trees
1	Banana plantation
1	Cluster of hala
1	Houselot
Punalau Ahupuaʻa	
10	Taro patches
1	Fishpond named Puekahi
10	*Kula* plots and gardens planted w/ sweet potato, banana, noni, *ulu*
4	Cultivated upland plots
8	Houselots
4	Coconut trees
3	Shore areas/fisheries
2	Koa canoe trees

Kahuku Ahupuaʻa	
162	Taro patches
39	*Kula* plots and gardens planted w/ *ʻawa*, banana, *wauke*, gourd, sweet potato, sugar cane, noni, watermelon, *pili* grass
7	Cluster of *hala*
6	Salt lands
4	Koa canoe trees
2	Fishponds
10	Houselots
1	Sweet potato patch cultivated upon cliffs
1	Watercourse bank
3	Cultivated upland plots
1	Brackish spring
1	Wooded upland area of ulu, ʻōhiʻa, kukui, koa, ti leaf, noni, etc.

Rights to Ocean Resources and Fishing Rights

Not only were Land Court Awards granted in the Turtle Bay Resort area, the rights to ocean resources and fishing rights were also granted. Maly and Maly (2003) offer a good explanation of this new system:

> In pre-western contact Hawaiʻi, all *ʻāina* (land), *kai lawaiʻa* (fisheries) and natural resources extending from the mountain tops to the depths of the ocean were held in "trust" by the high chiefs (*mōʻī aliʻi ʻai moku*, or *aliʻi ʻai ahupuaʻa*). The right to use of lands, fisheries, and the resources therein was given to the *hoaʻāina* (native tenants) at the prerogative of the *aliʻi* and their representatives or land agents (often referred to as *konohiki* or *haku ʻāina*). Following a strict code of conduct, which was based on ceremonial and ritual observances, the people of the land were generally able to collect all of the natural resources, including fish—and other marine and aquatic resources—for their own sustenance, and with which to pay tribute to the class of chiefs and priests, who oversaw them.
>
> Shortly after the arrival of foreigners in the islands, the western concept of property rights began to infiltrate the Hawaiian system. While Kamehameha I, who secured rule over all of the islands, granted perpetual interest in select lands and fisheries to some foreign residents, Kamehameha, and his chiefs under him generally remained in control of all resources. Following the death of Kamehameha I in 1819, and the arrival of the Calvinist missionaries in 1820, the concepts of property rights began to evolve under Kamehameha II and his young brother, Kauikeaouli (Kamehameha III), who ruled Hawaiʻi through the years in which private property rights, including those of fisheries, were developed and codified.
>
> Kamehameha III formally defined the ancient fishing rights and practices of the Hawaiian people in the Constitution and Laws of June 7, 1839, and reconfirmed them on November 9, 1840 (Hawaiian Laws, 1842; Hawaiian Laws compiled from between the years of 1833 to 1842).
>
> By the Law respecting fisheries, Kamehameha III distributed the fishing grounds and resources between himself, the chiefs and the people of the land.

> The law granted fisheries from near shore, to those of the deep ocean beyond the sight of land to the common people in general. He also specifically, noted that fisheries on coral reefs fronting various lands were for the landlords (*konohiki*) and the people who lived on their given lands (*ahupua'a*) under the *konohiki* (Maly and Maly 2003:v-vi).

According to Maly and Maly's (2003) review of documented fisheries and fishing rights recorded during the Mahele 'Āina, a total of 20 claims are known to have existed in the *ahupua'a* of 'Ōpana, Kawela, Hanaka'oe, 'Ō'io, Ulupehupehu, Punalau, and Kahuku. Due to the fact that the entire coastline of each of these *ahupua'a,* save for Kahuku, is located in the Turtle Bay Resort property, a large percentage of these claims are located within coastal or offshore waters of the project area (Table 3). As no maps for these claims have been found, it is unclear how many claims for the *ahupua'a* of Kahuku are in the project area. Nonetheless, it would be fair to count the remaining *ahupua'a* claims in as being on shore or offshore of the project area.

Table 3. Fisheries and Fishing Rights Granted for Turtle Bay Area

Helu	Claimant; Location; and Resource Claimed:
2770	Makaino at Kawela, O'ahu. An ocean fishery.
2850	Kawi at Kawela, O'ahu. One pond.
3815	Pailalau at Kawela, O'ahu. A fishery and salt bed at Hanaka'oe.
2885	Kupihea, Punalau and Kahuku, O'ahu. An ocean fishery.
2771	Maulua at Punalau, O'ahu. A fish pond named Puekahi.
2782	Makole at Kahuku, O'ahu. An aina paakai (salt bed); and two fish ponds at Amo.
2785	Makakiekie at Kahuku, O'ahu. A fishery called Kaiohana and a fish pond.
2787	Makaokalai at Kahuku, O'ahu. A fish pond named Kumuhahane; a pond called Kahukupunawai; and an aina kai (salt bed) named Hanumaha.
2932	Kailiuku at Kahuku, O'ahu. A fish pond at Waihinalo.
2702	Waialua at Kahuku, O'ahu. A salt making pond at Mahukini.
2704	Haui at Kahuku, O'ahu. A fish pond named Kuhiwa.
2705	Hao at Kahuku, O'ahu. A small fish pond on the kula land.
2732	Pukawale at Kahuku, O'ahu. The ocean fishery called Keekee.
2758	Napoe at Kahuku, O'ahu. Two fish ponds at Punalau.
3723	Male at Kahuku, O'ahu. Two fishponds at Ahamau.
3813	Pakui at Kahuku, O'ahu. An ocean fishery and salt making land.
3951	Niau at Kahuku, O'ahu. An ocean fishery at Kakaako (Kahuku).
4374	Kuapuu at Kahuku, O'ahu. The fishery of Pauwela.
4390	Kupaihea at Kahuku, O'ahu. An ocean fishery.
4449	Kaaikaula at Kahuku, O'ahu. An *'āina pa'akai* and ocean fishery.

Religious Developments

Western religions in Kahuku during the late 1800s were jostling to gain the loyalty of the community. In the 1878 *Annual report of the Hawaiian Evangelical Association*, Kahuku Church, which eventually merged with Hau'ula Church, was one of the last Hawaiian speaking Evangelical churches on the island (Hawaiian Evangelical Association 1878:2). This church is

later described in this report as "one of the feeble churches," to the point that, "its pastor has been called to Waianae, and installed over that church…It would be well for this church to unite with some stronger one…" (Hawaiian Evangelical Association 1878:10).

The Kahuku Ranch

According to Rechtman (2009), prior to Campbell's ownership, Charles Gordon Hopkins obtained the *ahupua'a* of Kahuku in 1851 the as part of Grant No. 550 and founded a ranch at Kahuku. At about the same time, transportation infrastructure was being assembled, including a road that would soon circle the island (Figure 19; Kuykendall 1938 in Rechtman 2009). Also in the late 1800s, the O'ahu Railway and Land Co. ran a line up to Kahuku from Honolulu via the Pali – with the terminus of the line running from Waianae (Honolulu Star-Bulletin 1941:155). This line was lauded for opening up new economic opportunities to windward districts of O'ahu (ibid.:158).

Figure 19. 1938 O'ahu Map with Kahuku Transportation Routes (courtesy of USDI).

The result of these developments were not all positive, as suggested by Emerson (1928), where he writes that the tyranny of the new land owners had caused the Native population of Kahuku to suffer, on which he elaborates:

> Kahuku had passed from control of its chief to that of an Englishman. The pastures of his big ranch extended along the shore for 12 miles, reaching inland to the mountain chain, and he was so autocratic that the natives could not own a dog, or pasture a cow or horse, without his consent. The depredations of herds and flocks on their small homesteads became unbearable, but they appealed in vain for their beloved *hala* trees and patches of vegetables. . . There was no

> redress, however, and with the fading of the forests the people also disappeared and the once populous district of Kahuku became a lonely sheep and cattle ranch (Emerson 1928:135-136 as cited in Rechtman 2009).

The 25,000 acre property in Kahuku that would become Kahuku Ranch had passed through a series of hands before it was purchased by James Campbell for $63,500 cash in the mid 1870s. Campbell then stocked this ranch with 3,000 head of cattle as well as a number of sheep and horses he hoped would reach 30,000 (Silva 1984:C-16).

The Kahuku Plantation

By the late 1890s, Campbell had leased a large portion of his ranch lands to James B. Castle, which would become the Kahuku Plantation. The plantation proved to be innovative both socially and economically. In the early 1900s, the Hawaiian Sugar Planters' Association became a recognized organization that aimed to improve general working and living conditions of plantation workers. Kahuku Plantation became a pioneer in the movement, providing a day-care center for the working mothers beginning in 1905 (Thrum 1921:116). The plantation had also developed a new fuel-saving device that burnt waste molasses, creating an ash that was then used as a high grade fertilizer (ibid.). By the mid-1930s, the plantation was cultivating nearly 4,500 acres and had 1,137 people under its employ (O'Hare and Hammatt 2006:21). With its heyday long over, the Kahuku Plantation shut its doors in 1971, causing the greater Kahuku area to experience economic instability for years.

Military Presence in Kahuku

Prior to any U.S. military bases were constructed, the American Marconi Company set up a wireless operation in Hawai'i in 1902, building their transpacific receiving station at Kahuku in 1915. In 1942, the Kahuku Airfield was constructed as an auxiliary airfield, with several runways, ancillary bunkers, and emplacements (O'Hare and Hammatt 2006:21). Pilots from Wheeler Air Force Base were trained to fly a variety of aircraft on this airfield. By the late 1940s, Kahuku Field was abandoned and the lands once leased by the military were returned to the landowner. In According to Nakamura (1981), the inland and mauka areas of Kahuku Ahupua'a were leased to the U. S. military for training purposes in the mid-1950s.

4.0 THE ARCHAEOLOGICAL RECORD

A total of eighteen archaeological studies have been conducted in various areas within the Turtle Bay Resort property. Presented in the following section is a summary of the findings for these reports. A list of the reports and their locations in chronological order is provided in Table 4 and map of the project area with all of the study areas and known archaeological sites is provided in Figure 20.

Table 4. Previous Archaeological Investigations in the Turtle Bay Resort Project Area

Authors	Year	Report Title and Publisher	Project Location	Findings
McAllister	1933	*Archaeology of Oahu.* (BPBM)	Island-wide survey	Site 50-80-02-0262; Kūki'o Pond
Dye	1977	Archaeological Reconnaissance Survey of Prudential Insurance Company Lands Near Kuilima-Hyatt Resort, Kahuku, O'ahu. (SHPD)	263 hectares surrounding the Kuilima Resort	Sites 50-80-02-6410 and -6411, these sites later expanded to include more features
Bath	1984	Subsurface Archaeological Reconnaissance Survey for the Kuilima Resort Expansion Project: Lands of 'Ōpana, Kawela, Hanaka'oe, 'Ō'io, Ulupehupehu, Punalau, and Kahuku, Ko'olau Loa, O'ahu. (PHRI)	Current Turtle Bay Resort (TBR) project area	7 new sites identified (T-1 to T-7; no SIHP #s.); sites T-1, -2, -4, -6, and -7 were tested ; sites -6410 and -6411 also tested
Neller	1984	An Archaeological Reconnaissance Survey of a Dune Burial Site Near Kahuku Point, O'ahu. (SHPD)	East of Kahuku Point	Burial; added to Site 50-80-02-6411
Davis et al.	1986	Preliminary Report Upon Completion of Fieldwork: Intensive Survey and Test Excavations Site 50-OA-2912, Punaho'olapa Marsh, Kuilima Resort Expansion Project, Land of Kahuku, Ko'olau Loa, Island of O'ahu. (PHRI)	Punaho'olapa Marsh	Site 50-80-02-6412
Walker et al.	1987	Data Recovery Plan (DRP) Kuilima Resort Expansion Data Recovery Program: Kuilima Resort, Lands of Kahuku, Kawela, and 'Ōpana, Ko'olau Loa, Island of O'ahu. (PHRI)	Current TBR project area	No Findings
Walker et al.	1988a	Intensive Survey and Test Excavations Site 50-OA-2899, Kahuku Point Archaeological Area, Kuilima Resort Expansion Project, Lands of 'Ōpana, and Kawela, Ko'olau Loa, Island of O'ahu. (PHRI)	Kawela Bay: west end of current TBR project area	Site 50-80-02-6410
Walker et al.	1988b	Intensive Survey and Test Excavations Site 50-OA-2911, Kahuku Point Archaeological Area Kuilima Resort, Expansion Project. (PHRI)	Kahuku Point: east end of current TBR project area	Site 50-80-02-6411
Jensen	1989	Archaeological Mitigation Program, Phases I & II, Monitoring and Burial Treatment Plans, Kawela Bay Mitigation Project, Lands of 'Ōpana, Kawela, and Kahuku, Ko'olau Loa District, Island of O'ahu. (PHRI)	Current TBR project area	No Finds
Neller	1989	Human Remains from Kahuku Point, O'ahu. (SHPD)	West of Kahuku Point	Burial; added to Site 50-80-02-6411

Authors	Year	Report Title and Publisher	Project Location	Findings
Kennedy	1992	Treatment of Inadvertent Burial Discovery at Turtle Bay Hilton, TMK: 5-7-01:13, Hanakaʻoe Ahupuaʻa, District of Koʻolau Loa, Island of Oʻahu. (PHRI)	Kuilima Point Burial Area	Burial; Site 50-80-02-4488
Maly	1992	Kuilima Development Company: Burial Treatment Plan, Lands of ʻŌpana, Kawela, Hanakaʻoe, ʻŌʻio, Ulupehupehu, Punalau, and Kahuku. (PHRI)	Current TBR project area, various locations	16 Burials; Sites 50-80-02-6410, -6411, and -6423
Kalima	1993	Kawela Bay Mitigation Project Osteological Analyses. (PHRI)	Kawela Bay and east edge of TBR project area	10 burials; Sites 50-80-02-6410 and -6423
Kennedy	1996	Treatment of Inadvertent Burial Discovery at Turtle Bay Hilton, TMK: 5-7-01:13, Hanakaʻoe Ahupuaʻa, District of Koʻolau Loa, Island of Oʻahu. (PHRI)	Kuilima Point	Site 50-80-02-4488
Carson et al.	1999	FINAL Treatment of Inadvertent Burial Discovery at Turtle Bay Hilton, TMK: 5-7-01:13, Hanakaʻoe Ahupuaʻa, District of Koʻolau Loa, Island of Oʻahu. (PHRI)	Kuilima Point	Site 50-80-02-4488
Borthwick et al.	2001	Archaeological Monitoring Report for a Golf Course Construction and Improvement Project at the Turtle Bay Resort Golf Club, Kahuku, Ulupehupehu Ahupuaʻa, Oʻahu, Hawaiʻi. (CSH)	*Mauka* of Kahuku Point (Golf Course 2)	No Findings
Corbin	2003	Archaeological Mitigation Kuilima Resort Expansion Project, Lands of Kahuku, Kawela and ʻŌpana, Koʻolau Loa District, Island of Oʻahu (PHRI)	Current TBR project area	No Findings
O'Hare and Hammatt	2006	Archaeological Mitigation Plan for the Turtle Bay Resort Land Use Master Plan Project, Kahuku, Punalau, Ulupehupehu, ʻŌʻio 1 and 2, Hanakaʻoe, Kawela, and ʻŌpana Ahupuaʻa, Koʻolau Loa District, Oʻahu Island (CSH)	Current TBR project area	No Findings
Collins and Nees	2009	A Cultural Impact Assessment for the Proposed Replacement of Kawela Stream Bridge, ʻŌpana Ahupuaʻa, Koʻolau Loa District, Oʻahu. (PCSI) Report included an Archaeological Assessment (disclosing results of a reconnaissance survey)	Kawela Bay Bridge area, bordering TBR project area	No Findings

4.1 Early Archaeological Studies

The earliest systematic archaeological study performed in the vicinity of the Turtle Bay Resort project area is the 1930 island-wide survey conducted by Gilbert McAllister (1933). In *Archaeology of Oahu*, McAllister identifies several historic sites in or near the project area, including Kūkiʻo Pond (Site 262) located within the project area as well as Kāpī or Punaulua Fishpond (Site 258) just west of the project area, and the Waikāne Stone/Pahipahialua *koʻa* (Site 259) *mauka* of Kawela Bay, and Puʻuala Heiau (Site 260) purportedly located on a ridge that overlooks Kahuku Ranch.

4.2 Recent Archaeological Investigations

The Turtle Bay Resort (TBR) has been the subject of numerous archaeological investigations between 1977 (Bishop Museum) through 2006 (Paul H. Rosendahl, Inc. [PHRI]) that have been documented in 21 separate reports. This work has been summarized for the purposes of developing an archaeological mitigation plan in 2006 (Cultural Surveys Hawaiʻi) for the then proposed master plan for development. Three main areas have been subjected to archaeological study – Kawela Bay, Kahuku Point, and Punahoʻolapa Marsh. An additional 14 sites were also investigated. The archaeological investigations in these areas are summarized below.

Kawela Bay

Intensive Survey

- 140 auger tests excavated
- 36 controlled test units
- 2 human burials encountered
- 11 radiocarbon dates obtained
- Area C contained the most subsurface features
- Area D yielded the highest density of artifacts and midden

Mitigation / Monitoring

- 42 controlled test units
- 212 subsurface features (hearths, postholes, trash pits, and dog burials)
- Traditional Hawaiian portable artifacts
- Shell and bone midden
- 9 radiocarbon dated obtained
- Marsh east of Kawela Bay tested and determined to be a modern feature

Kahuku Point

Intensive Survey

- 105 auger tests excavated
- 38 controlled test units
- 3 human burials encountered
- 8 fire pits exposed in dune faces
- 19 radiocarbon dates obtained
- 44 subsurface features uncovered
- 160 artifacts collected
- Substantial midden collected

Mitigation / Monitoring

- 21 auger tests excavated (*makai* of hole 16 in Golf Course)
    - Glass and metal fragments throughout two identified sand layers in auger holes

- 2 controlled test excavations (near 17th green of Golf Course)
    - Subsurface features (hearths, postholes)
    - Traditional portable artifacts (flaked and ground stone)
    - 7 radiocarbon dates obtained

Punahoʻolapa Marsh

Mitigation / Monitoring

- 25 auger tests excavated
- 3 trenches excavated for sampling
- 10 radiocarbon dates
- 50 pollen samples sent to two palynologists
- Dated vegetation history developed for the area

Other Sites on the Turtle Bay Resort Property (6413 – 6426)

A total of 14 additional archaeological sites were investigated to varying extents during monitoring activities by PHRI. Site areas were determined, some sites were only surface collected, and others had controlled excavations. Artifacts and midden were collected and an additional 22 radiocarbon dates were obtained.

In summation, a substantial amount of archaeological work has been conducted in the TBR property, including:

- 19 archaeological sites have been recorded to some degree;
- 291 auger tests excavations conducted;
- 121 controlled excavations (1x1 m; 2x1 m; and trenches) conducted;
- 78 radiocarbon dates obtained;
- 50 pollen samples analyzed; and
- Substantial midden and artifact collections were made.

There are a few problems and/or shortcomings with the previous archaeological investigation history. For instance, the archaeological data has been presented in 21 separate reports, with no synthesis. An apparent shortcoming of the previous archaeological studies is that they did not contain specific significance assessments of the archaeological sites that were recorded (O'Hare and Hammatt 2006:80). In addition, while 78 radiocarbon dates were obtained, it is probable that these were done without identifying the species of charcoal prior dating; this lack of species identification can produce erroneous results.

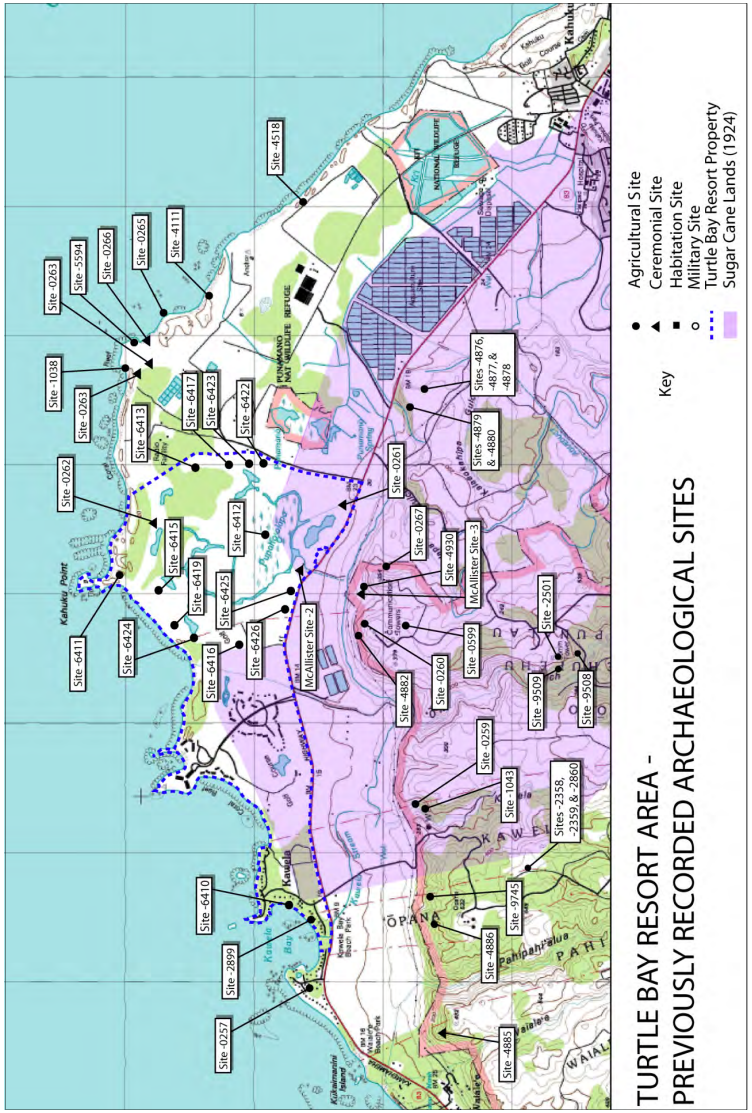

Figure 20. Previously recorded archaeological sites in the Turtle Bay Area.

4.3 Concurrent Archaeological Investigations

Turtle Bay Resort, in recognition of altered circumstances since previous archaeological studies were performed, has elected to commission a Supplemental Archaeological Inventory Survey (SAIS) as part of its Supplemental Environmental Impact Study (SEIS). This supplemental investigation was independently and concurrently proceeding at the time of the subject CIA.

On 2 February 2012, Haun & Associates concluded fieldwork for the supplemental archaeological inventory survey for the Turtle Bay Resort Development. Surface and subsurface surveys were performed in accordance with the Supplemental Archaeological Inventory Survey (SAIS) Plan, which was reviewed and accepted by the State Historic Preservation Division (SHPD; Haun *et al*. 2011).

According to the SAIS post-field report (Haun 2012), surface sites were identified in Test Areas E and F, while no surface sites or features were encountered in Test Areas A-D and G (Figure 21 and Table 5). The Test Area E survey yielded the remnants of seven World War II era concrete structures and an intact section of the Kahuku Point Airfield. Seven World War II era concrete structural remnants as well as a single potential pre-Contact agricultural mound and a previously identified historic wall were encountered during the survey of Test Area F.

Surface surveys were also performed in the Kahuku Point Preserve area and the length of forested areas adjacent to Kawela Bay. Twelve World War II remnants were discovered at Kahuku Point, consisting of 11 concrete military structures and 1 large earthen revetment related to the airfield. The Kawela Bay area survey yielded a World War II era pillbox, located at the northern end of Kawela Bay.

In addition to the pedestrian survey, Haun & Associates performed a total of 345 trench excavations, which consisted of 321 systematically positioned trenches and 12 discretionary trenches. A total sum of 1,958.5 meters (1.21 miles) of trench was excavated for the Turtle Bay Resort Development SAIS. Trenches varied in length from 3 to 23 meters, with an average length of 6.05 meters. In addition to backhoe testing, ten stratigraphic profiles were drawn in Test Area C within previously excavated sand borrow pits.

Test Areas A, F, and G bore no cultural deposits during subsurface investigations. The dearth of cultural materials was tentatively interpreted by Haun (2012) as being the result of the "extensive historic agricultural and WWII-era military activity in these areas" (Haun 2012:2). However, an intact human burial was discovered in Backhoe Trench B-6-2. Human remains were encountered in Test Area C, which consisted of a single "secondarily deposited human metatarsal" (foot bone) found on the surface of Sand Pit 6 (Haun 2012:2). No cultural deposits were encountered in Area C during subsurface testing. Three subsurface cultural deposits were discovered in Test Area D, including a single a human burial. Furthermore, five subsurface cultural deposits were encountered in Test Area E.

The full results of the Turtle Bay Resort Development SAIS will be presented in the Turtle Bay Resort Final SEIS.

4.4 Iwi Kūpuna

Iwi kūpuna are the ancestral skeletal remains of Native Hawaiians. These remains are highly revered by contemporary Hawaiians. It is believed that, upon death, the *nā iwi* of a person become the repository of the *mana* (power, authority) they possessed in life. The method of Hawaiian burials varied with an individual's rank, changed through time, and differed from one area to another. Coastal properties, especially where there are areas of sand, were common grounds for Native Hawaiian burials. Traditionally, the *kuleana* (responsibility, privilege) of caring for *nā iwi* was a sacred task. In general, today's Native Hawaiians strongly believe that *iwi kūpuna* should not be disturbed and rest in the original place of burial.

The TBR SEIS Lands have had many owners and withstood many developments, which has made it difficult for the proper treatment of *iwi kūpuna*. Further, as a Burial Treatment Plan (BTP) was not required by law until the late 1980s, the treatment of *iwi kūpuna* was discretionary until that time. In most cases, inadvertently discovered *iwi kūpuna* were removed from TBR Lands and held in a State Historic Preservation Division repository until a suitable location for reinterment near to the original burial location was decided. Over the years, some *iwi kūpuna* have been discovered on the TBR SEIS Lands. The archaeological documentation of *iwi kūpuna* was summarized by Haun (2011:68), where the discovery, recordation, and treatment of *iwi kūpuna* (ancestral skeletal remains) has been compiled for the project area from 1984 to 1993 (Bath *et al*. 1984; Neller 1984, 1989; Walker *et al*. 1988a, 1988b; Sullivan 1990; Kennedy 1992; Carson *et al*. 1996, 1999). Haun (2011) provides the history and details of *iwi kūpuna* that have been previously discovered in the project area.

Traditionally, the *kuleana* (responsibility) to *mālam*a (take care of) the *iwi kūpuna* was in the hands of the descendents and/or the *konohiki*. In accord with these traditional values, the Kahuku Burial Committee (KBC) was formed. KBC, comprised of individuals and families who have lineal and cultural connections to the land as well as cultural practitioners, have accepted the *kuleana* to *mālama nā i iwi kūpuna* that have been and may potentially be discovered on the TBR SEIS Lands. Initially, the KBC formed in response to *iwi kūpuna* that had been exposed in the Kahuku area over the years and not properly cared for. Since its initial formation, the KBC continues to be entrusted with the decision making process over the proper treatment of disturbed and displaced *iwi kūpuna* by the general community of Kahuku and surrounding *ahupua'a*. Distinguished members of the KBC are well respected *kūpuna* and cultural practitioners with ties to area, by blood and *hānai* (traditional Hawaiian practice of adoption), such as Richard and Lynette Paglinawan, Pua Colburn, Ralph Makaiau, Nova-Jean McKenzie, Buddy Ako, Warren Soh, and Carol Anamizu and several other prominent *kūpuna* of the greater Kahuku area.

Several years ago, TBR consulted with the KBC over *iwi kūpuna* encountered on TBR property with the main goal of proper treatment of *iwi kūpuna* and privacy of the descendents. From that period on, KBC has met regularly for several years with TBR, deliberating over the most culturally appropriate treatment for *iwi kūpuna* that have been discovered and may be discovered on the TBR SEIS Lands. Great care is taken during these deliberations to consider what is appropriate for each *iwi kūpuna* that may be discovered to ensure that the treatment is *pono* (righteous) for each *iwi kūpuna.* Furthermore, KBC has committed to identifying potential permanent reinterment locations within ʻŌpana-Kawela, Hanakaʻoe, and Kahuku Ahupuaʻa which would be consistent with the traditional Hawaiian values where *iwi kūpuna* were generally buried in the *ahupuaʻa* that their *ʻohana* lived in.

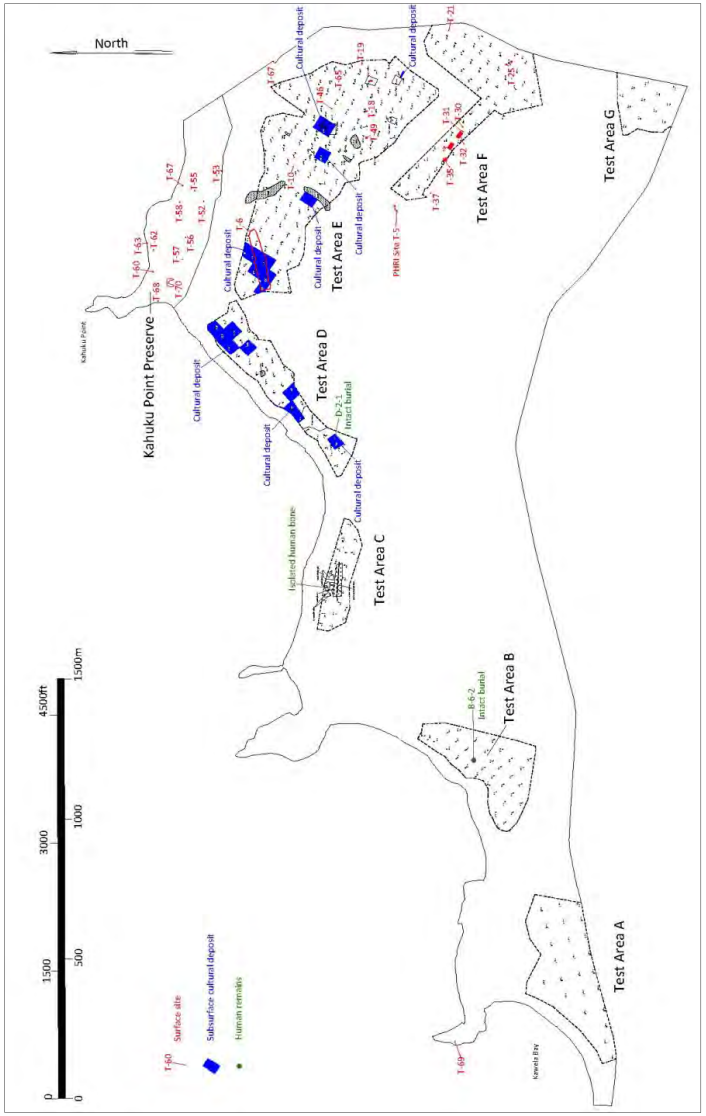

Figure 21. Map of recent archaeological findings (Haun 2012:Figure 1).

5.0 CONTEMPORARY USE OF THE LAND & SEA

As cultures are neither static, nor impervious to outside influence, SEIS Lands and surrounding lands and waters are currently used for Hawaiian traditional practices, traditional practices from abroad, modern practices, modern versions of traditional practices, and any manner of combination or hybrid of these practices. Thus, the lines between traditional cultural practices as they existed in ancient times and how they are practiced in modern times have become obscured. This section attempts to provide a summary of traditional Hawaiian and contemporary cultural activities associated with the subject area as they are practiced in the modern era.

5.1 HAWAIIAN TRADITIONS

An array of traditional activities are currently being practiced on the coast of SEIS Lands and surrounding areas.

Fishing and Marine Resource Gathering
Fishing as well as the collecting of shellfish and *limu* (seaweed) were crucial activities in maintaining the traditional Hawaiian diet. While pig, dog, chicken, and wild birds were sources for protein in the diet, fish and shellfish were the main protein sources (Titcomb 1977). According to John Clark (2003), the Turtle Bay Resort coastline contains several popular and/or traditional fishing sites, including:

- Kauhala. Located on the eastern extreme of what is now referred to as Kuilima Bay, next to Kahuku Point (John Clark 2003:167).
- Ono Ledge (also known as "The Ledge"). This ledge follows the 240-foot marine contour line between Kahuku and Ka'ena Points. Trolling for *ono,* or wahoo, is common here (John Clark 2003:272).

Fishing in these waters has numerous forms, including: pole, throw-net, netting, trapping, spearing. While a significant portion of fishermen and women are local, a diverse group of people come from near and far to fish using traditional methods in these waters.

Swimming and Diving
'Au or 'aukai (swimming) for sport, referred to as *heihei 'au*, is a ancient Hawaiian tradition according to anthropologist, Stewart Culin (1899:211), where males were known to race each other in competition and at times for prizes or wagers. Diving for sustenance has long been a tradition in Hawai'i. John Clark (2003) also lists a number of popular and traditional sites within the Turtle Bay Resort coastline to swim and dive, including:

- Kahuku Ledge. Located three-quarters of a mile off of Kahuku Point at 70 foot marine contour line and parallel to shore. Popular diving ledge (John Clark 2003:139).

- Kalokoiki (also known as Keyhole). A sandy beach and protected cove between Kalaeokaunu (Kuilima Point) and Kalaeokamanu (John Clark 2003:385).
- . A swimming pond and beach located east of Kawela Bay (John Clark 2003:385).
- Wild Beach. Located between Kawela Bay and Kuilima Point. The name refers to the irregular or "wild" wave patterns during high surf. Swimming and diving (John Clark 2003:390).

Surfing
He'e nalu (surfing, literally 'wave sliding') and *kaha nalu* (body surfing) are also longstanding Hawaiian traditions (Finney 1959). According to Pukui and Korn (1973:36), in ancient Hawai'i, surfing was a way of life and a "discipline for heroes."

The *papa he'e nalu* (surfboard) was also an important possession in ancient times. Pukui and Korn (1973) maintain that "Both males and females regarded surfboards as prized pieces of property and selecting their names required much thought"(Pukui and Korn 1973:36). Culin (1899:212) describes the *papa he'e nalu* of the historic era as made of wood from the *wiliwili* (*Erythrina corallodendrum*), *'ulu* (breadfruit; *Artocarpus altilis*), or *koa* (*Acacia koa*) trees. He adds that the boards measured up to six feet long and a little over a foot wide, occasionally flat, but often slightly convex on top and bottom. These boards were typically stained black and after each use, it dried and rubbed down with coconut oil then wrapped in cloth and suspended in the owner's house (Culin 1899:212).

According to John Clark (2003), the Turtle Bay Resort coastline contains several surf breaks, including:

- Gordieland. Located off the north point of Kawela Bay (John Clark 2002:81).
- Marconi. Located between Kahuku Point and Kalaeuila, or High Rock (John Clark 2003:238).
- John Jack. Located adjacent to Kahuku Point (John Clark 2003:129).
- Wilds. Located between Kawela Bay and the Turtle Bay Hilton Hotel (John Clark 2003:390).

Canoeing
Canoe racing, or *he'e wa'a*, was also observed as a traditional Hawaiian sport in the late 1800s (Culin 1899:211), that has continued to be practiced today in waters off of TBR's coasts. In the historic period, "Two or more canoes race, usually out to sea, the course being a mile or a mile and a half out and around a flag buoy and return…" (Culin 1899:211). Paddlers, with outriggers ranging from single rider to crew size, continue this ancient tradition. One access location for canoe paddling is Kalokoiki (also known as Keyhole). People are permitted to launch larger outrigger canoes, but the access is small and crowded.

5.2 Contemporary Activities

While Turtle Bay Resort provides an array of recreational activities for its patrons, the vast coastline and public access areas allow the local community to perform cultural practices as well as recreate on the resort's property. A number of popular and/or traditional activity areas are located along the Turtle Bay Resort coastline. Traditional activities include surfing, swimming, diving, and paddling. Other marine activities that not attributed to traditional Hawaiian practices, but are now popular are snorkeling and kayaking. Horseback riding, biking, segway riding, jogging, walking for recreation and fitness, hiking, group fitness classes, and golfing are activities that are currently occurring inland on the property.

Marine Activities

With such an extensive and varied coastline, in terms of water access, water conditions, presence or absence of reef or sand, etc., there are a plethora of marine sports and recreational activities that occur on TBR's coasts. Throughout the coastline, TBR visitors can be observed on any given day participating in the following activities, some of which are also performed by traditional cultural practitioners:

- fishing
- collecting
- swimming
- snorkeling
- scuba diving
- free diving
- body surfing
- skim boarding
- body boarding
- surfing
- kite surfing
- wind surfing
- stand-up paddle surfing
- paddling
- kayaking
- canoeing
- sailing
- motor boating
- collecting tropical fish
- sunbathing
- picnicking
- taking photographs or video
- wildlife viewing
- walking/jogging

Some areas are key access areas for various marine sports and recreational activities. The cove known as Kalokoiki and Keyhole, between Kalaeokaunu (Kuilima Point) and Kalaeokamanu is available for canoes and kayaks to enter. In regards to wildlife viewing, endangered species such as the *honu* (sea turtle) and *'īlioholoikauaua* (seal) are known to frequent the area. This is upheld in the transcripts for UNITE HERE v. City and County Of Honolulu (Hawai'i State Supreme Court 2010), which states:

> …Baker's report "summarize[d] all documented sightings of Hawaiian monk seals in the area of Turtle Bay resort, between Kawela Bay and Kahuku Point," as well as all monk seal births at or near the project site. Since the early 1980s, monk seal sightings at and around the project area were sporadic. Sightings were reported in 1984 and 1991. The record indicates no sightings between 1985 and 1989 nor between 1997 and 1999. In 2001, monk seal sightings at or around the project area began to increase, with three sightings in 2001 and 2002, six in 2003, nine in 2004, twenty-one in 2005 and fifty four in 2006. According to Baker's report, "[sixty-nine] of [the] 101 [documented] seal sightings [since 1984] are attributable to [eleven] known individual[seals]," "[f]ive of [which] are adult females who are documented to have given birth and nursed their pups on remote beaches on Kaua'i, Moloka'i, Hawai'i, Ni'ihau, Rabbit Island, and O'ahu." As of this report:

> [a] single birth has been recorded in [the project] area. A pup was born on Kaihalulu Beach, on the Kahuku side of the resort, on June 1, 2006, and the mother and nursing pup are currently in the area as of July 3, 2006, along the beach or in nearshore waters. The nursing period generally lasts [five to seven] weeks. Although not in the immediate area of interest, a second birth was documented at nearby Waiale'e Beach Park on March 15, 1991.
>
> The plaintiffs also referenced three water quality reports administered by Kuilima in 1989 that summarized observations of green sea turtles over periods of five days during daylight hours only. These reports indicated that, in July 1989, no more than three turtles were observed simultaneously in one time interval. The October 1989 report estimated a maximum of nine turtles in the bay during morning hours. In December 1989, there was an average of about ten turtles in the bay during early morning hours and three or four turtles in the bay during the mid-day and afternoon hours (Hawai'i State Supreme Court 2010:i).

While viewing these endangered species has become a popular activity for tourist as well as locals, these animals have, in the past, cultural significance to Native Hawaiians as a food source and in the case of *honu*, an *aumākua* for some families and individuals as well as a source material for a variety of traditional tools (Maly and Maly 2003; Kittinger et al. 2011).

Terrestrial Activities

Turtle Bay Resort offers several recreational activities on land for its patrons, including horseback riding, biking, segway riding, jogging, walking for recreation and fitness, tennis, hiking, and golfing. Weddings and memorials often take place on the property as well. In addition, film makers from near and far have used the property for films, television shows, and commercials.

6.0 COMMUNITY CONSULTATIONS

The purpose for oral interviews is to acquire information from *kūpuna* and local knowledgeable individuals about the background and contemporary cultural use, if any, of the subject property that could be adversely affected by the proposed Turtle Bay Expansion project.

Concerted attempts were made to identify and locate persons knowledgeable about traditional practices that took place in the past or that are currently taking place in the Turtle Bay area and potentially impacted by the expansion project. In addition to prior CIA reports written about the Kahuku area (Collins and Nees 2006; Hammatt 2008), the State Office of Environmental Quality Control (OEQC) and Office of Hawaiian Affairs (OHA) were consulted for a listing of Cultural Assessment Providers. Various Neighborhood Boards, civic clubs, and other North Shore community associations were also contacted to obtain cultural informants. Appendix C provides a listing of potential cultural informants and their detailed contact history. Of the 68 individuals recommended by others informants or identified through research as potential cultural informants, contact information was found for 52 individuals, all of which were solicited for participation. While no response was received from 15 of those asked to participate, 37 individuals responded and 16 interviews were secured. Many of those who responded to interview requests did not wish to be interviewed, but recommended other, more knowledgeable individuals or community groups to interview. One cultural informant, Cathleen Piʻilani Mattoon, wrote a letter on behalf of the Koʻolau Loa Hawaiian Civic Club outlining the organization's concerns with the development rather than opting to participate in an interview (Appendix F).

A total of 16 interviews were conducted between 4 May and 11 April 2012. All interviewees had a personal association with the Turtle Bay Resort area, most of which were repeatedly recommended by various sources in the community. Most informants are active in the local community and well respected for their leadership and knowledge of the project area and its history. Table 5 provides a list of the consulted parties, their association with the Turtle Bay Resort project area, and form of interview.

During the typical interview, a basic questionnaire (Appendix D) was used as a guide to solicit interviewees' knowledge of the area and biographical information. Maps of the Turtle Bay project area were used to further assist the interview process and gain specific information about locations of resources and/or cultural practices. After the interview, an interview summary was created. The interview summary was then shared with the interviewee for review, which allowed them the opportunity to correct, add, and/or delete information in their testimony. These interviews were occasionally supplemented with subsequent personal and telephone conversations with informants for clarification and additional information. When the interview summary met their approval, the interviewee was asked to sign an Oral History Release Form. Copies of release forms are provided in Appendix E. Summaries of the resulting interviews follow.

Table 5. List of Participating Cultural Informants

Name(s)/Title	Association	Form of Interview
Ralph Makaiau, Kupuna	Senior Project Manager of Turtle Bay Development; Native Hawaiian area descendent; Kahuku Burial Committee	Person-to-person, at Turtle Bay
Nova-Jean McKenzie, Kupuna	Kuleana land owner in Turtle Bay property; Native Hawaiian area descendent; Kumu of Hawaiian Studies, Retired	Person-to-person
John Colburn, Kupuna	Native Hawaiian area descendent; Kuleana land owner (east of Turtle Bay property)	Person-to-person, joint with Pua Colburn
Pua Colburn, Kupuna	Kahuku Burial Committee, member; Kuleana land owner (east of Turtle Bay property)	Person-to-person, joint with John Colburn
Junior Primacio, Kupuna	Fourth Generation Kahuku Village resident; Former plantation worker; Koʻolau Loa Neighborhood Board, Chair on Agriculture and Parks and Recreation Committees	Person-to-person, joint with Gladys Pualoa-Ahuna
Gladys Pualoa Ahuna, Kupuna	Seventh-generation resident of Lāʻie; Member of Koʻolau Loa Neighborhood Board	Person-to-person, joint with Junior Primacio
Carol Anamizu, Kahuna Lāʻau Lapaʻau	Former resident of Kuleana east of project area; collects traditional Hawaiian medicinal plants within the Turtle Bay property; Native Hawaiian cultural practitioner	Part I: Person-to-person, Part II: tour of traditionally used plants in TBR; Part III person-to-person
Butch Helemano, Kahu	Native Hawaiian area descendent and cultural practitioner; Master Hawaiian wood carver; collects plants and wood within the Turtle Bay property; Former resident of Turtle Bay	Person-to-person
Raymond "Buddy" Ako, Kupuna	Community Liaison for Turtle Bay Resort Development; Longtime employee of Turtle Bay Resort; Former resident of Kahuku; educated in Kahuku	Over-the-phone
Dawn Wasson, Kupuna	Educator of Hawaiian traditional practices; collects medicinal plants within the Turtle Bay property; Former resident of Kahuku	Person-to-person
Robert Nakata, Reverend, Kupuna	Former Hawaiʻi State Senator; member of Koʻolau Loa Neighborhood Board and other civic associations	Person-to-person
Mark Kahuokapono Manley	Commercial Fisherman; Native Hawaiian Cultural practitioner; Long-term resident of Kawela Bay; combines modern and traditional fishing methods	Person-to-person
Wayne Gemeno	Fisherman; fishes on Turtle Bay coast regularly for 50+ years; Plantation descendent	Person-to-person, at Turtle Bay
Kylie Matsuda	Managing Director, Kahuku Farms; Inc. Fourth generation at Kahuku Farms; plantation descendent	Person-to-person, withdrawn
Josanda Napeahi	Recreation and Security Officer at Turtle Bay Resort, eleven years; Native Hawaiian cultural informant	Person-to-person, at Turtle Bay
Marshall Pawn	Recreation and Security Officer at Turtle Bay Resort, seven years; Lifelong resident of Hauʻula; cultural informant; plantation descendent	Person-to-person, at Turtle Bay

6.1 Kūpuna Testimony

In this Cultural Impact Assessment, a total of nine *kūpuna* were interviewed, some of which are also cultural practitioners who currently use cultural resources gathered from the Turtle Bay resort property. In this assessment, *kūpuna* refers to individuals who are respected as elders of the community.

6.1.1 Mr. Ralph Makaiau

Ralph Makaiau, the Senior Project Manager of Turtle Bay Development, was born and raised in Kahuku and has been active in numerous Kahuku community and cultural associations for many years, including the Kahuku Burial Committee. Mr. Makaiau was interviewed by Kimberly Mooney of Pacific Legacy on Friday afternoon, 6 May 2011, at the Turtle Bay Resort Development office conference room on the Turtle Bay Resort Grounds.

Born to Emma E. and Ralph K. Makaiau, Sr. in September of 1948 at Kahuku, Mr. Makaiau has solid genealogical ties to the Turtle Bay Resort project area. He is related to several of the families that occupy the remaining *kuleana* lands located within and adjacent to the resort property. Uncle Ralph is also a life-long resident of Kahuku as well as an employee of Turtle Bay Resort since the days that it was named Kuilima - outlasting numerous owners and visions of what the resort would be like upon its completion. Hence, Uncle Ralph has a deep, life-long understanding of the subject area.

Mr. Makaiau's understanding of the cultural significance of the property has largely been obtained through his own experiences, observations of his parents' cultural practices, stories from others Kahuku natives, and archival research. Uncle Ralph explained that his grandfather had received the word to learn western ways and was part of the missionary migration to Utah. As was the case with most of his grandfather's contemporaries, their ability to speak the Hawaiian language was suppressed and the passing down of Hawaiian traditions and stories was frowned upon as well. Consequently, much of Uncle Ralph's knowledge on Hawaiian traditions of the area is admittedly not handed down to him by his immediate family in oral tradition. Much of his knowledge of the subject area's cultural background has been obtained from historic records and testimonies housed in the Bishop Museum and in published materials. However, Uncle Ralph recalls that his parents were avid practitioners of Hawaiian traditions, regardless of their missionary upbringing in Iosepa, Utah. For them, it was a way of life – not stories.

Through his ancestral and personal connections to the land, Mr. Makaiau feels confident working at the Turtle Bay Resort and participating in discussions regarding the development of the resort. However, one particular childhood experience helped to substantiate his connection to the land, according to Uncle Ralph. He recalls when he was about ten years old going to Kahuku Point one night with his father. As they stood on the point, Uncle Ralph remembered his father swiftly covering his head and face with a cloth, telling him to stay still and to be quiet. Then, without warning, a horrendous wind overcame them. His father began to speak very loudly in Hawaiian; cursing

against the wind. Suddenly, the wind stopped, and everything was still. He said his father never told him what had happened or what he said, but he felt at peace with the land ever since. His feelings were that his father was able to communicate with the spirits of the land and his father told them that they were not going to leave the land. Uncle Ralph's commanding oration of the story brought me into his experience, making my own hairs 'stand on end'.

From his earliest memories of the land that is now owned by Turtle Bay Resort, Mr. Makaiau recalls that the Kawela Bay area was largely managed by the Kahuku Sugar Plantation. These fields were extensive and spread across the property from east to west and relatively near to the coast. He remembers visiting his aunt who resided at Kawela Bay in one of the homes rented by plantation workers. These homes no longer exist, being demolished in the early 1980s. Further to the east, towards the hotel, Uncle Ralph recalls the other plantation settlement, Camp #3, that was largely wiped out by the tsunami of 1946. Uncle Ralph indicated on a late historic aerial photograph of the project area the extent of the air strips of Kahuku field, which took up a significant amount of land area within the eastern portion of resort property. He did not recall any archaeological or ancient structures anywhere on the property. Further, he remembers much of the land being used for the cultivation of sugar and corn, but that these agricultural endeavors were never that profitable. Traditionally, Uncle Ralph interprets from the written history that the general area of Kahuku was mainly used by *ali'i* for recreation.

In regards to cultural resources occurring on the property, Mr. Makaiau, states that the coastal areas still provide local cultural practitioners, mostly fishermen, with traditional food resources. He maintains that the entire coastline has been frequented by those fishing for a wide variety of fish and shellfish using lure, net, spear, trap, and bait. He also knows of some who collect *pipipi (Nerites spp.*), '*opihi* (*Cellana spp.*), and *limu* (various edible seaweed). In the past, cultural practitioners had requested permission from him to gather *lau hala* (pandanus leaves), which are used in various crafts, such as *haku leis*, hats, mats, and baskets. Several general groups have requested permission to gather these leaves, including Hawaiian, Tongan, and Samoan cultural practitioners. However, he has not been asked for permission to gather the *lau hala* leaves for some time. While he reasons that unauthorized gathering of this cultural resource could still be going on, he suggests that the gathering activity may have diminished due to the inferior quality of the leaves. Another cultural resource that has historically been collected from the property is salt. Uncle Ralph stated that there are natural salt pans located just east of Kahuku Point. These salt pans provided *pa'akai* (salt) seasonally, which could be used for curing or seasoning foods as well as ceremonial purposes. He says he doesn't know if anyone is currently collecting salt from this location.

Uncle Ralph admits that multiple burials have been encountered on the property during resort related construction in the past. However, he does not know the exact locations where these burials were inadvertently discovered. Mr. Makaiau states that in the initial construction phases of the Kuilima Resort, when burials were inadvertently discovered, SHPD would come out to document and collect the human remains, subsequently

storing them in their offices in Honolulu. By the early 1980s, SHPD decided that the human remains needed to be reinterred at Kahuku. All of these collected human remains have been reinterred in a safe location near the property. Uncle Ralph is not privy to the location of any other burials within the property, but suspects that they may exist within original (primary) sand dunes along the coast.

Mr. Makaiau recalls several stories dealing with supernatural events occurring on the property that he heard from relatives and others who grew up in the area. He says that many people have seen a glowing orb or "fire ball" in marshy areas, which people interpret as an omen or being from the spirit world. Though he admitted to never have witnessed this phenomenon, he says it can be explained with science: the marsh could have developed gaseous conditions and the glowing "fire balls" are the gasses being released into the air. It is understandable, he acknowledged, for people to see it as a mystical event. Another common claim is that Night Marchers have been witnessed on the property. According to legend, Night Marchers are the ghosts of ancient warriors that march as if heading to battle. To this he states that he's never encountered them, but he suggests that contrary to Pukui et al. (1976:169) the *ahupuaʻa* and stream name, ʻŌʻio (bonefish), is wrong as it is not a location abundant with the species. Rather, he suggests that the spelling is ʻŌiʻō or ʻOiʻo, which is translated by Pukui and Elbert (1986) as, a "Procession of ghosts of a departed chief and his company. More commonly called *huakaʻi pō*."(Pukui and Elbert 1986:280). What Mr. Makaiau appears to imply is that the place name had at some point been corrupted and the area in which the *ahupuaʻa* and stream are located was associated with this supernatural phenomenon. Thus, the area on which the Turtle Bay Resort sits has and continues to be a place of mystery and myth.

Ultimately, Mr. Makaiau confirms that there is a long and rich cultural history for the area in which the Turtle Bay Resort is located. He also expressed that the coastlines of the Turtle Bay Resort are locations that many traditional cultural resources are currently utilized by cultural practitioners – mainly consisting of marine resources for consumption. He stated that the resort has incorporated public access to the coast in its current design and additional beach access areas in the new plans. In regards to cultural resources located inland, Mr. Makaiau was not aware of any traditional activities occurring at the present time, although in the past he had granted permission for people to gather *lau hala* for cultural practices. Uncle Ralph also acknowledges that there is the possibility that burials may still exist in the property, but indicated that they would likely be limited to the primary, or original sand dunes located near the coast. On the proposed expansion, Uncle Ralph feels that there is a desperate need to create local jobs for the community of Kahuku and sees that the Turtle Bay Resort expansion is one way to do so.

6.1.2 Mrs. Nova-Jean McKenzie

Kumu Nova-Jean McKenzie is heir to the last remaining *kuleana* parcels within the Turtle Bay Resort property. During most of her childhood, Mrs. McKenzie resided at her family's Kahuku home, until it was washed away by the tsunami of 1946. Though her family moved to ʻAiea/Pearl City after the tsunami, Kumu McKenzie regularly camped,

fished, and gathered marine resources on the *kuleana* – and continues to do so to this day. Mrs. McKenzie is a retired teacher of Hawaiian Studies from Pearl City High School and is a member of the Kahuku Burial Council. Kumu McKenzie was interviewed by Kimberly Mooney of Pacific Legacy at her Waianae home on 25 August 2011.

Nova-Jean Laulipookanahele "Laulipo" Reis McKenzie was born in ʻAiea, Oʻahu on 30 November 1938. At the age of one year old, her biological father died and, subsequently, Nova-Jean was *hānai* (given) to her *tutu* (grandmother), Harriet Fernandez, who at the time was recently widowed and alone. Nova-Jean was raised by her grandmother as an only child, not having much to do with her mother or siblings. Being brought up in relative isolation from the rest of the family gave her the opportunity to receive her grandmother's *moʻolelo* and *manaʻo* about the history of the land, her family, and ancient Hawaiian traditions. Further, her grandmother spoke to her mainly in Hawaiian, allowing her to retain a fluency in the language that is rare in her generation.

Kumu McKenzie recalls many details of the general area from her formative years at the family's *kuleana*, which she thinks came to her grandmother through ancestral lines going back to Kauihaiwali (also spelled Kauihaiwale) who was originally awarded the *kuleana*. Mrs. McKenzie holds that long before the resort, her *kuleana* was accessed by a foot trail and when her grandmother got her 1939 Plymouth, she had a dirt road put in. Her earliest recollection of the area around the *kuleana* was that it was all flat land with scant trees – very different than what it looks like today, covered with ironwoods and the golf course. She says that after the tidal wave of 1946, the *naupaka* was wiped out and all replaced with ironwood. The tidal wave also took out the family house on the *kuleana* land, which was never rebuilt. On lands around her family's *kuleana*, she recalls *loʻi* and thinks there must have been *ʻulu* prior to the tidal wave, but could not remember exactly where. According to Kumu McKenzie, Kahuku was nearly all agricultural land throughout her childhood, aside from the lands being used by the military.

Before, during, and after World War II, military lands near Kahuku Point were used for a variety of purposes. In wartime, the lengthy airstrip was actively used for take-offs and landings of military planes. Further, the military base at Kahuku in wartime was a bustling center of activities, with many structures, tents, roads, and equipment. Kumu McKenzie remembers her grandmother making coffee for the troops and, in return, they would give her some of their rations such as ham, peaches, and pears in army green cans. After the war, the military dismantled much of its infrastructure and left the rest to the elements. Soon, small habitation shacks were erected on leased land by fishermen along the old airstrip. Years later, the airstrip was used for drag racing by non-military personnel. Before the resort was built, the family *kuleana* was accessed by taking Marconi Road and then driving down the airstrip, which led to her driveway. She also remembers that the Army Corps of Engineers (ACE) had excavated a massive pit in the sand adjacent to the east of her property during wartime for a gun turret, which was never erected, and eventually abandoned the pit and large stockpile of sand after the

threat of invasion was long gone. While these features are not as prominent as they were in those days, with the pit being filled partially in with eroded sands of the mound, they are still notable features of the landscape near Kahuku Point.

Many marine resources were more abundant when Kumu McKenzie was young. There were numerous shacks, as she recalls, that fishermen lived in near her property, especially along the old military airstrip. While these fisher folk held leases, they were forced out eventually. She remembers having a Filipino boarder, named Entise, who was allowed to live in a shed on the property in turn for catching fish and lobster for her *tutu*. Her *tutu* would then cook these foods for the three of them. Mrs. McKenzie recollects a hole in the reef between Kahuku Point and her property that Entise would dive for the lobster. When she was young, a cove near her property had plenty of *pipipi* (*Nerita* spp.) and *ʻopihi* (*Cellana* spp.). However, now there are only a few secret locations near her property that these shellfish thrive, which will remain undisclosed in this assessment to prevent over-exploitation of these rare resources. Also in abundance during her childhood were several *limu* varieties that she recalls her grandmother eating a lot of. She says in general *limu* along her coastline is rare nowadays. However, Kumu McKenzie holds that the *papa* (reef) is where her family has always been able to gather *paʻakai* (salt). To collect *paʻakai* in this location, the weather and surf have to be perfect. The surf has to be high enough to produce enough *ʻehu kai* (sea spray) to settle into the numerous *puka* (holes) and there has to be enough sun to bake the salt pans, which evaporates the water quickly, leaving the salt. These natural salt pans have remained a consistent source for sea salt. To the best of her memory, no fishponds or modifications to the coast line have ever existed near her *kuleana*.

In regards to plant gathering for traditional use, Kumu McKenzie holds that *hinahina* (*Heliotropium anomalum*) was always plentiful in the dune areas. However, people would collect the plants by yanking them out by the roots, which ended up nearly destroying the entire colony of *hinahina*. Further, ATV traffic and trampling has also compromised the plants' survival. Typically, the plant is gathered for making a *lei poʻo* (head *lei*). The *hinahina* is also utilized for medicinal purposes, but the exact application of the plant is not known to Kumu McKenzie. As with the *pipipi* and *ʻopihi*, the location of the remaining *hinahina* shall remain undisclosed to help protect what is left. However, she is concerned about people discovering and exploiting the *hinahina* when Turtle Bay constructs one of its planned public parks that is to be built near this plant habitat. Kumu McKenzie was not taught *lāʻau lapaʻau*, but she does recall a homemade black salve or ointment stored in an unmarked tin that her grandmother rubbed on her open wounds, referred to as *palakana* by her grandmother; however, the ingredients were never divulged to her. In her recollection, the salve was smooth and black, as if it were wax based and contained charred plant material.

Kumu McKenzie remembers some of the fauna that was present in the general area of Turtle Bay lands. She recalled seeing *pueo* or owl (*Asio flammeus sandwichensis*) in the area and that they were left alone, as they were *ʻaumākua* (ancestral guardians) for many families from the area. Kumu McKenzie also calls to mind that *puaʻa* (pig) were hunted in the *mauna* (mountainous area), *mauka* of Kamehameha Highway. Though not a

traditional Hawaiian activity, some locals used to hunt pheasant, an introduced species, and large doves in the area that is now Turtle Bay Resort property in historic times. She recollects her uncle using a rifle to hunt the pheasant, which were used for food and for feathers. Pheasant were plentiful in her younger years, but are no longer found in the area.

Kumu McKenzie reminisced about Kawela Stream, which she referred to as a creek, that she frequented as a child to capture *ʻōpae* (shrimp). Her grandmother would stop by her Aunty Maka's bakery, located across the street from Kawela Bay, at five oʻclock in the morning on her monthly drive to Honolulu to collect her late husband's pension. On these mornings, her *tutu* always picked up a list of things that Aunty Maka needed from town, such as fish and *limu kohu* (*Asparagopsis taxiformis*). While her grandmother and Aunty Maka enjoyed their breakfast, which typically consisted of a Saloon Pilot cracker (also known as hard tack) that had been soaked in a bowl of hot coffee and topped with butter, young Laulipo would ask to go down to the creek next to the property to catch *ʻōpae* (shrimp). Kumu McKenzie recalls that the creek was full of *ʻōpae* and that she had good fun catching those shrimp with her little net. In those days, she remembers the area being less treed and more open; although low lying vegetation shaded the creek. Some years later, a relatively large house was built near this creek, which was eventually torn down, and she wondered if the creek was altered or destroyed with the construction or demolition of this house.

To Kumu McKenzie's best knowledge, there are a set of dunes located near Kahuku Point that are primary dunes and are known to contain human burials. During the years that Prudential had leased the land to an All Terrain Vehicle (ATV) track operation, the ATV's had disturbed the dunes to the point that burials were being exposed. Subsequently, the human remains were collected and the ATV operation was shut down. Before that incident, Kumu McKenzie, or Laulipo as she was called in those days, recalls that her *tutu* used to tease her about the burials. Her grandmother would tell her to visit the people that live by the dunes, to which a little Laulipo would reply, "there's nobody that lives there…" and her *tutu* would counter, "yes, they come out at night…they carry their *kukui hele pō* [lantern]…" Young Laulipo exclaimed, "*Tutu*, there's no house down there…" to which her grandmother would laugh and say, "but they are there at night…you go down there." Thus, it appears as though Kumu McKenzie's grandmother was aware of the burials in the dunes, before any were exposed. Further, her grandmother believed that the area was visited by Night Marchers, thought to be the ghosts of ancient warriors marching as if heading to battle.

Regarding ceremonial use of the land, Kumu McKenzie held that when it came to the ancient Hawaiian religion, her grandmother would always tell her that, "it was all in the past" and to "look forward". Her grandmother never wanted her to know the remaining *kāhuna*, and that the old religious beliefs were *pau* (finished). Thus, Kumu McKenzie admits that she knows little of that aspect of the old ways. While she has never felt a sense of foreboding or had any deep spiritual experience there, she acknowledges that some people have had those experiences in that area.

Today, Kumu McKenzie believes that people, mostly locals, access these coastal areas to collect shellfish, *limu*, and to fish from the Turtle Bay Resort area and from Marconi Road. Many of these fishermen still employ the use of throw nets. There are also local divers and pole fishermen who frequent the area. The tourists from the resort primarily enjoy walking along the coastline to get exercise, beach comb, and sightsee. She was also aware that some cultural practitioners frequent the area near her *kuleana* to collect plants for various cultural practices.

In regards to the proposed expansion, Kumu McKenzie is supportive of the project and sees it as progress that will happen eventually. Her only concern is that of her *kuleana* and access to her *kuleana*. For her, selling is not an option. That land is very dear to her and her family and wants only to be ensured that she will not be forced out and will always be able to get to the property by car. While she has managed to hold on to and make regular visits to her *kuleana*, her relationship with the resort in the past has been trying to say the least. According to Kumu McKenzie, former Turtle Bay Resort owners and administrations have made access, use, and maintenance of her *kuleana* land extremely difficult - likely to force her to relinquish ownership of her ancestral land. The less-than-neighborly conduct had escalated to a point where a former resort administrator told her she could only access her property by way of the ocean, which forced her to challenge the resort in court. The court ruled in favor of Kumu McKenzie, mandating that Turtle Bay grant her access to her property from Kamehameha Highway. Since this ruling, Mrs. McKenzie has not had any major problems with the resort and has a positive impression of the current administration's treatment of her and her property rights. She maintains that most of the people who are against the resort expansion forget that they too came to the area as *malihini* (foreigners or newcomers) and had built upon undeveloped lands, just as the resort plans to do. Now that these people are established in the area, they simply do not want anyone else to come.

6.1.3 Mr. and Mrs. John and Pua Colburn

Mr. and Mrs. Colburn have a very long history and deep family ties to Kahuku. They come highly recommended by many Kahuku residents as being knowledgeable on the history of the area as well as its cultural significance. The Colburns were interviewed on 14 June 2011, by Kimberly Mooney of Pacific Legacy at their *kuleana* residence, which was at one time part of the Kahuku Army Airfield and is located approximately 450 meters east of the Turtle Bay Resort property.

The Colburns raised, have lived, worked, played, and raised a family in the Marconi area of Kahuku. John Francis Colburn was born on Mauna Loa, Moloka'i, on 22 November 1930 to Mr. Appiani Colburn and Madeline Juanita Fernandez Colburn. During his childhood, Uncle John relocated with his family to O'ahu. Uncle John lived in many places on O'ahu, but spent much of his formative years in the Marconi area on the family *kuleana* land, which is one of the last remaining of 96 original *kuleana* properties in Kahuku that was passed down from his maternal grandfather. This property had at one time been obtained by the military for the airfield. Prior to the military base, James Campbell, the famed Irish entrepreneur, had been able to acquire most of the *kuleana* lands in Kahuku, save for the Fernandez family's and a few other

families' *kuleana* lands. Campbell then leased those lands to the military. However, after the tsunami of 1946, his mother was able to bargain with the military to regain possession of the land. Uncle John has had possession of the land ever since, currently occupying one of the old military barracks that had been converted into a cozy house and using old storage facilities for outbuildings. Puakehauokalani Colburn was born May of 1936 to Richard and Phyllis Saffery Nascimento in Honolulu, where she spent most of her life, but has spent the last 30 years of her life living in Kahuku. Aunty Pua is a retired professional from the transportation, travel, travel, and tourism industries as well as food service industries. Uncle John is a retired transportation and construction contractor. Aunty Pua currently serves on the Kahuku Burial Committee and has been a member since its inception.

Knowledge of the cultural landscape goes back to ancient times for the Colburns. They attested that Kahuku was known as the land of *hala* (*Pandanus odoratissimus*). According the Colburns, when a young man was to go into town in the pre- and early European Contact era, he was expected to wear a *lei pāhale* (hat lei) or *lei 'ā'ī* (neck lei) made of *lau hala* or *hala* seed. However, from his earliest recollections of the land over sixty years ago, Uncle John said that Kahuku was nearly void of *hala* due to military, plantation, and ranch related disturbances. The Colburns also asserted that there was once a *heiau* somewhere in the Marconi area, possibly *makai* of the Colburn residence that was likely bulldozed by the plantation or military before they had moved there. Aunty Pua and Uncle John were never able to relocate the *heiau*. However, they maintain that some unexplained mechanical failures had befallen mechanical equipment during the construction of the oyster farm near to where the *heiau* once stood, suggesting that the land on which the *heiau* once stood still possesses *mana* or supernatural power. Only after the area was blessed by a *kahu* would the machinery work.

According to the Colburns, the Marconi and Turtle Bay area was owned by three Hawaiian families, one of which was the Kainanui Family. By the time Uncle John was an adult, the matriarch of the family was Emily Kainanui Blanchard who passed away in the 1980s. At over a hundred years old, Ms. Blanchard still had all of her faculties and was able to elaborate on what the lands were like before the plantation. She recalled that on her property, which is where her heirs currently live, including the Ah Quin and Lopez families, her family had their own *lo'i* in their backyard that was fed by a natural spring. Ms. Blanchard also said that natural springs could be spotted in the area by the presence of bulrushes. She recalled how beautiful the area was before the military came in and bulldozed everything, including the native plants, *lo'i,* and archaeological sites.

Uncle John's first memories of the project area are of the early 1940s, during the war and when the plantation and ranch were still in operation. The Turtle Bay Resort area was largely agricultural lands, with all lands between the OR&L train tracks and Kamehameha Highway were planted in sugar cane. Lands *makai* of the train tracks were not planted in sugarcane, but were planted in *haole koa* for cattle feed. The Colburns recalled that women had to go out and collect the seed pods from the *haole koa* trees and Judge Rathburn would scatter them throughout the fields on horseback as a method of propagation. Also during the plantation era, the coastline was controlled by the

plantation. Unless you lived in a coastal camp or *kuleana* property, the coast was *kapu* to those who did not have permission from the plantation to gather food and fish.

In regards to cultural resources in and around the Turtle Bay Resort, the Colburns were aware of several plant resources that are actively being collected and those that were collected until recent times. Before the gall wasp had wiped out the entire stand of Turtle Bay Resort *wiliwili* trees (*Erythrina sandwicensis*), people were known to gather the colorful seeds of the *wiliwili* to make *lei*. While the Colburns are not aware of anyone gathering *lau hala* from the Turtle Bay property, they have been growing several varieties of *hala* on their property, but the red variety, *hala ʻula,* has particularly coveted leaves that the Colburns allow their niece to gather for cultural practices. Other plants that grow in the general area that are used for cultural practices are *hinahina* (*Argyroxiphium sandwicense*), *naupaka* (*Scaevola* spp.), and *ʻākulikuli kula* or wild portulaca (*Portulaca oleracea*). The flowers of *hinahina* are traditionally used for *lei* making and leaves are used for *lāʻau lapaʻau* (herbal medicine). The *niu* (*Cocos nucifera*) was also a valued cultural resource in the project area with its many uses. Aunty Pua informed me that one of the applications was to chew the coconut meat and spit its juices upon the water, which casts an oily sheen on the water to aid visibility while in fishing.

According to the Colburns, coastal resources in Turtle Bay and Marconi area have severely declined in the last decade. Although the turtle populations have recovered, they believe that the turtles are not in the best of health because of dwindling food sources and unclean waters. Further, the Colburns believe that the general biological balance of the coast has been disrupted, as some species, such as the turtle have gotten more protection than other marine fauna and flora. For instance, Aunty Pua states that *limu,* a very important part of the traditional Hawaiian diet, has become very rare along the Kahuku coast. Also, fish populations and coral have declined because people are not fishing with sustainable methods. Some fishermen use long nets that catch fish and other marine creatures indiscriminately. Other fishermen use harmful chemicals, also known as "juice" to stun or kill the fish for easier collection, but this method kills the entire ecological unit in the process and takes many years for reef to recover. Also, many people generally over fish the area, taking more than their fair share as well as taking adolescent fish and pregnant lobster. Traditionally, marine resources were taken to suit the immediate dietary needs of the family or community and efforts were made to ensure the health of the reefs and its inhabitants. In regards to other coastal activities, such as surfing or paddling, Aunty Pua maintained that the Turtle Bay Resort coast was never a popular surf spot, as the waters were much too rough for most of the year.

The Colburns are also members of the Kahuku Burial Committee, as Uncle John is one of the heirs to adjacent *kuleana* lands and is therefore recognized as a descendant of those whose remains could be encountered during project construction. It is important to the Colburns to find a peaceful and final resting place within the property and to provide the descendants access to pay respects to their ancestors.

Regarding the proposed Turtle Bay Resort expansion and its impacts on cultural resources, the Colburns do not see the proposed project negatively affecting their lands

or cultural practices that occur on their lands. They voiced support for the expansion and welcomed any jobs that might be generated by the development. Furthermore, the Colburns added that Turtle Bay Resort currently provides beach access as well as public parking on the property.

6.1.4 Mr. Junior Primacio and Mrs. Gladys Pualoa-Ahuna

Mr. Primacio and Mrs. Pualoa-Ahuna were interviewed together at Tita's Place Restaurant in Kahuku on 22 June 2011.

John "Junior" Primacio was born in January of 1932 to Mr. and Mrs. John Primacio of Kahuku and is a fourth-generation resident of Kahuku Village. Now retired, Uncle Junior worked on the sugar plantation, served for some time in the U.S. military in Vietnam, and later took the position of General Manager with the Kahuku Housing Corporation. Mr. Primacio has given over 40 years of public service in the Koʻolau Loa District, dealing with land and resource management, community affairs, workers rights, and planning. He has served on the Koʻolau Loa Neighborhood Board as Chairman of the Committee on Agriculture as well as the Committee on Parks and Recreation. He was also a Unit Chairman for the International Longshore and Warehouse Union.

Gladys Kualei Puakalehua Pualoa-Ahuna, a seventh-generation resident of Lāʻie, was born to Mr. Peter McRae Enos and Mrs. Sophia Nainoa Keʻa on January 24, 1929. Aunty Gladys is now retired, but served as post master for the United States Postal Service in Lāʻie and continues to be active in community service. She is a member of the Lāʻie Community Association, and Koʻolau Loa Neighborhood Board as well as the president and co-founder of the Lanihuli Hawaiian Civic Club in Lāʻie. She has conducted missionary work in New Zealand, the Cook Islands, and in Lāʻie at the Polynesian Cultural Center for the Church of Jesus Christ of LDS.

Uncle Junior has extensive knowledge of the Turtle Bay Resort project area, which stems from his life-long residency in Kahuku as well as his service on the Kuilima North Shore Strategy Planning Committee since the initial phases of the development. From his earliest recollections, prior to the development of the hotel, the land that the hotel is situated on was pasture lands with cattle and there was a small plantation camp for workers, referred to as Camp Three. Uncle Junior recalls about twenty small, single-family dwellings making up the camp. All homes had single-wall construction, running water, electricity, and cesspools. Most homes had gardens containing vegetables and fruits to supplement the families' diets.

While his home was not located in one of the plantation camps in the project area, he was very knowledgeable about early plantation life in Kahuku from the stories of his parents, grandparents, and fellow plantation workers. In general for the area, he maintains that by the turn of the century, most of the plantation workers had been in Kahuku long enough to be established in the community, but not to a degree that they were united. As the plantation recruited from many different countries with different cultures and languages, the workers tended to gravitate towards others with their

shared mother-tongue and culture. The pay of a plantation worker was also relatively meager, although they were provided a shelter and other necessities such as kerosene. Yet, many workers came from areas where these simple benefits were marked improvements from what was available to them in their homelands, so they were grateful for these things and made the best of their situation. Many families, including his, had many children and had to find alternative ways to ensure that their kids had enough to eat and/or save money to put them through college. When his father was not working at the plantation, he hunted and fished. His father would then trade what he caught with other plantation workers for vegetables. This is how his family and most others survived. Further, he said that the Hawaiians that used to live in the mountains would come down and also trade their goods, like mountain apples or meat, for fish.

Aunty Gladys also remembered what life was like for the plantation workers. She remembered how the Filipino families grew their own vegetables from their homeland, such as *talong* (a variety of eggplant), beans, and bitter melon. The Hawaiians would grow their own *kalo* (taro) and made their own *poi*. She recalls that many households would raise their own meat and dairy cows, slaughter their own pigs, raise their own chickens, and catch their own fish – and in those days they had a lot of fish.

In regards to current cultural resources located in and around the property, Aunty Gladys and Uncle Junior were not aware of the specific plants that are gathered in the area, but recommended Carol Anamizu as a known cultural practitioner who regularly visits the area to collect plants for *lāʻau lapaʻau*. Furthermore, both agree that an array of marine resources is available on the coast of Turtle Bay Resort, which has provided sustenance for the local community, as it has from time immemorial. The two also noted that many feel that these waters are not as plentiful with fish, shellfish, or *limu* as they were in the past. Uncle Junior and Aunty Gladys recommended I speak with Sam Ah Quin, Ahi Logan, and Buddy Ako regarding fishing and marine resource gathering on the coast of Turtle Bay Resort property.

Uncle Junior's aspirations for the development have always been to provide jobs for local people laid off by the plantations as well as their children and to stimulate the local economy. Both insist that these sentiments are echoed by many in the community who are too humble to speak up about it. Uncle Junior states that several factions in the community, such as the newer home owners of North Shore, and outside organizations, such as Keep the Country Country Organization, have been against the development since day one. However, he has some concerns about management of the *mauka* lands that have been slated for agricultural use. He hopes that when the Land Trust takes over the property, they will preserve it for agriculture and manage it responsibly.

Many of the same sentiments were supported by Aunty Gladys. She maintains that the people of Lāʻie, along with Hauʻula, have always been supportive of Kahuku – more than other nearby *ahupuaʻa* in the district. In fact, Lāʻie has had similar opposition against their proposed Lāʻie Hotel Redevelopment that Aunty Gladys supports for the same reason that she supports Turtle Bay's expansion – jobs. However, upon hearing from Uncle Junior that Turtle Bay was planning on significantly scaling back the number

of rooms, she expressed that she was glad to hear that they were doing so and called it a "step in the right direction." She also added that Turtle Bay should add rental units to the proposed resort staff affordable housing for the younger workers who might not be in a position to buy a home.

6.1.5 Mrs. Carol Anamizu

Mrs. Carol Anamizu has been recommended by many cultural informants as a cultural practitioner who is highly knowledgeable on plants used for traditional Native Hawaiian healing (*lāʻau lapaʻau*) and still frequents the Kahuku area to collect medicinal plants as needed and when in season. Until a few years ago, she and her late husband worked and resided on a 17-acre *ti* farm near to the project area for over 30 years. She maintains her property in Kahuku. Mrs. Anamizu continues to give lectures on *lāʻau lapaʻau* at the Kahuku Public Library. Mrs. Anamizu was interviewed 6 September 2011. During the interview, Mrs. Anamizu proposed that she host a tour of the *lāʻau* plants at a later date. Mrs. Anamizu was able to conduct the tour on 8 March 2012 to show me Turtle Bay Resort's various *lāʻau*. Pictures of these *lāʻau* are provided in Appendix G. A final interview with Mrs. Anamizu was conducted on 11 April 2012.

While Mrs. Anamizu, or Aunty Carol, was born in 1952 on the Island of Molokaʻi to the Briones Family, she moved to Kahuku in the early 1980s with her late husband, Douglas, who was born and raised in the area. Together, the Anamizu's established Anamizu Farms, Inc., which specialized in plants used in traditional Hawaiian practices, focusing on *ti* and medicinal plants. Anamizu Farms, which is adjacent to the Turtle Bay Resort, also became a venue where the Anamizu's taught wayward teens of the area as well as students from Kahuku Elementary and Kamehameha Schools traditional farming methods and the many uses of these *laʻau*. The Anamizu's have hosted several conferences on the subject at their farm as well. Although Aunty Carol is no longer farming, she continues to practice *lāʻau lapaʻau* and lecture on the subject.

Aunty Carol's knowledge of *lāʻau lapaʻau* is extensive and was passed down from her grandmother to her mother; from her mother to her; and now from Aunty Carol to her daughter. She maintains that the tradition is based on ancient concepts, where the elements of earth and ocean need to be represented in the medicine and be balanced within the patient. Each medicinal formula is tailored to the patient, using ingredients representing the *ʻāina* and the *kai,* since she states, "…the beginning of sickness is on the land – the ending is in the ocean." According to Aunty Carol, *lāʻau* represents only 20% of the healing process and the remainder consists of prayer and divine forces. Aunty Carol carefully integrates *lāʻau lapaʻau* with Western methods, though she prefers to treat only those who are not taking pharmaceuticals with traditional Hawaiian medicines.

Aunty Carol uses a plethora of plants and trees in her *lāʻau lapaʻau*, many of which can be found in and around the Turtle Bay Resort property. According to Aunty Carol, the naturally occurring *lāʻau* that still can be found on the property coastline are beach *naupaka* (*Scaevola sericea*) and *hinahina* (*Heliotropium anomalum*). Beach *naupaka* is traditionally used in a directly applied poultice for broken bones. *Hinahina* has several applications. Medicinally, a tea is prepared with *hinahina* to flush the system. *Hinahina*

is also traditionally used in *lei* making. Several traditionally used plant species likely found on the property prior to the resort construction have been reintroduced to the property in the form of landscaping, such as *hau* (*Hibiscus tiliaceus*), *niu* (*Cocos nucifera*), *kou* (*Cordia subcordata*), *hala (Pandanus odoratissimus*), and *lauwa'e* (*Phymatosorus scolopendria* or *Microsorium scolopendria*). The *hau* has many uses, which is probably why it was brought to the islands by the first Hawaiians. According to Aunty Carol, the flowers were made into a tea to drink and the sap of the inner bark was applied directly to the birthing canal to aid in childbirth. The *niu* (coconut), brought to the islands as well, is a tree with scores of uses, including subsistence, construction, and craft. The wood of the *kou* tree, also introduced to the islands by humans, was traditionally used for woodcarving. The *hala* was also an important plant to Hawaiians, especially those of Kahuku, for various traditional crafts and other applications. The fern known as *lauwa'e* has several uses as well, including a tea mixed with *'alaea* (red dirt) for nausea and ornamentation/decoration.

Many of Aunty Carol's medicines come from the ocean and shoreline, most of which can be found on the coast of Turtle Bay Resort lands. She uses a variety of shellfish, fish bone, *limu,* and *pa'akai* as ingredients to cure her patients. The *pipipi* (*Nerita picea*), *kūpe'e* (*Nerita polita*), *wana* (sea urchin; Echinoidea spp.), and *'a'ama* crab (*Grapsus grapsus tenuicrustatus*) are shellfish used in various traditional medicines. For instance, the *'a'ama* crab is used as an organ cleanser for *kūpuna.* Also, *pipipi* and *kūpe'e* are boiled in water to make a broth in which the appropriate *lā'au* and/or *limu* is added. Dried fish bone and *wana* endoskeletons can be pulverized into powder that can be added to poultices for various ailments. According to Aunty Carol, powdered *wana* endoskeletons mixed with *pa'akai* and appropriate *lā'au* are used to remove skin tabs (acrochordons).

Obviously, the coastline of Turtle Bay Resort has been integral to maintaining the traditional diet with an array of subsistence marine resources. Aunty Carol holds that there are many fish species that the Turtle Bay Resort coasts are renowned for, especially the *moi* or threadfish (*Polydactylus sexfilis*), *pāpio* (juvenile Carangidae spp.), *manini* (*Acanthurus triostegus*), *kala* (Teuthidae spp.), and *weke* (Mullidae spp.). Aunty Carol knows of several local families that frequent the area to throw net for subsistence. According to Aunty Carol, shellfish species still collected on the coast for subsistence are the *pipipi*, *kūpe'e*, *'opihi* (Patellidae spp.), as well as various crabs, spiny lobster, and slipper lobster (Decapoda spp). *Limu* is yet another important element in the traditional Hawaiian diet. Aunty Carol maintains that several types of *limu* grow on the property coastline, including *limu kohu* (*Asparagopsis taxiformis*), *limu manauea* (*Gracilaria coronopifolia*), and *huluhulu waena* (*Grateloupia filicina*). She adds that most of these marine resources have become scarce since the resort has opened.

In general, the Turtle Bay Resort property and coastal waters have changed dramatically from the historic period to the present, according to Aunty Carol. She holds that there were vast *hala* groves above Kamehameha Highway before cattle was brought into the area, which ate and trampled the *hala*. This *hala* grove was a major source for *lau hala* (*hala* leaves) used for weaving traditional mats, baskets, blankets, pillow, and many

other crafts by people near and far. She also stated that the coast of the Turtle Bay Resort was once clean and contained many resources such as *lā'au*, *limu*, shellfish, fish, and *pa'akai* that were integral to the traditional diet, crafts, medicine, and ceremony. Today, she no longer gathers *lā'au* from TBR's coastline as she has reservations about possible pollutants from beach goers. She also disclosed that neither she, nor any of her close colleagues, collect *lā'au* on Turtle Bay's inland property due to the possibility of contamination, which makes it unsuitable for medical use or ingestion. However, according to Aunty Carol, the resort has incorporated many species of plants used in traditional cultural practices and she thinks it's possible that other practitioners collect *lā'au*.

Regarding the proposed Turtle Bay Resort expansion, Aunty Carol fears that the increased occupancy of the hotel will intensify the impacts on the environment, particularly the marine environment and ground water. She questions whether the resort will sufficiently address the increase in sewage produced by the hotel's expansion and if the sewage system fails, she fears that the effluent may make it into the ocean and destroy fragile the reef ecosystem. Aunty Carol is also concerned over the increase in beach goers and how they will impact the already dwindling numbers of fish and other marine resources. Another trepidation of hers is that farmers leasing the proposed agricultural park planned for Turtle Bay Resort lands, just *mauka* of Kamehameha Highway, may employ chemical pesticides, herbicides, and fungicides that could enter the ground water and the ocean via runoff. If the expansion is to proceed, Aunty Carol supports the notion of the resort dedicating space for an ethnobotanical garden and cultural education center to help preserve and protect traditional Hawaiian cultural practices, such as traditional farming and *lā'au lapa'au*. In addition, as Aunty Carol is on the Kahuku Burial Committee, she has concerns over further disturbance to *iwi kūpuna* during the construction process.

6.1.6 Mr. Butch Helemano

Mr. Butch Helemano is the official *Kahu* (minister and regent) for Waimea Valley, as appointed by the Office of Hawaiian Affairs (OHA). He is well known for his contributions to Native Hawaiian history and cultural preservation, in addition to being a celebrated *mea puolo* (musician), *mea kākau* (writer), and *kahuna kālai ki'i* (master woodcarver) of traditional and contemporary Hawaiian designs. Further, Kahu Helemano envisioned and established the public non-profit *Ka Aha Hui Na'auao* (The Wisdom Organization) in 2006, which was designed to preserve and perpetuate ancient Hawaiian language and traditions, such as construction of dry stone and thatched structures, sacred image wood carving, as well as manufacture of weapons, tools, and fishing implements out of stone and wood. Kahu Butch Helemano was interviewed on 28 August 2011 at the site of his weekly traditional Hawaiian wood carving class in Waimea Valley.

Butch Kauihimalaihi Helemano was born September of 1950 in Honolulu and primarily raised in Kalihi. His ancestry is predominantly Hawaiian with familial ties to Hau'ula, Kahuku, Lā'ie, and Waimea. While Kahu Helemano now lives in Mililani, he has spent over 35 years living and working in the North Shore area, with 18 years of residency at

Turtle Bay. His children were raised in Turtle Bay and educated in the North Shore and his wife currently teaches at Sunset Elementary. He also has family who hold prominent positions at the Turtle Bay Resort hotel. Mr. Helemano himself maintains strong ties to the area as the manager of Dillingham Airfield, Kahu of Waimea Valley, and as a registered minister proceeding over ceremonies island-wide, but largely on the North Shore. Furthermore, Kahu Helemano has a long list of mentors and informants who are predominantly *kūpuna* from the North Shore.

Having strong ancestral ties to Kahuku and adjacent *ahupua'a* as well as 18 years of residency at Turtle Bay, Kahu Helemano has an intimate knowledge of the Turtle Bay property and its cultural significance. In his youth, he often visited family in Kahuku and spent a lot of time fishing and riding his horse on the property's beaches and surfing its waters. From his earliest recollection, the land was much more rural.

When asked about the history and mythology pertaining to Turtle Bay, Kahu Helemano prefaced the sharing of *mo'olelo* (stories) of the area with his *mana'o* (belief/thoughts) that there is a misconception by outsiders that traditional Hawaiian *mo'olelo* are comprised of concepts, chronicles, and characters that only had cultural significance in the distant past. However, these stories are a major component of the living culture and are part of the framework that binds other elements of traditional Hawaiian culture. Thus, these stories are meant to be told and received in a current tense with the function of upholding cultural beliefs and practices.

Kahu Helemano maintains that there are many traditional stories and cultural features associated with this area. For example, he mentions the place name, Kuilima, which literally translates to the "joining of hands." He holds that this name is not only a reference to locals customarily walking hand-in-hand in ancient times, but also a way in which people of Turtle Bay were identified by others - as a community that shared a lot of *lōkahi* and *aloha*. The latter concept is the lasting legacy that comes from the *mo'olelo* and is passed on to the younger generations of Turtle Bay that they are also bound together by the tradition of *kuilima*. Another important element of the area's cultural landscape is that the Kahuku coast, specifically Kawela Bay, was the traditional resting and recreational place of the *ali'i,* due largely to the many natural *pūnāwai* (fresh water springs) that exist in the area. Kahu Helemano adds that somewhere in this area was a *kahua pā'ani* (training ground) for the *lua* (a hand-to-hand fighting technique) fighters. The area was also traditionally recognized for its *pū hala*, or *hala* (*Pandanus odoratissimus*) groves. In addition, Kahu Helemano holds that the *mo'olelo* of the Night Marchers, or *huaka'i pō,* who are the spirits of ancient chiefs and warriors marching in ghostly procession, as if to battle, is the most prominent story of the area. He maintains that the procession occurs four nights during the *mahina* and the procession is performed by these spirits for a particular reason. As the spirit marchers are manifestations of Kahu Helemano's ancestors, they are highly revered. Many terrible accidents have occurred in the Turtle Bay vicinity due to the development's disruption of the pathway used by the Night Marchers, according to the *kahuna pule*.

The traditional significance of the area, according to Kahu Helemano, was also the fecundity of its coasts and coastal waters. People from Kahuku depended heavily on fish for their diets. He holds that the area had many *ko'a* (fishing grounds) that belonged to chiefs and *konohiki* (guardian of the *ahupua'a*). One had to obtain permission from the chiefs or *konohiki* to fish in the *ko'a*. Some fish species that were abundant were the *kala* or unicorn/surgeon fish (Teuthidae spp.), *moi* or threadfish (*Polydactylus sexfilis*), *'ō'io* or bonefish (*Albula vulpes*), *'a'awa* or hogfish (*Bodianus bilunulatus*), *uhu* or parrot fish (Scaridae spp.), and the *'ula'ula* or red snapper (Lutjanidae spp.). Mollusks are represented by a variety of species, including the *he'e* or octopus (Octopodidae spp.) as well as shellfish such as *hā'uke'uke*, or shingle urchin (*Colobocentrotus atratus*), *wana* or typical sea urchin (Echinoidea spp.). In addition, crustaceans captured from the area are mainly *'ula*, spiny lobster (*Panulirus marginatus*) and *'a'ama* (*Grapsus grapsus tenuicrustatus*), and *lolo* or various sand crabs.

Kahu Helemano also maintains that there were many avian species in the area that were utilized by Hawaiians in the past. For example, wing bones of the *mōlī* or Laysan albatross (*Diomedia immutabilis*), once abundant along the entire coast, were used as *kākau* or tattooing needles. These birds, while graceful in flight, were an easy catch on land and were either killed by the blunt force of a staff or club, or by a thrown stone. Now these birds are federally protected and no longer used for cultural practices, such as tattooing.

According to Kahu Helemano, there also existed a variety of flora in the general Turtle Bay area used for traditional Hawaiian practices – some of which are utilized to this day. To his knowledge, *kou* (*Cordia subcordata*), typically planted around chiefly residences, were planted by his ancestors in the area. This wood is known for its workability as well as its durability in making an array of vessels such as cups, dishes, and calabashes. *Milo* (*Thespesia populnea*) could also be found in this area, for its use as a woodcarving medium. *Hau* (*Hibiscus tiliaceus*) was used to make outriggers for canoe because of its light weight and strength. Still used by woodcarvers in the area is the *kamani* (*Calophyllum inophyllum*), which is used to make bowls, at one time for the chiefs. Stands of *kamani* still exist near the stable area of the resort and Kawela Bay area. The *pū hala* (*Pandanus odoratissimus*), with its many uses and it representing the cultural identity of the people of Kahuku, would have been the most predominant tree in that area. Following in dominance would likely be the *niu* or coconut (*Cocos nucifera*) for its use as a staple food source as well as its many utilities. Plants that were mentioned were *naupaka* (*Scaevola* spp.), which is used for a variety of applications. The *pōhuehue* or beach morning glory (*Ipomoea pes-caprae brasiliensis*) and the *koali* or ivy-leaved morning glory *(Ipomoea indica)*, are medicinal plants that are also used for making cordage. These plants grow along the beaches of the project area, particularly on the eastern sandy beaches of Turtle Bay Resort. He adds that these plants and others used in Hawaiian traditional practices were abundant near the ranch, but they are nearly wiped out due to trampling from foot traffic and the fallen needles of the introduced ironwood trees, which have created an acidic mat that prevents native plants from reproducing. Kahu Helemano maintains that he and other cultural practitioners go to Turtle Bay area to collect these plants for ceremonies and crafts.

In regards to the Turtle Bay Resort expansion, Kahu Helemano shared his *mana'o* about several aspects of the development. A major concern of his is development for tourism in general, where he feels that the land and the Hawaiian culture are being desecrated. Places like Waikīkī, in its current state, are disheartening for him as a witness to the extremely fast and aggressive development projects as well as the acute exploitation of its natural resources and Hawaiian culture by the tourism industry. Kahu Helemano fears a second Waikīkī scenario in the North Shore. He notes, that this modern tragedy is further compounded by two conflicting principals, where a land owner's rights clash with the sentiments of the community. Yet, he feels that there must be a way that the two can come to compromise. The resort will inevitably expand, he holds. However, he hopes that the developers will find a way to expand in a way that the host community (i.e., Native Hawaiians) and the resort's neighbors will benefit or sustain little to no impact. Further, he would like to see some sincere effort by the resort to help perpetuate Native Hawaiian cultural practices. In regards to the bumper sticker, "Keep the Country Country" and other prominent slogans, the *kahu* holds that they are designed to keep the country pristine for rich property owners – not for Hawaiians. He is doubtful that most backers of this campaign would want most Native Hawaiians as neighbors. Therefore, he tends to distance himself from these groups. In summation, Kahu Helemano does not advocate for or against the resort's expansion, but feels that the resort should listen to the entire North Shore community – not just the rich.

6.1.7 Mr. Buddy Ako

Mr. Buddy Ako is currently the Community Liaison for Turtle Bay Resort Development and has spent most of his 73 years living, receiving an education, and working in Kahuku and Hau'ula. Mr. Ako participated in an over-the-phone interview on 1 February 2012 by Kimberly Mooney of Pacific Legacy.

Raymond "Buddy" A.H. Ako was born 7 July 1938 to James and Lei Ako in Honolulu. Until the age of eight years old, he was raised by his Chinese grandfather, Lau Ako, in Kāne'ohe, after which a young Buddy Ako moved from Kāne'ohe to Hau'ula to be raised by his mother and step-father. As Hau'ula was a relatively close community, Mr. Ako recalls learning about the natural world and Hawaiian traditions from several Hawaiian "uncles", including 'Aina Kamakee'aina, Joe A'alona, and Joseph Kalili. Although he lived in Hau'ula, Buddy attended Kahuku Elementary and High School from grades three to twelve. Between school and play, Mr. Ako spent most of his time in Kahuku, as the majority of his friends resided in Kahuku and he maintains that in those days there was much more for a kid to do in Kahuku than in Hau'ula. He fondly looks back on his many adventures in the mountains above Kahuku - hiking, picking feral pineapple from abandoned fields, swimming in reservoirs, and hunting doves and pheasant that he and his Kahuku friends would give to the Japanese farmers who tended small vegetable crops up *mauka*.

Although Mr. Ako did not spend too much time in the over 800 acres that are now owned by the Turtle Bay Resort, he remembers several locales within the property prior to the development. He recalled hanging out with a friend who lived at Kawela Bay, which was at that time a gated private community. In those days, local kids were not

allowed in that area without being with a resident. He also had a friend who lived in the Kahuku Plantation Camp #3, which is where the Turtle Bay Resort Hotel now sits. In his best recollection, Camp #3 was simply an outlying camp that was made up of a good number of families from an array of ethnic groups. However, many of these families lost their homes during the 1946 tidal wave, which also took the life of a young girl who lived in the camp. The homes lost in the tidal wave were never rebuilt by the plantation, yet a handful of Camp #3 homes remained on Kuilima Point until the mid-1960s. He recalls the camp vacated sometime before 1969 when the area was bulldozed and the hotel was erected. Despite the construction of the new hotel, most of the land at that time was still planted in sugarcane. Mr. Ako had another friend in his younger years that lived in one of the last Kahuku Ranch homes, which was located in an area that is now part of the golf course. Much of what are now Turtle Bay lands east of the hotel were part of the World War II Air Base and *kapu* to Mr. Ako in his youth.

While he admits he was never too interested in fishing in general, Mr. Ako holds that people did not traditionally fish in other people's *ahupua'a* . Technically being from Hau'ula, he was not indoctrinated in fishing practices or locations in Kahuku. From living in Kahuku for over 24 years and his many years at Turtle Bay, Mr. Ako was knowledgeable on several traditional practices occurring along the coast of the resort. For example, he maintains that people continue to throw net along the coast from Kawela Bay to Kahuku Point, to catch mullet, *kala*, and *manini*, but tend to favor the waters *makai* of the stables. He was also aware that people caught *moi*, using rod and reel between Kahuku Point and Kuilima Point. Popular areas for locals and non-locals to fish for *moi* are often riddled with tubes carved into the reef and rock, sometimes reinforced with PVC pipe, to secure the base of the fishing rod. Additionally, fishermen catch a variety of fish off the general coastline by spear-diving. Another cultural practice that is longstanding is the gathering of *limu kohu* at low-tide along the coast, but most common west of the stables and in Kuilima Cove. In regards to shellfish, such as *pipipi*, *'opihi*, and *wana*, Mr. Ako holds that he doesn't think people are gathering these traditional resources on the coast of Turtle Bay Resort due to past over-harvesting and inaccessibility.

Mr. Ako, as head of community relations for the Turtle Bay Resort, has a positive view of the proposed expansion project and feels it was a good decision by Replay Resorts to downsize the original proposed expansion. As a background, he was a part of the community when the plantation ended operations and experienced the tangible effects of the economic vacuum when the mill shut down. According to Mr. Ako, nearly all of the *kuleana* lands and private land holdings were bought out by the Campbell Estate and the community had become dependent on the plantation for jobs as well as housing. Tourism became one of the only viable options to keep the families together and in Kahuku. This option was reluctantly embraced by the community, favoring growth over continued poverty. Now, after 40 years of resort operations, he is still trying to help maintain a positive relationship between the resort and the community, which hinges largely upon the balance between economic prosperity for the resort and the community. Although Turtle Bay Resort has been under the control of several different organizations, some more concerned with the local community than others, Mr. Ako

feels as though the current developer is taking the project in a positive direction in terms of working with the community and developing responsibly.

6.1.8 Mrs. Dawn Wasson

Kupuna and Educator, Dawn Kahala Taotafa Wasson, has extensive knowledge of the Kahuku and Turtle Bay Resort area, having lived in and near to the locale for approximately 45 years. Aunty Dawn is also renowned as a cultural practitioner who collects plants for traditional Hawaiian use in the North Shore area, including the Turtle Bay Resort property. Ms. Wasson was interviewed by Kimberly Mooney of Pacific Legacy on Wednesday, 18 May 2011, at the Denny's restaurant in the Kāneʻohe Shopping Center. After several communications, the consultation with Ms. Wasson was concluded on 22 March 2012.

Aunty Dawn has a strong connection to the Turtle Bay Resort property, by means of personal experiences as well as having an extensive list of relatives, mentors, and informants associated with the area. She was born to the Keaweanahi family on 16 July 1944, in the town of Lāʻie, which is located ca. 5 miles south of the project area. In the early 1950s, she moved to the Kahuku area, where she remained for nearly 20 years. Ms. Wasson calls to mind many childhood memories of camping and fishing with her family in and around what is now the Turtle Bay Resort during weekends and school breaks. In 1972, Aunty Dawn became an employee of the Kuilima Resort Hotel, now known as the Turtle Bay Resort, staying with the hotel for two about years. In addition, Aunty Dawn regularly visits her relatives, the Ah Quin family, who has lived for many generations on lands just east of the Turtle Bay Resort property.

Ms. Wasson recalls that there were still plantation camps in the project area and that the land was largely agricultural during her childhood. However, she remembers an ancient wall near project area that may have been used as a boundary wall. In addition, she recalls the remnants of an ancient *heiau* east of the property that she holds was once a *luakini,* which is a type of *heiau* where human sacrifice occurred. While the *heiau* no longer stands, Aunty Dawn suggests that the hallowed ground has retained its *mana* and members of the community maintain a spiritual connection to the area. According to Aunty Dawn, the site of the hotel itself was once the location of an ancient *heiau*. She firmly believes that tragedy has befallen those responsible for the initial construction of the hotel, as spiritual retribution for desecrating the consecrated grounds. She stresses that the area is a *wahi pana* (place of legend) and therefore imbued with *mana*, which can manifest in the form of negative consequences for those who do not treat the land with respect.

Ms. Wasson imparted her deep knowledge of Hawaiian ethnobotany during the interview, being a practitioner of and an educator of traditional Hawaiian cultural practices. Aunty Dawn also shared that she gathers a variety of flora from the Turtle Bay area for an array of Hawaiian traditions including *lāʻau lapaʻau* (herbal healing), *nā mea hana lima* (handicrafts), and utilitarian applications. Typically, she collects *lāʻau* plants when they are in season and/or when a patient (*maʻi*) of hers is in need of a particular plant. Aunty Dawn divulged that many *lāʻau* plants are collected within the

project area, but was opposed to disclosing the exact locations of these plants over concerns that these fragile and rare plants might be over exploited. Ms. Wasson disclosed that numerous plants used for traditional crafts and utilitarian applications are currently gathered from the Turtle Bay Resort property, mostly near the coastline. Utilitarian plants mentioned were *pōhuehue* (*Ipomoea pes-caprae* subsp. *brasiliensis*), *naupaka* (*Scaevola* spp.*), niu* (*Cocos nucifera*), *hau* (*Hibiscus tiliaceus*), and *hala* (*Pandanus odoratissimus*). According to Aunty Dawn, the most common use for *pōhuehue,* which is a vine, is to string-up freshly caught fish and was also used to heal broken bones. She also holds that the vine is used to summon waves when whipped upon the ocean. Ms. Wasson explained that juice from the crushed leaves of *naupaka* is used for cleaning glasses, goggles, and snorkeling masks. The *niu* was not only valuable for its edible fruit; the entire palm provided a plethora of traditional Hawaiian uses. Of particular utility near the coast, the oil from *niu maloʻo* (mature coconut meat) could be spat onto the surface of the sea water to clearly see fish or other marine resources beneath the surface. The *hau* also had many uses, according to Aunty Dawn. The ancient Hawaiians used *hau* bark to fashion sandals that would not damage the coral reef as well as fire starter, rope material, *lāʻau lapaʻau*, and material to make clothing. The logs of *hau* trees were also used as *ʻama* (outriggers) of canoes and floating markers on the ocean surface to indicate fishing *kapu*. The *hala* had many uses as well. The leaves, or *lau hala*, were used to plait into mats, blankets, baskets, and hats. The fruits were used as brushes, *leis*, sustenance. The roots were used in *lāʻau lapaʻau (*medicine) and a powder from its flowers was valued as a male aphrodisiac.

In accordance with the other informants, Ms. Wasson attests that the coastline of Turtle Bay Resort property is an important locale for traditional Hawaiian cultural practices. The *kai* of this area has remained a source for a wide variety of staples in the Hawaiian diet. For countless generations, people have come to Turtle Bay to *laulele* (throw net), *paeaea* or *kūpali* (pole fish), and *pana iʻa* (spear fish) as well as launch boats and canoes to fish off shore. Aunty Dawn adds that great variety of fish, shellfish, and *limu* (seaweed) are found in these waters, including: *ʻanae holo* or *ʻamaʻama* (*Mugil cephalus*), *ʻōʻio* (*Albula vulpes*), *lai* (*Scomberoides* spp.), *hou* (*Thalasoma* spp.), *ʻāweoweo* (*Priacanthus* spp.), *kūmū* (*Parupeneus porphyreus*), *ula pāpapa* (*Scyllarides squammosus*), *heʻe (Octopus vulgaris*), and *wana* (*Echinoidea* spp.).

In regards to the project, Ms. Wasson feels that Turtle Bay Resorts should pay proper mind to natural resources, traditional Hawaiian culture, and other North Shore problems, such as traffic, before creating plans for development. She believes that Turtle Bay has already exhibited bad stewardship of the lands, as there have been noticeable declines in *mauka-makai* resources. Aunty Dawn is against development if it is not done responsibly. Additionally, while Aunty Dawn acknowledges existing beach access areas of the Turtle Bay Resort, she stated that the resort should add a boat access area with a corridor at least 20-30 feet wide.

6.1.9 Reverend Bob Nakata

Reverend Robert Nakata was born on April 2, 1941 in Honolulu. His formative years were spent in Kahaluʻu and Windward Oʻahu. Currently, Reverend Nakata is the

pastor of the United Methodist Church in Kahalu‘u, but has served as Hawai‘i State Senator and Chair of the Committee on Labor and Environment as well as a community activist for the poor, working, and indigenous people of Hawai‘i. He has been a member of several neighborhood boards and civic clubs in Ko‘olau Loa and Ko‘olau Poko Districts, including the Kahuku area. Reverend Nakata was interviewed by Kimberly Mooney of Pacific Legacy on Friday afternoon, 7 June 2011, at the United Methodist Church conference room in Kahalu‘u.

With his long history of public service and community activism in the North Shore area, Reverend Nakata is very familiar with the subject area. His memories reach back to the plantation era, where he recalls the project area to be rural with large scale sugar cane fields and irrigation ditches as well as families with household gardens growing a variety of fruits, vegetables, and chicken to supplement their diets. Fishing also played an active role in supplementing the local diet. He recalls that the narrow coastal plain was beautiful and had a relatively high rainfall. Flanking the coast were deep, heavily vegetated valleys.

Reverend Nakata also called to mind the history of politics and development in and around the subject area. The political debates in Ko‘olau Loa and Ko‘olau Poko Districts have often centered around the management or mismanagement of natural resources and infrastructure shared by the combined districts and, at times, shared with districts on the opposite side of the island. About 10 miles southeast of Turtle Bay, Reverend Nakata recalls an instance where the wells of Kahana and Punalu‘u Ahupua‘a were so heavily taxed, they became brackish, a result of fresh water being naturally replaced in the water table with ocean water, which was a direct effect of increased demands for water elsewhere on the island. This, he portends, may be a consequence of the resort’s expansion. A similar narrative, which ended on a positive note, was shared about the Waihe‘e Stream in Ko‘olau Poko, near Reverend Nakata’s childhood home. In this account, the Board of Water (BOW) performed tests on Waihe‘e Valley wells in the 1970s that effectively drained the water table to the extent that the Waihe‘e Stream ran dry, leaving his family’s *lo‘i* and other families’ *lo‘i* without a source for water. In retaliation, Reverend Nakata challenged the BOW in court and was able to get legislation passed to mandate that the BOW must leave 2.5 million gallons of water per day in Waihe‘e Stream at a specific measuring point along its length.

Another fear regarding the Turtle Bay Resort expansion is the destruction of archaeological resources and burials during resort construction activities. By doing independent research and utilizing the Freedom of Information Act, Reverend Nakata noticed discrepancies between archaeological recommendations for the project area and construction activities performed in 2005 while Turtle Bay Resort was under its previous ownership, Oak Tree Capital Management, LLC. His concern is that cultural resources such as archaeological sites and human burials may be damaged by the proposed development if they do not adhere to the mitigation plan. Reverend Nakata’s synopsis of Turtle Bay’s archaeological history is provided in Appendix F.

In regards to cultural resources, Reverend Nakata recalls that *ogo*, a specific type of edible seaweed or *limu* (*Gracilaria spp.*) has been collected from the shores of Turtle Bay Resort. However, he admitted that he was not the best person to comment on the presence or absence of cultural resources. Instead, Reverend Nakata referred me to Dawn Wasson and Didi Heron as better sources of information regarding cultural practices and resources occurring at Turtle Bay.

Reverend Nakata is a well known opponent to the expansion, especially regarding impacts to traffic, natural resources, and possible gambling that could accompany the expansion.

6.2 Cultural Practitioner and Informant Testimony

A total of two cultural practitioners and two cultural informants were interviewed for this assessment.

6.2.1 Mr. Mark Kahuokapono Manley

Mark Manley is a commercial fisherman of Native Hawaiian ancestry who was raised in the Kawela area of the North Shore. Mr. Manley was interviewed at his home near Kawela Bay on 17 June 2011 by Kimberly Mooney of Pacific Legacy, Inc.

Born in December of 1953 in Honolulu, Mr. Manley spent most of his formative years in Kawela and Kalihi. Currently, he operates a commercial fishing business on O‘ahu, frequently fishing off the coast of Turtle Bay Resort using a combination of traditional Hawaiian and contemporary fishing methods. He understands the unique subsurface topography of the coast, with its deep natural trenches, fresh water springs, shelves, and precipices that provide a variety of habitats for the diverse array of marine resources. He also knows the locations of local spawning grounds of various fish and takes care to *mālama* these important elements of the fragile ecosystem, one of which is Kawela Bay.

However, Mr. Manley has observed extreme changes to the coast and coastal waters of the Turtle Bay Resort property within the last decade. For instance, there is marked decrease of many fish, shellfish, and *limu* (various edible seaweeds) species, down to approximately five percent of the numbers seen 10 years ago. Further, he asserts that coral has been diminishing on the reefs around the resort. Another observation is that the coastal tides have been rising higher at Kahuku, especially at night.

Mr. Manley holds that he and others from Kahuku and outer areas employ a variety of traditional fishing methods to catch fish. Mr. Manley still fishes in the area by using a *ko‘a* (marked fishing area) 5-6 months out of the year (April-September), where his traps are relocated by triangulating with coastal markers, a method used by fishermen in Hawai‘i for time immemorial. A variety of fish and lobster are caught by using traps off the Turtle Bay Resort coast, including: *uhu*, parrot fish (Scaridae spp.); *ū‘ū*, menpachi or soldier fish (*Myripristis spp.*); *to‘au*, or blacktail snapper (*Lutjanus fulvus*); *palani*, a strong smelling surgeonfish (*Acanthurus dussumieri*); *manini,* or convict surgeonfish (*Acanthurus*

triostegus); *weke,* or goatfish (Mullidae spp.); *puhi*, various eels (Anguilliformes spp.); *'ula*, spiny lobster (*Panulirus marginatus*); and the *ula pāpapa*, or slipper lobster (*Arctides regalis*). All year round, he and other fishermen throw net, from shore and from boats, along the coast of Turtle Bay Resort's property. This method is used to catch many different types of fish, such as: *manini* (*Acanthurus triostegus*); *'ama'ama* and *'anae*, types of mullet (Mugilidae spp.); *palani* (*Acanthurus dussumieri*); *nenue*, representing the rudder and pilot fish (*Kyphosus bigibbus* and *K. vaigiensis*); *pāpio*, the young *ulua* or crevally (Carangidae spp.) – rarely caught by netting; *'ō'io*, ladyfish or bonefish (*Albula vulpes*); and *āholehole*, or flagtail (Kuhliidae spp.). Diving, with spear and/or net, is another traditional method of catching fish, which is performed six months out of the year (April-September) in waters off Kahuku. Many different species of fish as well as *he'e*, or octopus, could be caught in this manner. Others catch various crab by net and trap, such as *'a'ama* (*Grapsus grapsus tenuicrustatus*), *kuahonu,* also known as the *haole* crab (*Portunus sanguinolentus*), and *pāpa'i kualoa,* also known as the *kona* crab *(Ranina ranina).*

From his many years as a fisherman in the North Shore, he is also very knowledgeable on where fish and shellfish can be found off the coasts of Turtle Bay property. Fish species, such as the *moi,* or threadfish (*Polydactylus sexfilis*), can be found just north of the Turtle Bay Hotel and off of the tip of Kahuku Point. Another popular fish, the *manini* (*Acanthurus triostegus*), can be found on the north end of Turtle Bay. The *āholehole* (Kuhliidae spp.) is often found just east of Kahuku point.

Mr. Manley is also knowledgeable on various plants and trees that have utility in Hawaiian tradition. He holds that wood from *milo* trees (*Thespesia populnea*) has been gathered from the Kawela Bay area of Turtle Bay's property. Mr. Manley uses *milo* to carve hooks needed to remove eels from his traps. This wood is also traditionally used as a woodworking material, such as knives and calabashes. Gathered from the same area are *lauwa'e* fern (*Phymatosorus scolopendria* or *Microsorium scolopendria*), used for *luau* preparations and *naupaka* (*Scaevola* spp.*),* which has many traditional Hawaiian uses and can be found near Kahuku Point as well.

In regards to the proposed Turtle Bay expansion, Mr. Manley is against big expansion, but is for compromise. The only development that he supports would be if the expansion were to stay within the existing footprint of the hotel property. He feels as though the potential impacts to the ocean, water, and traffic need to be satisfactorily addressed before he can support the project. Mr. Manley is also very concerned about *iwi kūpuna,* or Hawaiian burials, being disturbed by the proposed development. He wants no added disruption of the *iwi kūpuna* whatsoever.

6.2.2 Mr. Wayne Gemeno

Sixty year old carpenter and avid fisherman, Wayne Gemeno, was born in Kāne'ohe and raised in Waialua/North Shore and currently resides near Waimea Bay. He has fished for sustenance, trade, gifting, recreation, and exercise off the coast of the Turtle Bay Resort since childhood – long before the resort was built. He is currently a member and prize-winning fisherman for the North Shore Pole Bendaz Casting Club and the Waialua

Casting Club. Mr. Gemeno was interviewed on 22 September 2011 in the main parking lot of the Turtle Bay Resort.

Mr. Gemeno has a long history of fishing at the Turtle Bay area. He recalls a time before the resort was built and all that existed in the area was the remains of the airfield and base. In his early fishing days there used to be a security gate fronting Kamehameha Highway and one would have to pay to park on the property before taking a trail to the beach. He also recalls that surfers also had to pay to park and hike into the property. In his recollection, people drove 4 x 4 vehicles through the property as well.

From his many years of fishing in these waters, Mr. Gemeno was able to name a wide variety of marine species that were once plentiful, but now are scarce. He holds that *mūhe'e* or squid (Loliginidae spp.), *'ula*, spiny lobster (*Panulirus marginatus*); and the *ula pāpapa*, or slipper lobster (*Arctides regalis*) were once very common in the area. Fish such as: *āholehole* or flagtail (Kuhliidae spp.), *ū'ū* menpachi or soldier fish (*Myripristis spp.*), *'āweoweo* (Priacanthus spp.), *kūmū* or goatfish (*Parupeneus porphyreus*), and *kala* also known as unicorn fish and surgeon fish (Teuthidae spp.) were also quite abundant in these waters. In addition, an array of *limu* (edible seaweed), including *limu manauea* or *ogo* (*Gracilaria* spp.), *limu waiwai'ole* or *limu wāwae'iole* (*Codium* spp.), and *limu 'opihi* (*Grateloupia* spp., *Polyopes* spp., and *Gymnogrongus* spp.) was readily available along the coast in the past, yet are all but absent today.

In regards to the Turtle Bay expansion, Mr. Gemeno would like Turtle Bay to add more beach access and perform some reef restoration. His major concern is about the health of these coastal ecosystems and the over harvesting of these waters. He maintains that there must be a moratorium placed on gill and purse netting, which he suspects is clandestinely happening in waters off of Kahuku at night. He also proposes that the Turtle Bay Resort sponsor and/or uphold some fishing and marine resource gathering regulations that will aid coastal ecosystems to replenish themselves.

6.2.3 Ms. Josanda Napeahi and Mr. Marshall Pawn

Ms. Napeahi and Mr. Pawn are currently employed by Turtle Bay Resort as recreation and security officers at Kuilima Cove. Mr. Pawn's family, who are of Filipino and Hawaiian descent, hails from Hau'ula and has been fishing off of the Kahuku coast for generations and has worked at Turtle Bay Resort for several years. Ms. Napeahi, of Hawaiian ancestry, was born on the Big Island and has lived in Kahuku and worked at the Turtle Bay Resort for over 11 years. A joint interview was performed by Kimberly Mooney of Pacific Legacy at the security/information kiosk at Kuilima Cove on 10 June 2011.

Both Ms. Napeahi and Mr. Pawn work full-time observing, protecting, and policing vacationers and locals as they utilize the coasts of Turtle Bay Resort for a variety of activities. Many of these activities are cultural practices, such as: fishing, marine resource gathering, surfing, paddling, kayaking, diving, snorkeling, and swimming. Most of the locals are recognized by Josanda and Marshall as descendants of plantation workers and/or local Hawaiian families who have relied on these waters for sustenance

for generations. These practitioners regularly disclose what they've caught or gathered and where the fish, mollusk, shellfish, and *limu* were acquired. Josanda and Marshall are also knowledgeable on a variety of methods used to obtain these marine resources, many of which are traditional Hawaiian methods. To their knowledge, these cultural practitioners take only what they need to feed themselves and their families. Thus, Mr. Pawn and Ms. Napeahi are very familiar with what types of marine resources are caught and gathered from the Turtle Bay area, how much is typically taken, where they were obtained, and the methods used to acquire them.

According to Marshall and Josanda, a wide variety of marine resources are regularly gathered from the coast of Turtle Bay Resort, with numerous distinct areas that are abundant with specific species. Beginning with the west side of Kuilima Point, *'opihi* or limpets (Patellidae spp.), and *hā'uke'uke*, or shingle urchin (*Colobocentrotus atratus*), are collected at and just below the waterline of the craggy, west-facing precipice of the point. On the east-facing precipice of Kuilima Point, *pipipi* (*Nerita picea*) are most abundant. In the area around Kahuku Point and Marconi Beach, *he'e* or octopus (Octopodidae spp.), *kuahonu*, also known as the *haole* crab (*Portunus sanguinolentus*), *'ula'ula* or spiny lobster (*Panulirus marginatus*); and the *ula pāpapa* or slipper lobster (*Arctides regalis*) are common. This area is also abundant in *'ū'ū*, menpachi or soldier fish (Myripristis spp.), *'āweoweo* (Priacanthus spp.), *weke* or goatfish (Mullidae spp.), *manini* (*Acanthurus triostegus*), *kala* also known as unicorn fish and surgeon fish (Teuthidae spp.), and *uhu* or parrot fish (Scaridae spp.). However, both added that nowadays marine resources have declined to about 20-30% of what could be seen in these waters just ten years ago. Fish and shellfish sizes have decreased as well.

Methods used to catch these marine resources are varied as well, according to the security guards. Traditional Hawaiian netting is popular in Turtle Bay and Kuilima Cove. Spear-fishing and diving occur during the day and night at Turtle Bay, Kuilima Cove, and off of Marconi Beach. On-shore pole fishing, using bait and lures, ensues in various areas at various times along the entire Turtle Bay Resort coast line.

Other cultural activities are common in the coastal waters of the resort property. Surfing is popular west of the Turtle Bay Hotel and north, northeast, and east of Kuilima Cove. In addition, paddling, kayaking, swimming, and snorkeling are regular activities around Kuilima Cove and Kawela Bay. In regards to the proposed resort expansion, neither Josanda nor Marshall offered opinions on subject.

6.3 Withdrawn Testimonies

While 16 interviews were performed, one of these interviews is not included in this draft report. Ms. Kylie Matsuda participated in both an interview and interview summary review, but subsequently withdrew her testimony from the public document.

6.4 Concurrent Community Consultations

The Hawai'i Supreme Court ruled in 2008 that Turtle Bay Resort (TBR) was required to supplement the Environmental Impact Statement (EIS) prepared by its predecessor to resume its development plans with up-to-date assessments, including a Cultural Impact Assessment (CIA), which was not a requirement under the law when the initial TBR EIS was accepted. However, the TBR Project Team recognized that a process of meaningful engagement and dialogue was necessary to re-establish trust and confidence with the broader North Shore community that TBR would *mālama* this land.

To address this issue, the TBR Project Team, under the guidance of the consultant group, Kuiwalu, has engaged in proactive community outreach, meeting with over 200 individuals and groups for the past two years to discuss concerns over potential impacts to the area's natural resources, cultural resources, and current lifestyle. Consulted Parties and Stakeholders consisted of the Kahuku Burial Committee, Ku'ilima North Shore Strategic Planning Committee, Ko'olauloa North Shore Alliance, as well as various Native Hawaiian organizations, elected officials, and government agencies. Kuiwalu used several approaches to reach out to the community, including conducting individual and small talk story interview sessions, hosted group meetings, attended traditional public meetings, created a cultural advisory council, consulted with the Kahuku Burial Committee, established the www.turtlebayseis.com website, and published notices in the Star Advertiser and the Office of Hawaiian Affairs newspaper, *Ka Wai Ola*. Appendix C provides a summary of these consultations as well as a complete table of the individuals and groups who were engaged in this outreach.

7.0 SUMMARY AND DISCUSSION

Guidelines provided by the Office of Environmental Quality Control (OEQC; Appendix A) outline acceptable methods to identify the types of cultural practices and beliefs that are subject to a Cultural Impact Assessment (CIA). To carry out the Turtle Bay Resort CIA, archival research was conducted followed by community consultations to identify cultural practices, cultural resources, and beliefs associated with SEIS Lands and surrounding areas. Cultural practices are typically customs relating to subsistence, commerce, residency, agriculture, recreation, religion, spirituality, and collection of cultural resources, which may be carried out by Hawaiian practitioners or practitioners from other ethnic groups. Further, cultural resources, such as natural features, archaeological sites, and collectable materials associated with these types of customs, as well as traditional cultural properties and historic sites were also subject to this CIA.

7.1 SUMMARY OF FINDINGS

Archival research has revealed that, in general, the SEIS Lands and surrounding areas have a long and interesting history. From the archaeological record, traditional stories and myths, and historic documents attributed to this vast area, it is evident that these lands have been the stage of many significant acts in the long drama of O‘ahu’s pre- and post-Contact history. Oral traditions and historical references to the specific area are ubiquitous as found in this and previous historic investigations (Silva 1984; Wong-Smith 1989). Similarly, the Turtle Bay Resort lands have been the subject of numerous archaeological investigations between 1977 and 2006, resulting in 21 individual reports. These archaeological investigations have documented 19 archaeological sites providing data from 291 auger tests excavations, 121 controlled excavations, 78 radiocarbon dates, 50 pollen samples, and substantial midden and artifact collections. The concordant Supplemental Archaeological Inventory Survey (SAIS) is likely to add a significant amount of data to the existing archaeological record for the project area.

Ethnographical evidence obtained through community consultations upholds the archival research findings that the Turtle Bay Resort property was abundant in cultural resources and lore, though much has changed throughout time. These community consultations also verified the existence of cultural practices, such as the gathering of various traditional marine and terrestrial resources. Out of the sixteen interviews performed, information from 15 interviews is represented in this report, omitting testimonial information from one individual. From the thirteen interviews a variety of cultural resources in the Turtle Bay Resort property were identified, including a total of 40 species of flora and fauna as well as *pa‘akai* (sea salt) (Figure 22; Tables 6 and 7). From the Turtle Bay Resort coastline and coastal waters, 32 marine species, including 17 species of fish, six crustacean, one mollusk, two gastropod, two sea urchin, and four sea weed species were identified. A total of six plant species and two tree species were identified as collected from inland areas of Turtle Bay Resort. These resources are

currently being gathered by an array of Hawaiian cultural practitioners for a variety of traditional activities, including *lā‘au lapa‘au* (herbal healing), *kālai ki‘i* (wood carving), *lei* making, cordage making, and consumption. While none of the informants claimed that any of these cultural resources were the last of their kind or this was the only place to collect them, the majority of those interviewed shared that these resources have drastically declined in their lifetimes and are now found in diminutive numbers. Further, the locations of many resources are guarded secrets according to many informants who fear over-harvesting to the point of extinction.

Table 6. List of Cultural Resources in Turtle Bay Resort Property

	Hawaiian Name	Common Name	Scientific Name
Marine Resources	*‘A‘awa*	Hawaiian hogfish, Table boss	*Bodianus bilunulatus*
	Āholehole	Hawaiian flagtail	*Kuhlia sandvicensis*
	‘Ama‘ama	Striped mullet	*Mugil cephalus*
	‘Anae	Mullet	Mugilidae spp
	‘Āweoweo	Bigeye, glasseye	Pricanthidae spp.
	Kala	Unicorn fish	Acanthuridae spp.
	Manini	Convict Tang	*Acanthurus triogus sandvicensis*
	Moi	Six-fingered threadfin	*Polydactylus sexfillis*
	Nunue	Sea chub, rudderfish	Kyphosus spp.
	‘Ō‘io	Bonefish	Albula spp.
	Palani	Eyestripe surgeonfish	*Acanthurus dussumieri*
	Weke	Goat fish	Mullidae spp.;
	Puhi	Moray eel	Gymnothorax spp.
	To‘au	Blacktail snapper	*Lutjanus fulvus*
	Uhu	Parrotfish	Scaridae spp.
	Ulua (juv. *Pāpio*)	Jack, Trevally	*Carangidae spp.*
	‘Ū‘ū	Soldierfish, menpachi	Myripristis spp.
	‘A‘ama	Natal lightfoot crab	*Grapsus grapsus tenuicrustatus*
	Kuahonu	*Haole* crab	*Portunus sanguinolentus*
	Lolo	Sand crab, Ghost crab	Ocipodidae spp.
	Pāpa‘i kualoa	Kona crab	*Ranina ranina*
	‘Ula‘ula (also *‘ula*)	Spiny lobster	*Panulirus marginatus*
	‘Ula pāpapa	Slipper lobster	*Arctides regalis*
	He‘e	Octopus and squid	Cephalapoda spp.
	Pipipi	Nerites	*Nerita picea*
	‘Opihi	Limpets	Patellidae spp.
	Wana	Sea urchin	Echinoidea spp.
	Hā‘uke‘uke	Shingle urchin	*Colobocentrotus atratus*
	Limu kohu	None	*Asparagopsis taxiformis*
	Limu manauea	*Ogo, ogonori (Japanese)*	Gracilaria spp.
	Limu waiwai‘ole	None	*Codium edule*
	Limu ‘opihi	None	*Grateloupia*, *Polyopes*, and *Gymnogrongus* spp

	Hawaiian Name	Common Name	Scientific Name
Terrestrial Resources	*Hala*	Pandanus, screw pine	*Pandanus tectorius, Pandanus odoratissimus*
	Hinahina	Native heliotrope, beach heliotrope	*Heliotropium anomalum*
	Koali	Morning-glory	Ipomoea spp.
	Lauwa'e	Creeping fern, maile-scented fern	*Phymatosorus scolopendria*
	Naupaka	Scaevolas, fan-flowers, half-flowers	*Scaevola* spp.
	Pōhuehue	Beach morning glory	*Ipomoea pes-caprae subsp. brasiliensis*
	Kamani	Beach mahogany, oil nut tree	*Calophyllum inophyllum*
	Milo	Portia Tree	*Thespesia populnea*

Adding to the cultural significance of the Turtle Bay Resort property is the existence of several other cultural connections of the Hawaiian community to these lands. As evidenced by previous archaeological investigations, inadvertent discoveries, as well as community consultations there are known human burials within the property, specifically in sand dune areas. Sensitivities regarding the *iwi kūpuna* are high, given the past disturbances. Obviously, for those with ancestral ties to the land, the *iwi kūpuna* represent and reinforce spiritual ties to the land. Several interviewees objected to any disturbance of *iwi kūpuna*. Also mentioned in several interviews were manifestations of ancestor spirits and supernatural phenomenon within the property. In the testimony of Ralph Makaiau, as a child he experienced a supernatural force on this property that seemed to challenge his very being and ties to the land, yet his father contested this force, successfully warding off or placating the conflicting force. This act solidified Mr. Makaiau's spiritual connection to his ancestral lands. Another example is the existence of "Night Marchers," which are widely held by locals to traverse through the property. Mr. Makaiau suggested that the very name of the *ahupua'a* "'Ōi'ō" or "'Oi'o", which translates as "Procession of ghosts of a departed chief and his company," refers to this path (Pukui and Elbert 1986:280). Kahu Butch Helemano maintains that these warrior spirits are the ancestors of his and others who have roots in this area. This is upheld by Aunty Dawn Wasson's account of the hotel being built in the location of an ancient *heiau* that was demolished prior to its construction. Aunty Dawn holds that harmful consequences of disturbing this site have already occurred and could transpire in the future.

In regards to cultural practices being performed in and around the Turtle Bay Resort property, other than the gathering of marine and terrestrial resources, no traditional activities were reported as occurring at the present. While surfing and paddling occur in waters around the project area, according to Kahu Helemano, Ms. Napeahi, and Mr. Pawn, none of the thirteen interviewees held this area as being a traditional or culturally significant surf spot. The lack of reference to this activity in the archival research upholds this idea as well. As Aunty Pua noted, the waters in this area are much too rough most of the year and there are better surf spots to the west. This was echoed by Kumu McKenzie during her interview.

In summary, the Turtle Bay Resort property contains an array of cultural resources that are currently being used for traditional cultural practices, including marine food sources, medicinal plants, plants used in crafts, wood for woodcarving, and salt for various uses. The presence of human burials on the property has also been established. Furthermore, supernatural and/or divine phenomenon in the project area experienced by a few informants and acknowledged by others, suggests that there is still cultural significance and spiritual connection for those who have ancestral ties to the land.

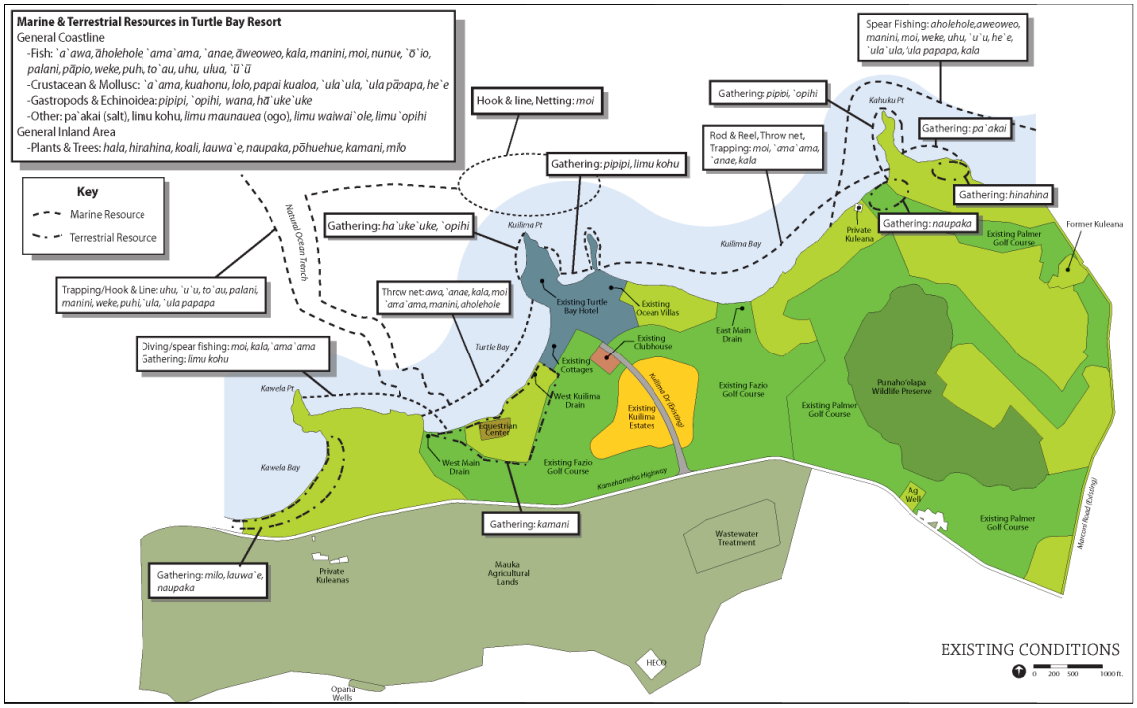

Figure 22. Existing Conditions Plan with cultural resource locations (adapted from Turtle Bay Resort SEISPN Figure 7).

Table 7. List of Informants with Cultural Resource Locations on TBR SEIS Land and Surrounding Vicinities

Cultural Informant/Title	TBR Affiliation	Past Resource Areas/Type	Present Resource/Activity Areas	Project Related Concerns
Ralph Makaiau, Senior Project Mgr. at TBR	Senior Project Manager of Turtle Bay Development; Native Hawaiian area descendent; Kahuku Burial Committee	**General coastal waters/reef:** Fishing (entire TBR coastline); recreation for *ali'i* **Dune Areas:** burial ground **Various locations:** *lau hala* gathering for crafts like *haku leis* (Hawaiians, Samoans, Tongans);	**Coastal waters/reef:** Fishing (entire TBR coastline); recreation **Dune Areas:** ancestor burials **East of Kahuku Point:** salt pans (seasonal and tidal) **Mauka of Kam. Hwy:** pig hunting (not in TBR)	Supports TBR
Nova-Jean McKenzie, Kupuna and Kumu	Kuleana land owner in Turtle Bay property; Native Hawaiian area descendent; Kumu of Hawaiian Studies, Retired	**Kauihaiwali Kuleana (now McKenzie) pre-tidal wave:** full time traditional Hawaiian residence, *lo'i*, breadfruit trees **General coastal waters/reef around TBR:** fishing and gathering (entire TBR coastline); lobster, various fish, *pipipi, 'opihi, limu, pa'akai* (salt) **Kawela Stream:** *'ōpae* (shrimp) **Mauka of Kam. Hwy:** pig hunting **Dune Areas:** burial ground	**McKenzie Kuleana post tidal wave:** camping, fishing, gathering marine resources (salt, limu, shellfish) **Coastal waters/reef:** her family and others - Fishing and gathering (entire TBR coastline); lobster, various fish, *pipipi, 'opihi, limu;* notes serious declines; preparation and harvesting of *pa'akai* (salt) **Dune areas:** ancestor burials; *hinahina* for medicine and *lei po'o* (head *lei*)	Supports TBR; Wants to maintain access to her kuleana
John and Pua Colburn, Kūpuna	Native Hawaiian area descendent; Kuleana land owner (east of Turtle Bay property)	**Unspecified Locations**: full time traditional Hawaiian residence, *lo'i* ,Pandanus *lau hala* or *hala* seed for *lei pāpale* (hat lei) or *lei 'ā'ī* (neck lei), *ākulikuli kula* aka *wild portulaca*	**Coastal waters/reef:** Fishing and gathering, various species; does not practice; notes serious declines **General area**: *hinahina, niu, kamani, milo, kou*	Supports TBR;
Junior Primacio, N.B Chairman; Chair Parks and Rec. Committee	Fourth Generation Kahuku Village resident; Former plantation worker; Ko'olau Loa Neighborhood Board, Chair on Agriculture and Parks and Rec. Committees	**Various Locations**: Plantation families growing supplemental vegetable gardens; Not aware of traditional resource areas	**Unspecified locations:** *lā'au lapa'au* collections **Coastal waters/reef:** Fishing, various species; does not practice	Supports TBR
Gladys Pualoa-Ahuna, Kupuna	Seventh-generation resident of Lā'ie; Member of Ko'olau Loa Neighborhood Board	**Various locations** (home sites): small scale *lo'i kalo* and *poi* making (family consumption); family raised pigs, cows, chickens for consumption; Plantation: family supplemental vegetable gardens	**Coastal areas** (entire TBR coastline): fishing and gathering, various species; does not practice	Supports TBR; rental units and affordable housing for resort staff

Cultural Informant/Title	TBR Affiliation	Past Resource Areas/Type	Present Resource/Activity Areas	Project Related Concerns
Carol Anamizu, Cultural Practitioner	Former resident and traditional plant farmer of lands east and *mauka* of project area (Punamanō); collects traditional Hawaiian medicinal plants near the Turtle Bay property; Native Hawaiian cultural practitioner	**Mauka Areas**: *lau hala* for local use and to sell	**Coastal areas** (entire TBR coastline above the high-tide line): beach *naupaka* still can be collected for medicine; *hinahina* can still be found (rare) for medicine and *lei* making; **Throughout TBR in landscaping:** *hau, niu, kou, hala*, and *lauwa'e* for an array of traditional uses (not used by Ms. Anamizu, but may be collected by other practitioners); **Coastal waters/beaches:** *pipipi, kūpe'e, wana, 'a'ama* crab; variety of fish and *limu* for medicine; *moi, papio, manini, kala, weke, pipipi, kūpe'e, 'opihi*, slipper lobster, spiny lobster, *limu kohu, limu maunawea, huluhulu waena* for sustenance	Has concerns about inadequate sewage management system; Concerned about additional disturbances to *iwi kūpuna* ; Supports responsible development
Butch Helemano, Kahu and Kumu; Cultural Practitioner	Native Hawaiian area descendent and cultural practitioner; Master Hawaiian wood carver; collects plants and wood within the Turtle Bay property; Former resident of Turtle Bay	**Dune Areas:** burial ground **Various locations:** *mōlī* (Laysan Albatross) for tattooing implement; *pū hala* for personal adornment; for wood carving = *kou, milo, hau, kamani; and niu* (various uses) **Near Ranch:** *naupaka, pōhuehue, koali* **Coastal Waters:** various species (interview summary) had to get permission from konohiki or chief **Unspecified area:** *kahua pā'ani* (training ground for *lua* or hand-to-hand fighting)	**Dune Areas:** iwi **Near stables:** he and others gather *kamani* for woodcarving **Eastern sandy beaches**: knows of *naupaka* for a variety of traditional applications; *koali* (ivy-leaved morning glory); *pōhuehue* (beach morning glory) for medicine and cordage **Coastal areas** (entire TBR coastline): available species: *kala, moi, 'ō'io, 'a'awa, uhu, 'ula'ula, lobster, ahamoi, lolo* crabs, *ukiuki, wana* for sustenance	Does not advocate for or against the resort's expansion, feels that the resort should listen to the entire North Shore community – not just the rich.
Raymond "Buddy Ako", Community Liaison at TBR	Community Liaison for Turtle Bay Resort Development; Longtime employee of Turtle Bay Resort; Former resident of Kahuku; educated in Kahuku	**Coastline waters/reef**: Fishing and gathering, various species (notes serious decline of *pipipi and 'opihi*) Not aware of specifics	**Coastal waters/reef:** Fishing (entire TBR coastline), various species; does not practice	Supports TBR
Dawn Wasson, Kupuna, Educator	Cultural Practitioner; collects medicinal plants within the Turtle Bay property; Former resident of Kahuku	**Entire TBR Lands**: Plantation agriculture and housing for workers **Kuilima Point**: site of ancient *heiau* **Coastal waters/reef**: Fishing and gathering, various species	**Undisclosed locations on TBR property**: *pōhuehue, naupaka, niu, hau*, and *hala* for an array of traditional practices, including medicinal use; **Coastline waters/reef:** Fishing (pole, throw-net, and spear) = *'anae holo/'ama'ama, 'ō'io, lai, hou, 'āweoweo, kūmū, ula pāpapa, he'e, wana*	Against irresponsible development
Robert Nakata, Reverend; Former State Senator;	Ko'olau Loa Neighborhood Board and other civic associations	**Dune Areas:** burial ground	**Coastal waters/reefs**: *Limu ogo*; does not practice	Archaeological sites and human burials

Cultural Informant/Title	TBR Affiliation	Past Resource Areas/Type	Present Resource/Activity Areas	Project Related Concerns
Mark K. Manley, Cultural Practitioner	Commercial Fisherman; Native Hawaiian Cultural practitioner; Long-term resident of Kawela Bay; combines modern and traditional fishing methods	**General Coastal and offshore waters/reef around TBR:** fishing in general	**General Coastal and offshore waters/reef around TBR:** throw net = *manini, 'ama'ama, 'anae, palani, nenue, pāpio, 'ō'io, āholehole, 'a'ama, kona, haole* crabs; trapping = *uhu, 'ū'ū, to'au, palani, manini, weke, puhi, 'ula, ula pāpapa, 'a'ama, kona and haole* crabs; diving = fish, *he'e* **Near Hotel and Kahuku Point:** *moi, āholehole, manini* and threadfish **Kawela Bay Area**: *milo* for woodworking **Kahuku Point:** *naupaka* and *lauwa'e* for a variety of traditional applications	Expansion outside of hotel footprint; potential impacts to the ocean, water, and traffic; *iwi kūpuna* disturbances
Wayne Gemeno, Cultural Practitioner	Fisherman; fishes on Turtle Bay coast regularly for 50+ years; Plantation descendent	**Coastal waters/reef:** Fishing and diving (entire TBR coastline); lobster, squid, *āholehole, menpachi or 'ū'ū, 'āweoweo, kūmū, uhu*, various *limu*	**Coastal waters/reef:** Fishing and diving (entire TBR coastline) = lobster, squid, *āholehole, menpachi or 'ū'ū, 'āweoweo, kūmū, uhu,* various *limu ;* notes serious declines	Health of coastal ecosystems; enforcement of fishing regulations
Josanda Napeahi, Cultural Informant	Managing Director, Kahuku Farms; Inc. Fourth generation at Kahuku Farms; plantation descendent	Not aware of specifics	**Coastal waters/reefs**: Mostly near Kuilima Point and Turtle Bay; diving = various reef fish, shingle urchin, *'opihi, pipipi* (to access under the overhangs) **Netting:** various school fish, milk fish, mullet **General Coastal and offshore waters:** surfing	No comment
Marshall Pawn, Cultural Informant	Recreation and Security Officer at Turtle Bay Resort, eleven years; Native Hawaiian cultural informant	Not aware of specifics	**Coastal waters/reefs**: Mostly near Kahuku Point and Marconi; diving (day/night) = slipper a spiny lobster, blue crab, *mū he'e* (octopus), *uhu* (parrot fish), other fish; pole and reel (day/night) = *'ū'ū or menpachi, 'āweoweo, weke, manini, kala, uhu* **General Coastal and offshore waters:** surfing	No comment

7.2 DISCUSSION

In total, 41 individual cultural resources were identified as currently being gathered from within the Turtle Bay Resort property and adjacent coastal waters, including 32 marine species of fish, shellfish, and seaweed as well as sea salt, six plant species, and two tree species. These resources are currently being gathered by an array of Hawaiian cultural practitioners for a variety of traditional activities, including *lāʻau lapaʻau* (herbal healing), *kālai kiʻi* (wood carving), *lei* making, cordage making, and consumption. None of the informants claimed that any of these cultural resources were the last of their kind or that this was the only area to collect them. However, the majority of those interviewed shared that these resources have drastically declined in their lifetimes and are now found in diminutive numbers. Further, many fear the over-harvesting of these resources to the point of extinction and keep the locations of these resources guarded secrets. Several informants fear that any expansion of the resort will impact the already resource deficient marine and terrestrial gathering areas.

There are five potential development plans as outlined in the Revised Turtle Bay SEISPN (Sichter 2012a), consisting of:

A) Reduced Density Plan (Proposed Action)
B) Full Build-Out Plan (Alternative)
C) Resort Residential Only Plan (Alternative)
D) Conservation Partner Plan (Alternative)
E) No Action (Alternative)

To address potential impacts to identified cultural resources in Turtle Bay Resort's SEIS Lands, surrounding lands, and coastal waters, the locations of identified cultural resources have been overlain on plan maps for the Reduced Density, Full Build-Out, Resort Residential Only, and Conservation Partner Plans (A-D; Figures 23 - 26). The preferred action and proposed alternatives will have unique impacts to these cultural resources. Impacts to cultural resources for each development scenario will be determined by the following three criteria:

1) Destruction of the resource
   a) Defined as the complete destruction of the area or eradication of identified cultural resource(s) caused by project related activities.

2) Limits access to the resource
   a) Defined as any project related environmental change that permanently limits the access to a cultural resource or activity area.

3) Compromises health of a cultural resource, area, and/or practitioner
   a) Defined as any threat to the physical condition of identified cultural resources, cultural resource area, and/or cultural practitioners caused by the proposed actions

Identification of impacts was only possible for cultural resources that informants had assigned provenience to during community consultations.

7.2.1 Marine and Terrestrial Resources

As previously mentioned, at this time 32 marine species were identified through community consultations as being caught or collected from the coastline and coastal waters off of the Turtle Bay Resort. In addition, there are six plant and two tree species that are currently being gathered on the premises (Tables 6 and 7; Figure 22). Each proposed action will be examined individually to identify impacts to marine resources. Figures 23 through 26 overlay the rough locations of cultural resources onto the individual set of plans for the preferred action and alternative actions A-D (Sichter 2011: Figures 8-11; Sichter 2012a). In addition, Table 8 summarizes the impacts.

In examining Turtle Bay Resort's five proposed development options, all but the No Action (Plan E) alternative option will have some impact to cultural resources identified on the property. The identified impacts for each development scenario are as follow:

<u>Plan A – Reduced Density (Proposed Action)</u>
The Reduced Density (Proposed Action), will likely impact a variety of marine resources, including *ʻaʻawa, ʻamaʻama, ʻanae, kala, moi, manini, āholehole,* and *limu kohu,* found in the near shore waters of Turtle and Kuilima Bays, which under this option will be flanked by several hotels, resort residences, and public parks. In addition, terrestrial resources such as *lauwaʻe, naupaka, kamani*, and *milo* found within the horse stable area and Kawela Bay area will be impacted by the planned hotels and resort residences (Table 9; Figure 23).

- Construction Impacts:
  - limited to terrestrial resources, such as *lauwaʻe, naupaka, kamani*, and *milo in the path of construction* will be likely be destroyed during construction activities (Criterion 1)
- Long Term/Operational Impacts:
  - near shore marine resources, such as *ʻaʻawa, ʻamaʻama, ʻanae, kala, moi, manini, āholehole,* and *limu kohu* may be impacted by increased beach and water users invading sensitive habitats (Criterion 3)
  - terrestrial resources, such as *lauwaʻe, naupaka, kamani*, and *milo,* not destroyed during the construction phase, the health of the remaining plants and may be compromised by increase in population density (e.g. trampling) resort landscaping (Criterion 3)

Plan B - Full Build-Out (Alternative)

Plan B, which is the Full Build-Out option will impact the greatest spectrum of marine resources. The effected marine species, include *ʻaʻawa, ʻamaʻama, ʻanae, kala, moi, manini, āholehole,* as well as *pipipi, ʻopihi, hāʻukeʻuke,* and *limu kohu,* which are typically found in or on coral reefs and near-shore waters (Table 9; Figure 24). The effected terrestrial species include *lauwaʻe, naupaka, kamani*, and *milo,* which are located in the horse stable, eastern Kuilima Bay, and Kawela Bay areas where several hotels are proposed.

- Construction Impacts:
  - Limited to terrestrial resources, such as *lauwaʻe, naupaka, kamani*, and *milo* in the path of construction, will likely be destroyed during the construction of the hotels (Criterion 1)
- Long Term/ Operational Impacts:
  - Coastal resources such as *ʻaʻawa, ʻamaʻama, ʻanae, kala, manini,* and *moi*, as well as *pipipi, ʻopihi, hāʻukeʻuke* will have limited access to them due to the buildup of hotels on the coastline (Criterion 2)
  - Near shore marine resources, such as *ʻaʻawa, ʻamaʻama, ʻanae, kala, manini,* and *moi*, as well as *pipipi, ʻopihi, hāʻukeʻuke,* and *limu kohu* may be impacted by increased beach and water users (Criterion 3)
  - Terrestrial resources, such as *lauwaʻe, naupaka, kamani*, and *milo,* not destroyed during the construction phase, the health of the remaining plants and may be compromised by increase in population density (e.g. trampling) resort landscaping (Criterion 3)

Plan C - Resort Residential Only (Alternative)

Plan C, which is the Resort Residential Only option, will impact numerous marine species, including *ʻaʻawa, ʻamaʻama, ʻanae, kala, moi, manini,* and *āholehole* along most of the coastline. Terrestrial resources, including *lauwaʻe, naupaka, kamani*, and *milo* located in the horse stable, eastern Kuilima Bay, and Kawela Bay areas where will be impacted by the planned residential units and Beach Club (Table 9; Figure 25).

- Construction Impacts:
  - Limited to terrestrial resources, such as *lauwaʻe, naupaka, kamani*, and *milo* in the path of construction, will probably be destroyed during the construction of the residential and commercial areas (Criterion 1)
- Long Term/Operational Impacts:
  - Marine resources such as *ʻaʻawa, ʻamaʻama, ʻanae, kala, manini,* and *moi*, as well as *pipipi, ʻopihi, hāʻuke'uke* will have limited access to them due to the buildup of residences and commercial areas on the coastline (Criterion 2)
  - Near shore marine species such as *ʻaʻawa, ʻamaʻama, ʻanae, kala, moi, manini,* and *āholehole* may be impacted by increased beach and water users (Criterion 3)

- Terrestrial resources, such as *lauwaʻe, naupaka, kamani*, and *milo,* not destroyed during the construction phase, the health of the remaining plants and may be compromised by increase in population density (e.g. trampling) resort landscaping (Criterion 3)

Plan D - Conservation Partner (Alternative)

Plan D, which is the Conservation Partner alternative will impact numerous marine species, such as *ʻaʻawa, ʻamaʻama, ʻanae, kala, manini,* and *moi*. Yet, the impacts appear to be less extensive than the previously mentioned plans as much less of the coastal areas will be developed with fewer units (Table 9; Figure 26). Only *kamani* found in and around the horse stables appears to be potentially impacted by proposed developments on this plan.

- Construction Impacts:
  - Limited to *kamani*, if in the path of construction, will probably be destroyed during the construction of the residential and commercial areas (Criterion 1)
- Long Term/Operational Impacts:
  - On a much smaller scale, marine resources such as *ʻaʻawa, ʻamaʻama, ʻanae, kala, manini,* and *moi* will have limited access to them due to the buildup of residences and hotels on the coastlines of Turtle Bay and west Kuilima Bay (Criterion 2)
  - Near shore marine species such as *ʻaʻawa, ʻamaʻama, ʻanae, kala, moi, manini,* and *āholehole* may be impacted by increased beach and water users, though on a smaller scale than the previously mentioned plans (Criterion 3)
  - The *kamani* trees not destroyed during the construction phase, the health of the remaining plants and may be compromised by increase in population density (e.g. trampling) resort landscaping (Criterion 3)

Plan E - No Action (Alternative)

Plan E, referred to as the No Action alternative, has no foreseen impacts (Table 9).

In summation, the most affected marine species are those that thrive on or near reefs as well as shallow sandy waters. The foreseen impacts are trampling or crowding of habitat by an increased number of beach-going vacationers and/or residents. As the high density hotels of the Full Build-Out option are proposed to front Kuilima Bay, Turtle Bay, and Kawela Bay, these marine resources may be impacted with increased direct human contact including: trampling, dragging gear, picking up/ molesting marine life, (Kerr et al. n.d.) and increase in sunscreen introduced into water, which has a negative effect on coral reef ecosystems (European Commission 2008; Danovaro et al. 2008; Kerr et al. n.d.). Thus, the health of the cultural resource habitat will likely be compromised (Criteria 3), which will decrease the health and subsequently the population of these resources. As for the terrestrial resources, the clearing of land and

construction of structures of any size will likely result in the destruction of these plants and trees.

7.2.2 Archaeological Resources

Numerous archaeological studies have been conducted in various areas within the TBR SEIS Lands and surrounding areas. From the sixteen archaeological investigations performed on SEIS Lands, a total of twenty-six traditional and historic sites have been documented including twenty-five human burials. According to Haun et al. (2011:39), "A search of the DLNR-SHPD archaeological report database and other sources identified 27 survey and excavation projects undertaken in the project area vicinity in the Koʻolauloa District from the Lands of Kaunala to the east and Mālaekahana to the west." In the concurrent SAIS (Haun 2012), adds numerous historic surface features, subsurface cultural deposits, as well as three human burials to the archaeological record. The inland portion of SEIS Lands are well documented as having been planted in sugar cane, the chance of encountering traditional archaeological sites in these lands is slight. However, coastal portions of SEIS Lands that have not been disturbed have the potential to contain archaeological deposits.

7.2.3 Iwi Kūpuna

The presence of *iwi kūpuna* in SEIS Lands and surrounding areas is already well established. Burials have been discovered in each *ahupuaʻa*, predominantly near to the coastline (Haun et al. 2011:68-71). In any ground disturbing event nearer to the coast, *iwi kūpuna* could potentially be impacted. As the inland portions of SEIS Lands are documented as former cane fields, the chance of encountering *iwi kūpuna* in these lands is less likely.

Currently, the Kahuku Burial Committee (KBC) has accepted the *kuleana* to *mālama i nā iwi kūpuna* in compliance with the burial laws.

7.2.4 Spiritual Connections to the Land

The general area has been the associated with many mythical legends and *moʻolelo,* giving it a significant place in the pre-Contact Native Hawaiian landscape and in the Native Hawaiian psyche. Thus, it is critical that Native Hawaiians and/or cultural practitioners continue to be involved in the protection and preservation of these valued cultural resources to ensure their spiritual connection to the land.

7.2.5 Contemporary Use of Land and Sea

A wide variety of contemporary and ancient versions of traditional activities as well as non-traditional activities have been identified as occurring on SEIS Lands and surrounding areas, many of which are not mutually exclusive. It is possible that marine and terrestrial activities will be impacted to varying degrees by the Proposed Action, Full Build-Out, Resort Residential Only, and Conservation Partner Plans in terms of access during and after construction (Criterion 2).

Table 8. Impact Table for Marine and Terrestrial Resources

	Species	Plan A	Plan B	Plan C	Plan D	Plan E
Marine Species	*ʻAʻawa*	3	2,3	2,3	2,3	
	Āholehole	3	2,3	2,3	2,3	
	ʻAmaʻama	3	2,3	2,3	2,3	
	ʻAnae	3	2,3	2,3	2,3	
	ʻĀweoweo					
	Kala	3	2,3	2,3	2,3	
	Manini	3	2,3	2,3	2,3	
	Moi	3	2,3	2,3	2,3	
	Nunue					
	ʻŌʻio					
	Palani					
	Weke					
	Puhi					
	Toʻau					
	Uhu					
	Ulua (juv. *Pāpio*)					
	ʻŪʻū					
	ʻAʻama					
	Kuahonu					
	Lolo					
	Pāpaʻi kualoa					
	ʻUlaʻula (also *ʻula*)					
	ʻUla pāpapa					
	Heʻe					
	Pipipi		3			
	ʻOpihi		3			
	Wana					
	Hāʻukeʻuke		3			
	Limu kohu	3	2,3			
	Limu maunawea					
	Limu wāwaeʻiole					
	Limu ʻopihi					
Terrestrial Species	*Hala*					
	Hinahina					
	Koali					
	Lauwaʻe	1	1,3	1,3		
	Naupaka	1	1,3	1,3		
	Pōhuehue					
	Kamani	1	1,3	1,3	1,3	
	Milo	1	1,3	1,3		

Key: 1 = Destruction of the resource; 2 = Limits access to the resource; 3 = Compromises health of the resource, area, and/or practitioner

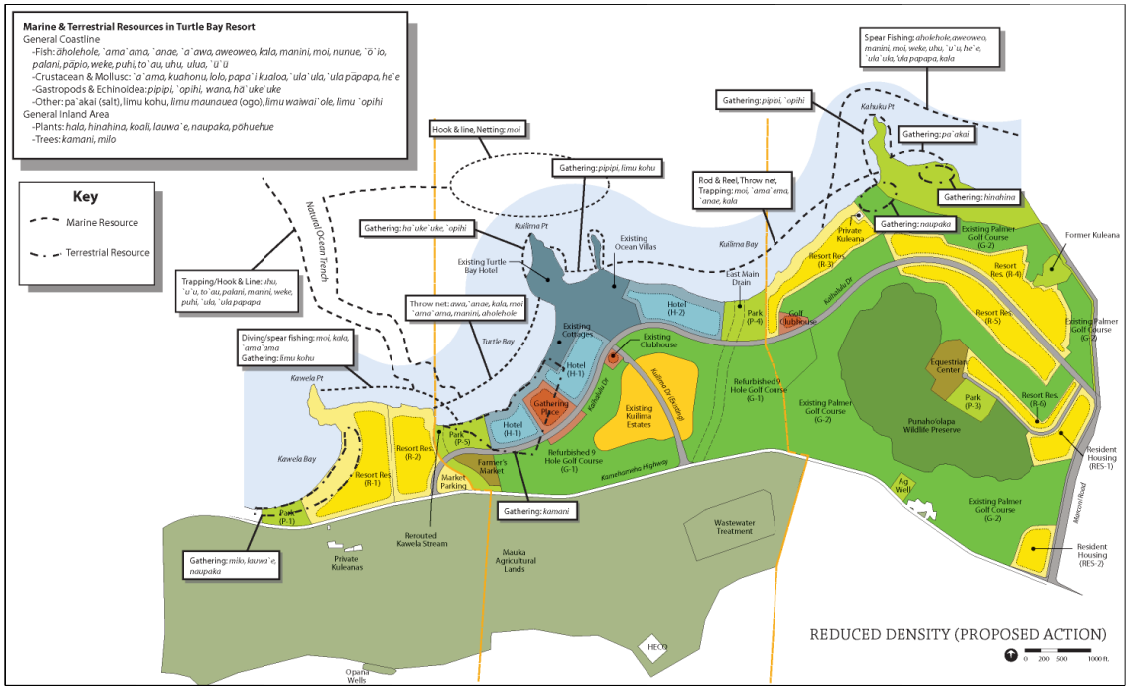

Figure 23. Plan A — Reduced Density Plan (Proposed Action) with cultural resource locations (adapted from Sichter 2011:Figure 8).

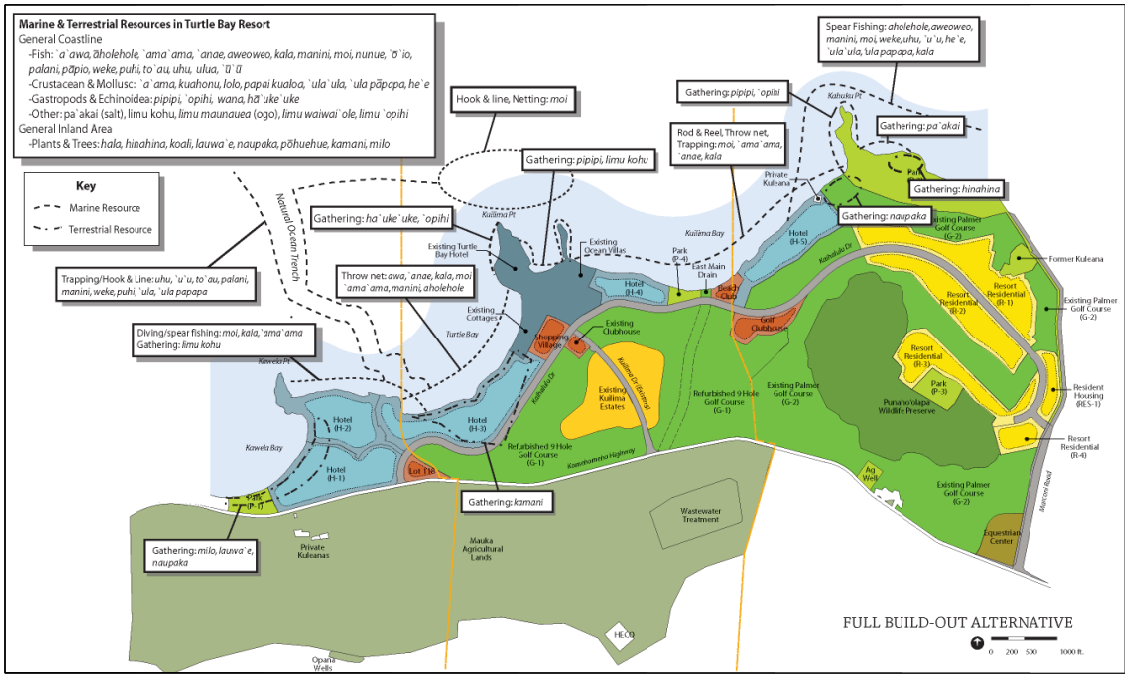

Figure 24. Plan B — Full Build-Out Plan (alternative action) with cultural resource locations (adapted from Sichter 2011:Figure 10).

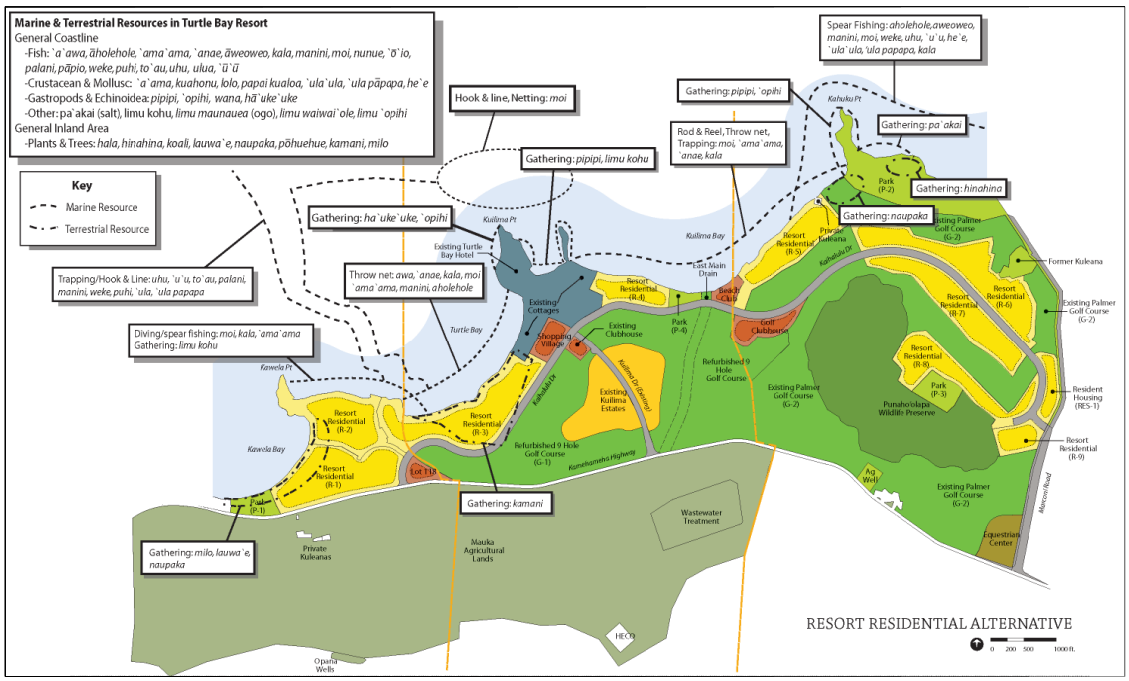

Figure 25. Plan C — Resort Residential Only Plan (alternative action) with cultural resource locations (adapted from Sichter 2011:Figure 11).

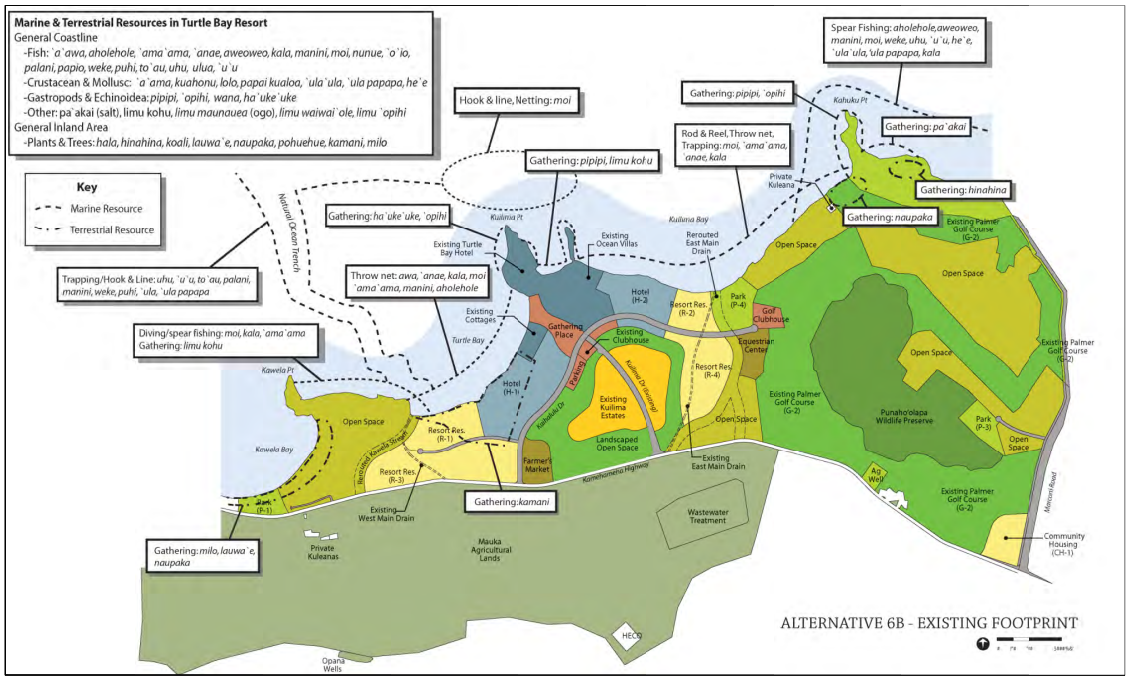

Figure 26. Plan D — Conservation Partner Plan (alternative action) with cultural resource locations (adapted from Sichter 2012).

8.0 RECOMMENDATIONS

Numerous cultural resources being utilized for cultural practices have been identified in and around TBR SEIS Lands and surrounding areas. It appears that many of these resources will be impacted should the resort choose the Proposed Action or any of the alternatives barring the No Action alternative. While none of these cultural resources are unique or restricted to TBR SEIS Lands or surrounding areas, the archival research and community consultations have suggested that this area and its resources are important to them. A number of the consulted parties do not wish to stop development or go back to a pre-Contact lifestyle, but do share a genuine concern for the land and sea, as well as a desire to ensure resources are available for present and future generations. Many want to hold on to their cultural heritage by continuing the practices of their ancestors and make sure that *iwi kūpuna* are treated with respect. Yet, there is a real need for economic stability for the younger and future generations to be able to stay in the area, which is essential to maintain familial and cultural bonds in the community.

It is acknowledged that TBR's Proposed Action intends to reduce density by approximately 60% from the density proposed in the original expansion project as formalized under the1985 Unilateral Agreement. The Proposed Action concentrates higher density development in *makai* Hanakaʻoe Ahupuaʻa, the resort's existing core, by constructing two new hotel sites and a new community Gathering Place near to the existing Turtle Bay Hotel. The originally proposed hotel sites in the *ahupuaʻa* of ʻŌpana-Kawela (to the west) and Kahuku (to the east) will be developed instead with lower density resort-residential units. Density at ʻŌpana-Kawela Ahupuaʻa will be reduced by over 75% of what is allowable under the existing zoning. Similarly, Kahuku Ahupuaʻa is planned for affordable community housing and resort-residential units with 65% less density than is allowed under existing entitlements. The result is the concentration of development in the central core of the SEIS Lands and the general preservation of a rural character to the east and west. Further, the Proposed Action provides for two hotel sites, rather than the five approved in the current land use entitlements and the number of hotel units is reduced from 2,500 to a range of 625 to 1,000. By implementing generous shoreline setbacks, this development concept achieves public access to the entire shoreline intended in the Unilateral Agreement and further enhances the pedestrian experience, affording unencumbered coastal access (Sichter 2012b).

8.1 Tomorrow's Ahupuaʻa and the Role of Konohiki

TBR has elected to incorporate traditional Hawaiian values and the framework of the *ahupuaʻa* system into the proposed expansion, with the concept of "Tomorrow's Ahupuaʻa". According to the Final SEISPN,

> *Tomorrow's Ahupuaʻa* studies the history of the *ahupuaʻa*, the successes and challenges, the elements found within each *ahupuaʻa*, and the needs and resources that are available. *Tomorrow's Ahupuaʻa* will honor the important aspects of the traditional *ahupuaʻa*: understanding and

> maintaining lands from *mauka* to *makai*; recognizing and stewarding the unique elements and resources of each *ahupuaʻa* in order to strive for self-sustenance; and creating a management framework inspired by the traditional *ahupuaʻa* to care for the lands, resources, people, and culture (Sichter 2011:6-13).

It is recommended that TBR consult with the ʻAha Kiole Advisory Committee (AKAC), consisting solely of Native Hawaiian traditions experts and cultural practitioners, which was formed in 2007 by the Hawaiʻi State Legislature through Act 212 to create natural and cultural resource management system recommendations that are based on Native Hawaiian traditional land and resource management systems to be integrated into the state's existing governmental organization. The AKAC (2010) describes the *ahupuaʻa* as a sub-unit of land under the *moku* (regional) land management system, termed as the ʻAha Moku System. The AKAC would be instrumental in ensuring that the proposed "Tomorrow's Ahapuaʻa" concept is harmonious with traditional values.

The role of *konohiki* also includes maintaining the balance of resources and prosperity throughout the *ahupuaʻa,* keeping harmony with neighboring *ahupuaʻa*, and *mālama* those who depend on the resort and its leadership. In addition, maintaining respect for the land and its *mana* is crucial in developing responsibly. It is, perhaps, the best way to show respect to your host culture and to set a good example for others. It is recommended that TBR be proactive in embracing the role of *konohiki,* by consulting with local cultural practitioners and *kūpuna* to identify the needs of the *kaiāulu* (local community) and present them with possible solutions to help balance resources and prosperity within Tomorrow's Ahupuaʻa. It is recommended that TBR implement a *mauka-makai* (upland to ocean) and inter-*ahupuaʻa* resource distribution system to make TBR's Tomorrow's Ahupuaʻa concept a leader in cultural and natural resource management. TBR should prioritize commerce for resort operations between themselves and local agriculturists, horticulturalist, aqua-culturists, craftsmen, tradesmen and other goods or service providers over providers of goods and services from outside areas.

8.2 Marine and Terrestrial Resources

Regarding the marine and terrestrial resources that will inevitably be impacted by the proposed development, Turtle Bay Resort could embrace the role of *konohiki* by initiating an Integrated Coastal Resources Management Plan as well as a multi-media and multi-faceted Education Program.

To help formulate a balanced and integrated Coastal Resources Management Plan, it is recommended that TBR assemble a committee comprised of local *kūpuna* with expertise in marine resources as well as officials from the appropriate government agencies and environmental/wildlife organizations. This plan would provide a starting point for TBR to act as *konohiki* by facilitating meetings for the committee and between the committee and the *kaiāulu*.

The resort should also provide a venue to hold Education Program workshops to help preserve cultural practices and natural resources as well as allow non-Hawaiian peoples the opportunity to learn from their host culture. Tourists and visitors could be informed about the sensitive nature of natural resources and their importance in the traditional lifestyle. These concepts would be instrumental in enforcing a Coastal Resources Management Plan. Additionally, designing an ethnobotanical garden within the resort would be a good way to provide a space to continue traditional agricultural and horticultural practices in a way that allows local cultural practitioners to share the merits and importance of *lāʻau lapaʻau,* traditional Hawaiian diet, and traditional crafts to visitors as well as locals.

8.3 Archaeological Resources

In regards to concerns about the potential disturbance of archaeological sites, an Archaeological Monitoring Plan (AMP) should be prepared prior to the commencement of construction. Further, if archaeological sites are encountered during ground disturbing activities of any alternative chosen by the TBR, a cultural interpretive display is recommended using artifacts (to the extent possible), archival photos, artistic renderings, and traditional accounts from ʻŌpana, Hanakaʻoe, and Kahuku Ahupuaʻa descendants and Native cultural practitioners to educate its patrons of colorful past.

8.4 Iwi Kūpuna

TBR is advised to treat *iwi kūpuna* with the utmost respect. To those who have roots in the area, *iwi kūpuna* are the remains of their ancestors and any disturbance to them should be avoided. A thorough AMP should address concerns of encountering inadvertent discoveries during project related construction. TBR should continue to regularly consult with the Kahuku Burial Committee (KBC), which represents individuals and families who have a lineal and cultural connection to the *iwi kūpuna* as well as the area.

8.5 Spiritual Connections to the Land

A concern has been established by community consultations that unsettled or displaced spirits may plague the new development and/or surrounding localities. Further, several localities in the subject area are known as *wahi pana* (legendary places), where *nā kūpuna* (ancestors) lived and worshiped, and is the final resting place for the ancestors of many local people. Therefore, it is recommended that any major event or construction related activity be preceded with a blessing ceremony performed by a *kahuna* or *kahu pule*.

8.6 Contemporary Use of Land and Sea

As there have been a plethora of activities perceived as contemporary and ancient versions of traditional activities as well as non-traditional activities have been identified as occurring on SEIS Lands and surrounding areas. To ensure that these activities are not impacted, it is advised that TBR provide alternate access routes to these activity areas should current routes be obstructed by project or resort related activities.

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APPENDIX A

GUIDELINES FOR ASSESSING CULTURAL IMPACTS
OBTAINED FROM
OFFICE OF ENVIRONMENTAL QUALITY CONTROL WEBSITE

Guidelines for Assessing Cultural Impacts

Adopted by the Environmental Council, State of Hawaii
November 19, 1997

1. INTRODUCTION

It is the policy of the State of Hawaii under Chapter 343, HRS, to alert decision makers, through the environmental assessment process, about significant environmental effects which may result from the implementation of certain actions. An environmental assessment of cultural impacts gathers information about cultural practices and cultural features that may be affected by actions subject to Chapter 343, and promotes responsible decision making.

Articles IX and XII of the State Constitution, other state laws, and the courts of the state require government agencies to promote and preserve cultural beliefs, practices, and resources of Native Hawaiians and other ethnic groups. Chapter 343 also requires environmental assessment of cultural resources, in determining the significance of a proposed project.

The Environmental Council encourages preparers of environmental assessments and environmental impact statements to analyze the impact of a proposed action on cultural practices and features associated with the project area. The Council provides the following methodology and content protocol as guidance for any assessment of a project that may significantly affect cultural resources.

Background

Prior to the arrival of westerners and the ideas of private land ownership, Hawaiians freely accessed and gathered resources of the land and seas to fulfill their community responsibilities. During the Mahele of 1848, large tracts of land were divided and control was given to private individuals. When King Kamehameha the III was forced to set up this new system of land ownership, he reserved the right of access to privately owned lands for Native Hawaiian ahupuaʻa tenants. However, with the later emergence of the western concept of land ownership, many Hawaiians were denied access to previously available traditional resources.

In 1978, the Hawaii constitution was amended to protect and preserve traditional and customary rights of Native Hawaiians. Then in 1995 the Hawaii Supreme Court confirmed that Native Hawaiians have rights to access undeveloped and under-developed private lands. Recently, state lawmakers clarified that government agencies and private developers must assess the impacts of their development on the traditional practices of Native Hawaiians as well as the cultural resources of all people of Hawaii. These Hawaii laws, and the National Historic Preservation Act, clearly mandate federal agencies in Hawaii, including the military, to evaluate the impacts of their actions on traditional practices and cultural resources.

If you own or control undeveloped or under-developed lands in Hawaii, here are some hints as to whether traditional practices are occurring or may have occurred on your lands. If there is a trail on your property, that may be an indication of traditional practices or customary usage. Other clues include streams, caves and native plants. Another important point to remember is

that, although traditional practices may have been interrupted for many years, these customary practices cannot be denied in the future.

These traditional practices of Native Hawaiians were primarily for subsistence, medicinal, religious, and cultural purposes. Examples of traditional subsistence practices include fishing, picking opihi and collecting limu or seaweed. The collection of herbs to cure the sick is an example of a traditional medicinal practice. The underlying purpose for conducting these traditional practices is to fulfill one's community responsibilities, such as feeding people or healing the sick.

As it is the responsibility of Native Hawaiians to conduct these traditional practices, government agencies and private developers also have a responsibility to follow the law and assess the impacts of their actions on traditional and cultural resources.

The State Environmental Council has prepared guidelines for assessing cultural resources and has compiled a directory of cultural consultants who can conduct such studies. The State Historic Preservation Division has drafted guidelines on how to conduct ethnographic inventory surveys. And the Office of Planning has recently completed a case study on traditional gathering rights on Kaua'i.

The most important element of preparing Cultural Impact Assessments is consulting with community groups, especially with expert and responsible cultural records and review of transcripts of previous ethnographic interviews. Once all the information has been collected, and verified by the community experts, the assessment can then be used to protect and preserve these valuable traditional practices.

Native Hawaiians performed these traditional and customary practices out of a sense of responsibility: to feed their families, cure the sick, nurture the land, and honor their ancestors. As stewards of this sacred land, we too have a responsibility to preserve, protect and restore these cultural resources for future generations.

TEXT OF ACT 50, SLH 2000

A BILL FOR AN ACT RELATING TO ENVIRONMENTAL IMPACT STATEMENTS

UNOFFICIAL VERSION

HOUSE OF REPRESENTATIVES H.B. NO, 2895 H.D.1
TWENTIETH LEGISLATURE, 2000
STATE OF HAWAII

A BILL FOR AN ACT

RELATING TO ENVIRONMENTAL IMPACT STATEMENTS.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF HAWAII:

SECTION 1. The legislature finds that there is a need to clarify that the preparation of environmental assessments or environmental impact statements should identify and address effects on Hawai’i’s culture, and traditional and customary rights.

The legislature also finds that native Hawaiian culture plays a vital role in preserving and advancing the unique quality of life and the "aloha spirit' in Hawaii. Articles IX and XII of the state constitution, other state laws, and the courts of the State impose on government agencies a duty to promote and protect cultural beliefs, practices, and resources of native Hawaiians as well as other ethnic groups.

Moreover, the past failure to require native Hawaiian cultural impact assessments has resulted in the loss and destruction of many important cultural resources and has interfered with the exercise of native Hawaiian culture. The legislature further finds that due consideration of the effects of human activities on native Hawaiian culture and the exercise thereof is necessary to ensure the continued existence, development, and exercise of native Hawaiian culture.

The purpose of this Act is to: (1) Require that environmental impact statements include the disclosure of the effects of a proposed action on the cultural practices of the community and State; and (2) Amend the definition of "significant effect" to include adverse effects on cultural practices.

SECTION 2. Section 343-2, Hawai`i Revised Statutes, is amended by amending the definitions of "environmental impact statement' or "statement" and "significant effect", to read as follows:

"'Environmental impact statement" or "statement" means an informational document prepared in compliance with the rules adopted under section 343-6 and which discloses the environmental effects of a proposed action, effects of a proposed action on the economic [and] welfare, social welfare, and cultural practices of the community and State, effects of the economic activities arising out of the proposed action, measures proposed to minimize adverse effects, and alternatives to the action and their environmental effects.

The initial statement filed for public review shall be referred to as the draft statement and shall be distinguished from the final statement which is the document that has incorporated the public's comments and the responses to those comments. The final statement is the document that shall be evaluated for acceptability by the respective accepting authority.

"Significant effect" means the sum of effects on the quality of the environment, including actions that irrevocably commit a natural resource, curtail the range of beneficial uses of the environment, are contrary to the State's environmental policies or long-term environmental goals as established by law, or adversely affect the economic [or] welfare, social welfare[.], or cultural practices of the community and State."

SECTION 3. Statutory material to be repealed is bracketed. New statutory material is underscored.

SECTION 4. This Act shall take effect upon its approval.

Approved by the Governor as Act 50 on April 26, 2000

2. CULTURAL IMPACT ASSESSMENT METHODOLOGY

Cultural impacts differ from other types of impacts assessed in environmental assessments or environmental impact statements. A cultural impact assessment includes information relating to the practices and beliefs of a particular cultural or ethnic group or groups.

Such information may be obtained through scoping, community meetings, ethnographic interviews and oral histories. Information provided by knowledgeable informants, including traditional cultural practitioners, can be applied to the analysis of cultural impacts in conjunction with information concerning cultural practices and features obtained through consultation and from documentary research.

In scoping the cultural portion of an environmental assessment, the geographical extent of the inquiry should, in most instances, be greater than the area over which the proposed action will take place. This is to ensure that cultural practices which may not occur within the boundaries of the project area, but which may nonetheless be affected, are included in the assessment. Thus, for example, a proposed action that may not physically alter gathering practices, but may affect access to gathering areas would be included in the assessment. An ahupuaʻa is usually the appropriate geographical unit to begin an assessment of cultural impacts of a proposed action, particularly if it includes all of the types of cultural practices associated with the project area. In some cases, cultural practices are likely to extend beyond the ahupua'a and the geographical extent of the study area should take into account those cultural practices.

The historical period studied in a cultural impact assessment should commence with the initial presence in the area of the particular group whose cultural practices and features are being assessed. The types of cultural practices and beliefs subject to assessment may include subsistence, commercial, residential, agricultural, access-related, recreational, and religious and spiritual customs.

The types of cultural resources subject to assessment may include traditional cultural properties or other types of historic sites, both man-made and natural, including submerged cultural resources, which support such cultural practices and beliefs.

The Environmental Council recommends that preparers of assessments analyzing cultural impacts adopt the following protocol:

1. identify and consult with individuals and organizations with expertise concerning the types of cultural resources, practices and beliefs found within the broad geographical area, e.g., district or ahupuaʻa;
2. identify and consult with individuals and organizations with knowledge of the area potentially affected by the proposed action;
3. receive information from or conduct ethnographic interviews and oral histories with persons having knowledge of the potentially affected area;
4. conduct ethnographic, historical, anthropological, sociological, and other culturally related documentary research;
5. identify and describe the cultural resources, practices and beliefs located within the potentially affected area; and

6. assess the impact of the proposed action, alternatives to the proposed action, and mitigation measures, on the cultural resources, practices and beliefs identified.

Interviews and oral histories with knowledgeable individuals may be recorded, if consent is given, and field visits by preparers accompanied by informants are encouraged. Persons interviewed should be afforded an opportunity to review the record of the interview, and consent to publish the record should be obtained whenever possible. For example, the Primary source materials reviewed and analyzed may include, as appropriate: Mahele, land court, census and tax records, including testimonies; vital statistics records; family histories and genealogies; previously published or recorded ethnographic interviews and oral histories; community studies, old maps and photographs; and other archival documents, including correspondence, newspaper or almanac articles, and visitor journals. Secondary source materials such as historical, sociological, and anthropological texts, manuscripts, and similar materials, published and unpublished, should also be consulted. Other materials which should be examined include prior land use proposals, decisions, and rulings which pertain to the study area.

3. CULTURAL IMPACT ASSESSMENT CONTENTS

In addition to the content requirements for environmental assessments and environmental impact statements, which are set out in HAR §§ 11-200-10 and 16 through 18, the portion of the assessment concerning cultural impacts should address, but not necessarily be limited to, the following matters:

1. A discussion of the methods applied and results of consultation with individuals and organizations identified by the preparer as being familiar with cultural practices and features associated with the project area, including any constraints or limitations which might have affected the quality of the information obtained.
2. A description of methods adopted by the preparer to identify, locate, and select the persons interviewed, including a discussion of the level of effort undertaken.

3. Ethnographic and oral history interview procedures, including the institutions and repositories searched, and the level of effort undertaken. This discussion should include, if appropriate, the particular perspective of the authors, any opposing views, and any other relevant constraints, limitations or biases.
6. A discussion concerning the cultural resources, practices and beliefs identified, and, for resources and practices, their location within the broad geographical area in which the proposed action is located, as well as their direct or indirect significance or connection to the project site.
7. A discussion concerning the nature of the cultural practices and beliefs, and the significance of the cultural resources within the project area, affected directly or indirectly by the proposed project.
8. An explanation of confidential information that has been withheld from public disclosure in the assessment.
9. A discussion concerning any conflicting information in regard to identified cultural resources, practices and beliefs.
10. An analysis of the potential effect of any proposed physical alteration on cultural resources, practices or beliefs; the potential of the proposed action to isolate cultural resources, practices or beliefs from their setting; and the potential of the proposed action to introduce elements which may alter the setting in which cultural practices take place.
11. A bibliography of references, and attached records of interviews which were allowed to be disclosed.

The inclusion of this information will help make environmental assessments and environmental impact statements complete and meet the requirements of Chapter 343, HRS. If you have any questions, please call 586-4185.

APPENDIX B

HISTORICAL RESEARCH REPORTS ON KAHUKU AND SURROUNDING AHUPUA‘A

- CAROL SILVA (1984)
- HELEN WONG-SMITH (1989)

Cupressus are from the wetter regions of the forest. Note however, that they are not as common as the cheno-am pollen. The pollen of Pritchardia, an endemic Pacific palm, is found in great abundance here, which is a bit puzzling. Selling included pollen of this genus in his sum of hygrophytic indicators but also noted that it may occur in either a wet or a dry forest (1948: 85-86). It is possible that this palm was prehistorically more common and more abundant at lower elevations; today they are confined chiefly to between 1000-3000 feet. Selling notes that their distribution is highly local; that is, they may be confined to one valley only (1947: 325-337). Also, many planted groves have now disappeared, perhaps due to insect damage. It would be difficult to interpret almost one-quarter Pritchardia pollen without invoking a localized grove or clump of trees within the drainage basin.

Sample No. 34, the clay with rich organic lenses, is presumably derived from overlying sediment at a time of higher standing water. The algal record attests to this. The most prevalent form was Pediastrum at 25% (calculated as a double-fixed sum), which prefers freshwater with some circulation (i.e., not stagnant and not swiftly running) (Table 8). Other algal (and perhaps animal) cysts and cells support this idea. Sedge pollen is much reduced from the underlying sample and is of a smaller size. The remaining allothonous pollen and spores include Pritchardia at 20%, acrostic fern spores at 19%, cheno-ams at 4%, and various tree and shrub pollen with a tricolpate or tricolporate morphology. With few variations in percentages in the latter categories, Sample No. 34 presents a similar paleoclimatic picture with respect to the dry indicators present (cheno-ams, Umbelliferae), while the ecologic changes are slight--chiefly with a greater amount of standing water in the basin favoring floating algae and various cysts. Pritchardia retains a similar ecologic abundance here as in the lower sample suggesting its prevalence in the valley. There was nothing in either sample that could be likened to cultivated plant pollen.

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APPENDIX C:

PRELIMINARY HISTORICAL DOCUMENTARY RESEARCH

Lands of Opana, Kawela, Hanakaoe, Olo, Olupehupehu, Punalau and Kahuku Enclaves, Island of Oahu

by

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It is the intent of this preliminary research effort to identify and examine immediately available sources for information relative to the project site.

A sampling of specific mythological, cultural and historical information has been assembled from the writings of native historians, from missionary and travellers' accounts, land records and cartographic sources.

It is hoped that the data collected herein will prove useful in the formation of a general impression and understanding of the total land area, as well as provide specific historical information of service to professional consultants.

MYTHOLOGY

Several traditions have survived regarding the origin of this district. The striking commonality that exists among these myths is that the district is characterized by a certain physical instability.

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A proverb which captures this states:

Kahuku 'Aina lewa. Kahuku, an unstable land.

An accompanying note to the above explains further:

O'ahu, according to legend, was once two islands that grew together. Kahuku is the part that bridges the gap. (Fukui, 1963:144)

Levi Chamberlain related the following tale which he recorded on his 1828 tour of Oahu:

The natives tell a marvellous story respecting the origin of this district /sic/, which they say floated in from the sea, and attached itself to the ancient shore of the island, that there was a subterranean communication between the sea & the ancient shore, by which a shark used to pass, & make depredations up on land. The basis of the tract, which is from 5 to 7 miles in length, & from 1 to 2 miles in breadth, appears to be of coral; and it was evidently redeemed from the sea, as a good deal of the land, in many places along the shore around the whole circuit of the island, evidently has been. (Chamberlain, 1957:35-6)

A third rather novel creation myth links the district with the sacred legendary princess, Laleikawai. Within this tradition are found the names of two small bodies of water that act as anchorages for the floating Kahuku land mass:

Kahuku district, according to legend, was once a floating island blown about by the winds. As it banged against Oahu, it made noises which disturbed the old women guarding the Princess Laleikawai. The old women grappled the island with fishhooks and attached it securely to Oahu. Folou pool on the sea side of the Kahuku mill is one spot where the hook was fastened. The other end was fastened at Kukio pond, 300 feet inland at Kahuku Point. (Boswell, 1938:48)

In the final creation tradition, the floating land mass was cited as a home of the menehune. This legend bears particular import in that it acknowledges two natural attributes of the area - the district's springs and its verdant uplands.

Ka-hu-ku section of O'ahu was once a separate island... It was an islet where people were the Mene-hune, or Dwarfs as

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they are called today. Many stories are told about the miraculous feats performed by the Little People of ancient Hawaii. It is known, also, that they always worked from just after sunset until just before dawn.

Legend tells us that Kahuku was a floating island situated several miles out to sea. For a long time, the people of O'ahu had planned to make the island a part of their land, for they saw it come close to O'ahu's shores. The floating island of the Menehune did not have any fresh-water springs because there were no high mountains covered with verdure and trees to capture the rains. So, the Little Folk used to paddle their islet into the bays of O'ahu at night to haul water from the springs of the large island.

One day, a resident of Kahuku suggested that all the people gather together to make strong hooks of whalebone and attach them to a stout rope made of sacred Olona fibres. This was done.

The Menehune came to take water as usual, then the residents of O'ahu attached the large hooks to the floating isle while the Little Folk were off at the water-springs. When the water was loaded, the Menehune started to paddle off again, but they could not move their islet or free it from the ivory hooks and Olona ropes.

Today, many people who travel Kahuku section of O'ahu and see the many islets seeming to float off shore, and hear the sea singing its songs, they say, 'Listen to the Menehune grumbling while they try to move their island that used to float!'

The rumbling and grumbling is heard only at night, for that is the time for the Menehune to be working at Kahuku. (Paki, 1972:53)

Aside from creation myths, a colorful assortment of legends exist for the broad Kahuku area. These will be examined first as I believe they exemplify some of the characteristics that can also be attached to the less-written-about ahupuaa just north of Kahuku which fall within project boundaries. Once the bulk of pertinent Kahuku literature is exhausted - a close perusal of the relatively few legendary references to Opana, Kawela, Olupehupehu, Olo, Punalau and Hanakaoe will be conducted.

The entire district of Kahuku was well-remembered for its fragrant groves of hala; the following proverb and translation memorializes them for all time:

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Nani i ka hala ka 'Ōiwi o Kahuku.
The body of Kahuku is beautified by hala trees.
(Pukui, 1983:248)

The above appears to be extracted from a chant composed by Halemano. In an attempt to win back the attention of his wife, Halemano recalls pleasant sentiments shared:

A kukui au a Kahewahewa,
Ka au nana i laila,
Halolioi kuu waimaka e iwe,
Nani na hala ka ohwi o Kahuku,
I ka lawe a ka makani he mikioi. (Elbert, 1965:281)

As I reported to Kahewahewa,
I stood and gazed, then
Tears filled my eyes causing me to weep.
How beautiful are the hala, native trees of Kahuku,
As they are being fanned by the Mikioi wind. (Ibid.,280)

Mention is made of the famed hala groves of Kahuku in the tragic tale of the prophet Kaopulupulu. Kaopulupulu and his son are summoned by chief Kahahana to appear before him in consequence of an act that Kaopulupulu dutifully performed. Although the prophet clearly foresees his death, he and his son set out for Kahahana's court.

...In the morning, ascending a hill, they turned and looked back over the sea-spray of Kalalua to the swimming halas of Kahuku beyond. Love for the place of his birth so overcame Kaopulupulu for a time that his tears flowed for that he should see it no more. (Thrum, 1912:210)

A final reference to the hala of Kahuku can be found in the classical myth of Pele and Hiiaka. In travelling to Kauai to fetch Pele's loved one, Lohiau, Hiiaka encounters two rude creatures who refuse the goddess Hiiaka the slightest acknowledgement. Their discourtesy causes Hiiaka to compose chant lines employing a word-play on "hala".

They /Hiiaka and companions/ passed through the lands of Lale, Halae-kahana and Keene and at Kahipa they saw the crouching figures of Puna-he'e-lapa and Pahi-pahi-alua, who stole

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away into the shelter of the pandanus groves without deigning to give them any salutation. At this show of disrespect, Hiiaka called out:

Komo i ka nahele ulu hinalo,
Nahele hala o Po'o-kaha-lulu;
Ola nahele hala makai o Kahuku.
Heaha la ho'i ka hala
I kapu ai o ka leo, e?
I Sookuli ai oe i ka uwalo, e?
E uwalo aku ana au;
Maloko uai oe, e?

We enter the fragrant groves,
Hala groves whose heads make a calm,
Wild growths by the sea of Kahuku,
But what, indeed, are your halas?
Shall their murmur forbid you speech?
Make you dumb to my salutation?
I make this kindly entreaty
To you who sit in the grove. (Emerson, 1915:97-8)

Emerson includes the following footnote relative to the hala word-play:

There seems to lurk a play in this word hala. It stood not only for the pandanus tree; it also meant a fault, a sin. (Ibid.:97)

In another well-known classic - the tradition of the pig-god Kamapuaa - residents of Kahuku are called upon by their chief, Olopana, to capture the chicken-thief, Kamapuaa. Once he is bound and readied to be carried off, his grandmother's chanting stirs Kamapuaa into action and he decimates his many captors and gains freedom. (Elbert, 1965:200-1)

Another set of traditions deal with a stream which courses under the mountain range and connects Kahuku with Waipahu. The following proverb summarizes this characteristic feature:

Pukana wai o Kahuku.
The water outlet of Kahuku.
Refers to the outlet of an underground stream that once flowed from Kahuku to Waipahu, O'ahu. (Pukui, 1983:299)

An abstract of this legend appears in a descriptive account

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of the Kahuku area as visited by train in the early 1900's.

As our train sped on toward Kahuku, we were told of the various water-holes of the district with certain of them furnishing catches of fish, but only on the nights of Kane. One called Punamano is famed for a shark-man's exploits, and another as having connection with Waipahu, in the Ewa district, which is said to have been verified in the following manner:

A kapa-beating log of peculiar sound, unlike any other known on the island, which was placed in its waters at the close of a kapa-making season to keep it smooth and free from cracks that would impart an impression to the cloth in its manufacture, was missed, and, believing it to have been stolen, search was made all through the Koolau, Waialua and other districts till at last it was found in use at Waipahu. Recognizing it by its resonant tone, it was claimed by the searching owner, and right thereto by those in possession as vigorously maintained. To test the truth of ownership as claimed, the Ewa people accompanied the claimant back to Kahuku to visit the scene and witness a test of the underground stream theory. A bundle of ti leaves were gathered, which was wrapped together and consigned to the waters of Punahoolapa. In the course of a few days they were lost to sight, whereupon the party set out for Ewa, and after careful watching, as predicted, the bundle of ti leaves came forth on the bosom of the waters of the Waipahu stream. The kapa log was thereupon recognized as the rightful property of the Kahuku claimant. (Thrum, 1910:130-1)

Another version of the same tale, though somewhat more embellished, is presented by Pukui and Curtis in The Water of Kane. (Pukui and Curtis, 1976:162-7)

The legend, which closes this section of mythology relating to the general Kahuku area, appears antiquated in its content; it is set during the period of migration to Hawaii from Kahiki (foreign lands).

The story I am about to tell you came to me as a marvellous, mysterious, miraculous myth of the long ago, when strange powers dwelt in both animals and men, and when cannibalism might have been carried on to be reported later under the guise of eating the flesh of beast or fish. In the long ago there were two "fish" crossing the trackless waters of the Pacific Ocean. Their home was in one of the far-away lands, known as Tahiti. These "fish" were great canoes filled with men. They decided that they would like to visit some of the lands about which they had heard in the legends relat-

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ed by their fathers. They knew that certain stars were always in certain places in the sky during a part of every year. By sailing according to these stars at night and the sun by day they felt confident that they could find the wonderful fire-land of Hawaii about which they had been taught in the stories of returned travellers. So the two "fish" - the two boats - after weary days and nights of storm and calm, of soft breeze and strong, continuous winds, found the northeast side of the island of Oahu with its rugged front of steep, precipitous rocks. The travellers landed first on a point of land extending far out into the sea, terminating in a small volcano. Here they made examination of the unfriendly coast and decided to journey entirely around the island, one fish, or boat, going toward the north and the other toward the south. They were apparently intending to pass around the island and find an appropriate location for a settlement. Possibly they planned to make a permanent home or hoped to meet some good community into which they might be absorbed. The point of land which marked the separation of the two companies is called Makapuu. The boat which sailed toward the north found no good resting-place until it came to the fishing-village of Kaaula. The stories told by the old natives of the present time do not give any details of the meeting between the strangers and the people residing in the village. Evidently there was dissension and at last a battle. The whole story is summed up by the Hawaiian legend in the saying: "The fish from Tahiti was caught by the fishermen of Kaaula. They killed it and cut it up into pieces for food." Thus the visitors found death instead of friendship, and cannibalism was thereby veiled by calling the victims "fish" and the victory a "catch."...

The second fish from Tahiti had gone on southward in its journey around the island of Oahu. It passed the rough and desolate craters of Koko Head on the eastern end of the island. It swam by Diamond Head and the beautiful Waikiki Beach. Either the number of the inhabitants was so large that they were afraid to make any stay or else they preferred to make the complete circuit of the island before locating, for they evidently made only a very short stay wherever they landed, and then hurried on their journey. By the time they reached Kaena, the northwestern cape of Oahu, they were evidently anxious concerning their missing companions. Not a boat on the miles of water between Kaena and Kahuku, the most northerly point on the island. The legend says that the fish changed itself into a man and went inland to search the coast for its friend, but the search was unsuccessful. It was now a weary journey from point to point, watching the sea and exploring all the spots on the beach where it seemed as if there was any prospect of finding a trace of their expected friends. Where a break in the coral reef permitted their boat to approach the land they forced their way to shore. Then when the thorough search failed again, the boat was pushed out over the line of white tumbling breakers to the great sea until at last the Tahitians came to Kahuku.

Now they appeared no longer as "fish," but went to the village at Kahuku as men. They made themselves at home among the people and were invited to a great feast. They heard the story of a battle with a great fish at Hauula and the capture of the monster. They heard how it had been cut up and its fragments widely distributed among the villages on the northwest coast. Evidently provision had been made for several great feasts. The people of Kahuku, although several miles distant from Hauula, had received their portion. The friendly strangers must share this great gift with them. But the men from Tahiti with heavy hearts recognized the fragments as a part of their companion. They could not partake of the feast, but by kindliness and strategy they managed not only to decline the invitation, but also to secure some portions of the flesh to carry down to the sea. These were thrown into the water, and immediately came to life. They had the color of blood as a reminder of the death from which they had been reclaimed. Ever after they bore the name "Hilu-ula," or "the red Hilu."

Then the "fish" from Tahiti went on around to Hauula. They went up to the tabu land back of Hauula. They pulled up the tabu flags. Then they dammed up the waters of the valley above the village until there was sufficient for a mighty flood. The storms from the heavy clouds drove the people into their homes. Then the Tahitians opened the flood-gates of their mountain reservoir and let the irresistible waters down upon the village. The houses and their inhabitants were swept into the sea and destroyed. Thus vengeance came upon the cannibals.

The Tahitians were "fish," therefore they went back into the ocean to swim around the islands. Sometimes they came near enough to the haunts of fishermen to be taken for food. They bear the name "hilu." But there are two varieties. The red hilu is cooked and eaten, but never eaten without having felt the power of fire. The trace of the cannibal feast is always over its flesh. Therefore it has to be removed by purification of the flames over which it is prepared for food. The blue hilu, the natives say, is salted and eaten uncooked. Thus the legend says the two fish came from Tahiti, and thus they became the origin of some of the beautiful fish whose colors flash like the rainbow through the clear waters of Hawaii. (Westervelt, 1973:139-145)

EARLY HISTORY OF THE KAHUKU DISTRICT

The native historian S. M. Kamakau bridges the time gap between the mythological and historical eras by relating the following long-held traditions of the ancients:

There is only one famous hiding cave, ana huna, on Oahu. It is Pohukaina. The opening on Kalaeoka'o'io that faces to-

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ward Ka'a'awa is believed to be in the pali of Kanehoalani, between Kualoa and Ka'a'awa, and the second opening is at the spring Ka'ahu'ula-punawai. This is a burial cave for chiefs, and much wealth was hidden away there with the chiefs of old. On the Kona side of the island the cave had three openings, one at Keilikulamanu - near the lower side of the cave of Koleana in Moanalua - another in Kalihi, and another in Pu'iwa. There was an opening at Waipahu, in Ewa, and another at Kahuku in Ko'olauloa. The mountain peak of Konahuanui was the highest point of the ridgepole of this burial cave "house," which sloped down toward Kahuku. Many stories tell of people going into it with kukui-nut torches in Kona and coming out at Kahuku. Within this cave are pools of water, streams, creeks, and decorations by the hand of man (hana kinohinohi'ia), and in some places there is level land.

According to the traditions of some people, Oahu was said to have once been a floating land, he 'aina lewa o Oahu. The Kahuku side was a wide open gap (puka hamama) and this was called Ka puka o Kahipa a me Nawaiuolewa, "The opening of Kahipa and Nawaiuolewa." The piece of land that closed it up was called Kahuku, and the hooks that made fast the piece of land and joined it to the island were called Kilou and Polou. (Kamakau, 1974:38-9)

Included under this heading "early history" is a brief discussion of ancient sacred relics uncovered in the Kahuku district.

In his series Arts and Crafts of Hawaii - Religion, Peter H. Buck numbers three carved images as having been found in Kahuku.

The first two are classified as temple images; they are described as follows:

Two images of a similar type were found at Kahuku, Oahu. Both have the high head slab, one plain and the other with triangular and lozenge-shaped openings...Each has a pointed prop and each is more than 5 feet tall. The image with the slab openings was destroyed by fire, and the other is in a private collection. Fortunately, the Museum has field photographs, from one of which the figure was drawn. (Buck, 1964:495)

The last of the three is categorized as a worked stone god. Regarding these, Buck notes:

Worked stone representing the human form in part or in whole was termed a ki'i pohaku (stone image), and it was only after the necessary ritual that it became an akua pohaku (stone god). After the general acceptance of Christianity,

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many keepers of the stone gods hid them, either from lingering sentiment or because they were afraid to destroy them by breaking them up. Thus they have been found in caves, in concealment cavities in stone piles, in taro swamps, and buried underground. Some were kept by families, particularly by fishermen, who saw no contradiction to Christianity in keeping a good luck talisman which increased the supply of fish....(Ibid.:496)

...The last drawing (fig. 312,a), taken from a cast of a specimen in the Berlin Ethnographic Museum, is from Kahuku, Oahu. It differs from the Hawaii specimens in having raised elliptical eyes; a small, raised nose; a hollowed mouth with a raised upper lip; and a sharp chin. (Ibid.:498)

A SAMPLING OF HISTORICAL ACCOUNTS - Post 1778

Two of the earliest voyager descriptions of the northwestern part of Oahu mention expanses of cultivated fields and well-inhabited communities. Cook's officers who assumed command of his ships after his death jotted the following impressions:

SUNDAY 28th. Winds E'erly, fresh breezes with open Cloudy Weather. Run round the N°ern Extreme of the Isle which terminates in a low Point rather projecting;[2] off it lay a ledge of rocks extending a full Mile into the Sea, many of them above the surface of the Water; the Country in this neighbourhood is exceedingly fine & fertile; here is a large Village, in the midst of it is run up a high Pyramid doubtlessly part of a Morai.[3] I stood into a Bay just to the W'ward of this point[4] the Eastern Shore of which was far the most beautifull /sic/ Country we have as yet seen among these Isles, here was a fine expanse of Low Land bounteously cloath'd with Verdure, on which were situate many large Villages and extensive plantations; at the Water side it terminated in a fine sloping, sandy Beach...(Clerke in Beaglehole, 1967:I:572)

[2]Kahuku Point, low, covered with sand dunes; its position, lat. 21°43' N, long. 157°59' W, gives us a check on Clerke's noon position a few lines above.
[3]'An oracle tower,' lana nu'u mamao; cf. p. 270, n.3 above.
[4]Waimea Bay, not a very deep indentation in the coast. (Ibid.)

WOA'HOO.[3] We saw this Island the beginning of last year, but only just as a high lump. We this Time saild along its NE & NW sides but saw nothing of the S°ern part. What we did see of this Island was by far the most beautiful country of any in the Groupe; particularly the Neck that Stretches to the N°ward: & its NW side. Nothing could exceed the verdure of

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the hills, nor the Variety which the face of the Country display'd. It /s north-eastern/ parts[4] were cliffy, & rugg'd to the Sea side, but the Valleys look'd exceedingly pleasant, near the N point we were charmed with the narrow border full of Villages, & the Moderate hills that rose behind them;... (King in Beaglehole, 1967:I:610)

An excellent discussion of the historical agrarian aspects of of the district is given in The Hawaiian Planter.

KAHUKU

This blunt northern tip of the island of Oahu, whose name means "The hillock," is now the seat of the Kahuku Plantation Company's offices, town, and mill, and for many years has been planted in sugar cane. Kahuku ahupua'a presents something of a paradox. McAllister (1933, p.153) remarked in his survey that it did not seem possible that this "rather desolate, wind-swept" plain could ever have supported much life, agricultural or human, before the era of industrial machinery and organization. Yet one of his informants "remembers the time when trees now found only in the mountains" covered it. And in Captain Cook's time it was reported that "nothing can exceed the verdure of the hills, the variety of wood and lawn, and the rich cultivated valleys which the whole face of the country /on this northern end/ displayed" (Cook, 1784, Vol. 3, p. 115). Thirteen years later Vancouver (1798, Vol. 3, p. 71) wrote of Kahuku and surrounding territory: "Our examination confirmed the remark of Capt. King excepting that in point of cultivation or fertility, the country did not appear in so flourishing a state, nor to be so numerously inhabited, as he represented it to have been at that time, occasioned most probably by the constant hostilities that had existed since that period." There is a similar discrepancy between the descriptions of other areas in the 1780's and 1950's /sic/ insofar as cultivation is concerned; but not in verdure. What catastrophe of the elements, slow or swift, has wrought the change in Kahuku?

In 1833 Hall (1839) observed at Kahuku that "much taro land now lies waste because the diminished population of the district does not require its cultivation." There seems no evidence of old terraces in the upland along either branch of Kahuku Stream, but in the seaward swampland north and south of Kukio Pond there are such remains. A 1935 informant, Kaleo, knew the names of 11 localities where terraces were formerly cultivated.

Rounding the northern tip past Kahuku onto the "sunset coast," the next sizable wet-taro area is the deep valley of Waimea. Before reaching Waimea the intervening stream beds, shown on the map as Hanako'ae, Pahipahialua /sic/, and Kaunala, had not sufficient flatlands for taro cultivation under the old system. Two exceptions to noncultivation in this region were to be found. One was in 'Opana (The-squeezing) adjoining Hanako'ae /sic/, where there was formerly a small spring-

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watered terrace area named Ka-wela (The-heat), which is also the name of the bay below. The other was in Waiale'e, next before Kawela, where there were another small group of terraces anciently named Kane-ali'i. In 'Opana the legend is told that the gods Kane and Kanaloa struck spring water from a rock known as Wai-kane, to give life to this hitherto waterless region around Kawela Bay." (Handy, Handy and Pukui, 1972:462-3)

Agricultural notes are also found within a delightful description of Pahipahialua (which adjoins the ahupuaa of Opana) and its surrounding lands. This 1815 account is provided by a visitor named John B. Whitman; the following excerpt is taken from his An Account of the Sandwich Islands:

A friend of mine having lived on Owhyhee for several months had returned to Woahoo for the purpose of taking possession of a large plantation which the high priest of the Islands had given him. He requested me to accompany him, and we commenced our journey early in the morning of September 6, 1815...

Passed through Whyamere /ca:Waimea/ and arrived at Pypy-erure /ca:Pahipahialua/ which makes the point of the Island. It is not so fertile as Whyarure /ca:Waialua/ the low lands being rock and uncultivated. It was late in the afternoon when we arrived at the estate belonging to my friend and was introduced to the superintendant. He was a good looking man whose grey hair and wrinkled visage bespoke him not far from sixty years of age. Being informed of the nature of our visit, his rapid orders produced a confusion among the under tenants somewhat resembling the bustle at a country inn on the arrival of unexpected hungry travellers. An uproar in the hog pen announced the speedy dissolution of two of the members. New mats were brought for us to set on. The tarbooed fire was lighted from the old mans match rope, another fire blazed at some distance. I perceived a farce was playing which I could not rightly comprehend, but waited with patience the conclusion of it. Fresh taro was brought by different hands and laid near the two fires. Two gourd shells filled with water were next brought and I determined to solve the mystery. Taking hold of one of them I was saluted with eyer nu wye tarboo (that is tarbooed water), and the other was immediately handed to me. It appeared we were to have two suppers cooked. One tarbooed, the other noa /ca: noa-made free of restriction/ and as we did not wish to be idle, in the mean time, we sallied forth to take a cursory view of the newly acquired estate.

It consisted of a small valley well stocked with taro in fine order, several of the patches having been recently planted. A strip of low rocky land extending to the sea and a large extent of fishing ground which was said to be very

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productive.
Returning to our host we found supper ready. The old superintendent, our guides and my friend seated themselves on a large mat and partook of a tarbooed supper consisting of a hog and poey /ca:poi/. My friend it seems had been regularly tarbooed by the Head Priest on Owhyhee which entitled him to the privilege of eating out of the same dish with him, and with any of his tarbooed men. Not having had that distinguished honor conferred upon me I of course was excluded from the sacred feast, but much to my satisfaction I found a hog well cooked and served up separate. Not being inclined to a supper "a le solitaire" I invited the boys to partake with me and jocularly observed to our host that I had tarbooed them as my hicarnies /ca:aikane/ or friends for the time being. Supper being finished we spent the evening with the old man who gave us an account of the estate and its resources, and the yearly rent which he had prepared to send the High Priest which consisted of about two hundred large salted fish, two hogs of the largest size, five suits of tarper /ca:tapa/, five pows /ca:pa'u/ and ten taros. Having no knowledge of the value of gold and silver and no standard circulating medium by which to establish the relative value of things, the rents are paid in the produce of the soil and the quantity is proportionate to the size of the farm.

January 9th. The transfer of the estate being settled and the old man reinstated as superintendant, we retired to rest in an old hut which served as the sleeping house of all the family, men and women, hogs, dogs and fleas.

In one corner our host had prepared some clean new mats and two suits of new tarpers for our comfort. Here we laid ourselves down to rest. The jabbering of the inmates gradually subsided and nothing was heard save the grunt of a hog, or the whining of a whelp caused by a host of fleas levying contributions on their half starved carcasses; or the ejaculatory plaint awa ker ootoo (oh, dear, the fleas) which now and then escaped from our guides.

Our new bedding for some time preserved us from this troublesome insect, but after having been asleep a short time I awoke and found myself literally covered with them. My friend storming like a madman, rushed out of this worse than hornets nest, and finding I must retreat, I soon followed him, and we took up our quarters in the open field, where we passed the remainder of the night in undisturbed repose.

In the morning we commenced our line of march homeward, and, as is the custom, after being hospitably entertained, and provided with new tarpers, we paid our host the compliment to take the tarpers along with us...

After proceeding for some time over an uncultivated plain, we arrived at a small village situated on the sea shore. It consisted of about twenty huts occupied by fishermen, by the side of the pathway there was a fine bed of watermelons, and we sat down on a fallen cocoa nut tree to rest ourselves, several of the natives came to us and one of them offered us some melons. We gladly accepted his kind of-

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fer and told our servants to pull some for us, but the Indian who had offered us the melons, said something to them which deterred them from going on to the ground. He however bade us pull what we might want, which we did. Our servants would not eat or touch any. We shortly discovered the reason of their mysterious conduct, for the kindness of the Indian had like to have caused some trouble. This generous fellow in his zeal to serve the white men had overstepped the bounds of honesty, and given us what was not his. The rightful owner came and was somewhat exasperated to see us encroaching upon his property without asking his consent. We assured him of our honest intentions, telling him the circumstances without pointing out the offender, which he desired us to do, but knowing the motives which had actuated our friend, we declined giving the information, at the time offering him compensation for his melons, which after some hesitation he accepted. He was very desirous to discover who it was that had given us the liberty but was not satisfied on this point, although there were a number of the villagers who had witnessed the whole transaction, some of whom even upbraided him, his want of generosity in receiving recompence, he however, became passified and we parted friends, having supplied ourselves with a number of very fine melons. (Whitman, 1979:74, 78-82)

In 1828, missionary Levi Chamberlain completed his second circuit of the island of Oahu, examining students and in general evaluating the effectiveness of teachers and education upon the native populace. His remarks demonstrate that within Kahuku there still existed a viable and fairly progressive community - one whose scholars were numerous and whose head-man apparently valued formal education.

Tuesday Feb. 5th. After breakfast I examined two schools, belonging to Laie & Malaekahana, and was pleased with the appearance of the scholars. At a quarter before 11 A.M. we set out for Kahuku, and after travelling about two hours over a level sandy country, arrived at the school house, where we found 83 scholars assembled, waiting to be examined. A lad of about 11 years of age had the direction of the school. His father the head man of the place was present, and gave countenance to his son, who managed the school with a good deal of address. I gave books to those of the scholars who were destitute, whom I found able to read....

A good hog had been cooked for us, & when the examination closed, dinner was waiting. I had not been very well since morning, and had not much appetite to eat, but my attendants made a hearty meal; and the remainder of the food was placed in the calabashes of our natives, and carried along to furnish

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food for us when we should be again in need. (Chamberlain, 1957:35-6)

The mid-1800's brought enormous transformations in land ownership patterns. At that time, Kamehameha III relinquished absolute ownership of land in the Islands and individuals were allowed to register legal verifiable claims to their houselots and agricultural plots.

Numerous awards were granted within the project boundaries; a detailed discussion of each can be found in this report under the headings of "Archival Documents" and "Original Land Ownership: Land Commission Awards."

As part of his Crown Lands, Kamehameha III chose to retain the ahupuaa of Kahuku and Kawela (Indices, 1929:27-8). The remaining ahupuaa within project boundaries were all classified as Government lands (ibid.:40-44). Rights of native tenants in these Crown and Government lands were strictly respected.

Almost immediately after this land division occurred, sales and leases of parcels within these seven ahupuaa were conveyed. Thus, over the years an intricate chain of title arose. Suffice it to say, for the purpose of this preliminary study, that large tracts of land were obtained in fee or in lease-hold by men such as C. G. Hopkins in 1850-1 (Index, 1916:53) and Robert Moffitt Stoney for the purposes of sheep and cattle and thorough-bred horse ranching.

The following news article provides a brief history of ownership and a description of Kahuku Ranch (which stretched from Kahuku Point northward) at the time it was purchased by James Campbell:

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Kahuku Ranch. This fine ranch, covering the north portion of Oahu, formerly the property of the late R. Moffitt, and more recently of Juluts I. Richardson, Esq., was last week sold by the latter to James Campbell, Esq., one of the proprietors of the Pioneer Sugar Mill of Lahaina, for the sum of $63,500 cash. It includes 23,000 acres in fee simple, and large tracts of mountain land under long leases, with $34,000 worth of live stock, including 3,000 head of cattle, with the choice band of merino sheep and horses now on it. It is unquestionably the best stock ranch on these islands, and it has been brought to a high state of perfection under the management of the late proprietors, who divided the plain into ten or twelve large paddocks, walled with heavy stone walls. It stretches from Laie to Waimea, a distance of thirteen miles, and those who have ever visited it must have admired its lovely green pastures of manienie grass so fattening to stock. It is the intention of Mr. Campbell to increase his band of sheep to 30,000 of the choicest breed. The price paid is a handsome one, securing to its present proprietor the most desirable ranch on the Islands, and to Mr. Richardson a comfortable fortune, the result in part of his industry and good management, and in part of the Reciprocity Treaty, the first fruit from which he has been so fortunate as to reap.... (Hawaiian Gazette, 10/4/1876, p.3:2)

Campbell's development of his lands, his deep involvement in sugar cultivation and the post-1900 history of the project site demand much additional research time and therefore will not be addressed in this preliminary work.

CARTOGRAPHIC RECORDS

Tax maps and the maps on file at the State Survey Division revealed the general location of a sizeable number of original awards deeded during the Great Mahele of Kamehameha III (mid-1840's through early-1850's). In spite of the fact that a proportion of these early awards were neither plotted nor even surveyed and also considering that for those parcels that were delineated, the accuracy of location can not be guaranteed - one is still quite able to gain a fair understanding of residential and agricultural patterns existing over a century ago in these particular districts.

Pertinent data from several of these maps was collected and all the awarded claims which were shown have been roughly sketched on current Tax Maps of the area. These Tax Maps as well as a map depicting the placement of the seven ahupuaa comprising the total land area under study have been included at the end of the present preliminary report (Figures 16-18).

Once a comprehensive list of land claims falling within the project's bounds was drafted and Land Commission Award numbers were compiled, then archival land records were carefully examined.

ARCHIVAL DOCUMENTS

During the Mahele, it was a requirement for individuals to register claims only for those lands actively used for farming and for residence. Testimony was then submitted by witnesses who verified or contested an individual's claim.

Data gleaned from these registers proved to be particularly useful as claimants often submitted detailed inventories of their fixed properties - mentioning even the number of taro patches, cultivated plots, fisheries, varieties of trees and sometimes the general location of each.

A full tally of all holdings mentioned within the entire ahupuaa was then developed in an effort to re-create broad land use patterns for each district. They are as follows:

Opana contained
- 7 taro patches, some in cultivated kula lands
- 1 cultivated kula plot
- 1 cluster of hala trees

Kawela contained
- 28 taro patches
- 11 houselots
- 10 upland gardens planted with noni, sweet potatoes, gourds, bananas, sugar cane and wauke
- 17 kula plots and gardens planted with wauke, noni, ulu, sweet potatoes, sugar cane, bananas and ohia
- 1 fishery
- 2 watercourses
- 1 salt land
- 5 clusters of hala trees
- 1 ulu tree

Hanakaoe contained
- 1 fishery
- 1 salt bed
- 1 salt pool
- 1 hala grove
- several gardens and kula plots planted with noni, onions, sweet potatoes
- 1 cultivated upland plot

Olo contained

- 15+ gardens and kula plots planted with awa, taro, banana, noni, wauke, sugar cane, sweet potato, gourd, edible fruits
- 16 koa canoe trees
- 5 houselots
- 4 taro patches
- 3 groves of hala
- 3 salt bed lands
- 1 sweet potato patch cultivated upon cliffs
- 4 cultivated upland plots planted with banana, awa, sugar cane, wauke, sweet potato, gourd

Ulupehupehu contained
- 15+ kula plots and gardens planted with wauke, sweet potato, gourd, banana, sugar cane
- 7 koa canoe trees
- 2 cultivated upland plots planted with wauke, banana, orange trees
- 1 banana plantation
- 1 cluster of hala
- 1 houselot

Punaluu contained
- 10 taro patches
- 1 fish pond named Puakahi
- 10 kula plots and gardens planted with sweet potato, banana, noni, ulu
- 4 cultivated upland plots
- 8 houselots
- 4 coconut trees
- 3 shore areas/fisheries
- 2 koa canoe trees

Kahuku contained
- 162 taro patches
- 39 kula plots and gardens planted with awa, banana, wauke, gourd, sweet potato, sugar cane, noni, watermelon, pili grass
- 7 cluster of hala
- 6 salt lands
- 4 koa canoe trees
- 2 fishponds
- 10 houselots
- 1 sweet potato patch cultivated upon cliffs
- 1 watercourse bank
- 3 cultivated upland plots
- 1 brackish spring
- 1 wooded upland area of ulu, ohia, kukui, koa, ti leaf, noni, etc...

The above listing is by no means complete nor is it restricted only to the project area; it serves merely as a guideline. However, the next set of data compiled from the registers, testimony and survey notes relate to the specific parcels plotted within the project.

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ORIGINAL LAND OWNERSHIP: LAND COMMISSION AWARDS

Opana Ahupuaa

1. Claimant Kookoo (LCA 2897:2)
"I have a claim at Opana with three lo'i and a kula, bounded on the north by the sea, on the east by the kula, on the south by the pali, on the west by Pahipahialua." (Native Register v.3:683)

2. Claimant Paukoa (LCA 2734:3)
"I have a little claim for two lo'i at Opana, bounded on the north, east and south by a kula, on the west by Kookoo's /land/...My claim is from my makuas, from the time of Kamehameha I to the present." (Native Register v.3:612)

3. Claimant Kuheleloa (LCA 2835:2)
"At Opana I have a claim for two lo'i, surrounded by kula, it is cultivated kula land." (Native Register v.3:657)

Boundaries of the above parcel, translated from the survey notes state:
"Parcel 2. One taro patch at Opana. Commence at the south angle and run N. 18 W. 100 links
then N. 74 E. 57 "
then S. 14 E. 98 "
then S. 72 W. 48 " . It is surrounded by Konohiki lands. .05 acre." (Survey Notes RP 509)

Kawela Ahupuaa

1. Claimant Kookoo (LCA 2897:2)
"I, Kookoo, have a claim for land at Kawela.
1. Three lo'i,...the boundaries are: North, Kalili's lo'is, east and south, kula, west, Peelalau's /land/...
4. I also have a claim for salt land, bounded on the north and east by the sea, on the south by the kula, on the west by Kauahi's /land/...
There is a houselot at Kawela, bounded on the north by the shore, on the east by Kekua's lot, on the south by the Road, on the west by Makaino's lot.
These are my claims which were from my makuas, from the time of Kamehameha I to this time." (Native Register v.3:383)

"Kalakua, sworn, says he knows the land claimed by Kookoo in Kawela. It consists of 3 kalo patches and a House site. The 3 kalo patches form one piece, bounded on Hauula side by the kula land, mauka and Waialua side by Lono's land, makai by the Konohiki.
The kula land claimed has not been cultivated for some time. The House site is near the kalo patches. It is enclosed with a wooden fence. Claimant has held the land for over ten years.
The Konohiki had no objections to this claim." (Foreign

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Testimony v.10:159)

Translated survey notes give the boundaries of LCA 2897:2 as:
"Parcel 2. Houselot. Commence at the south angle and run
N. 15½ W. 158 links
then N. 74½ E. 158 "
then S. 15½ E. 158 "
then S. 74½ W. 158 " . It is surrounded by the Konohiki lands. ¼ acre." (Survey Notes RP 506)

2. Claimant Kamakai (LCA 2837:2)
"My house claim is at Kawela, bounded on the north by the sea, on the east by a pond, on the south by a sandy gulch, on the west by the lot of Peelalau." (Native Register v.3: 658)

"His /Kamakai's/ House site is in Kawela. It is not enclosed. He got the land from Kaeo some 10 years ago. The Konohiki consented to this claim." (Foreign Testimony v.10:158)

Translated boundaries for LCA 2837:2 are:
"Parcel 2. Houselot. Commence at the south angle and run
N. 14 W. 116 links along Pailalau's /Peelalau's/ lot.
then N. 80 E. 100 "
then S. 9 W. 110 "
then S. 81 E. 72 " along the stone wall to the point of commencement. .09 acre." (Survey Notes RP 507)

3. Claimant Pailalau (or Peelalau) (LCA 3815:1)
"My houselot is at Kawela. My occupancy of these claims was since the time of Kamehameha II." (Native Register v.4:176)

"His /Pailalau's/ House site is near the sea side and is not enclosed. Claimant died about 2 years ago leaving the land to his widow. He got the land from Kaeo some ten years ago.
The Konohiki consented to this claim." (Foreign Testimony v.10:170)

Translated survey boundaries:
"Houselot. Commence at the south angle and run
N. 21 W. 114 links
then N. 80 E. 100 " along the stone wall
then S. 14 E. 116 " Kamakai's lot
then S. 81 W. 74 " " the stone wall to the point of commencement. .1 acre." (Survey Notes RP 511)

4. Claimant Moo (LCA 2784)
"I, Moo, am a claimant for land at Kawela. There are four lo'i and also two kula. The boundaries are north, Kekua's land, east, Kaunahi, south, Kuheleloa, west, kula...
A houselot is another claim of mine, bounded on the north by the trail and a kula, on the east, a kula, on the west by the lot of Kawi. This is my claim which I had from the makuas, from the time of the Ali'i Kamehameha I, until the present." (Native Register v.3:634)

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"Kalakua, sworn, says he knows the land claimed by Moo in Kawela. It consists of 2 kalo patches and a House site. The 2 kalo patches are bounded on Hauula side by Kauaula's land, - mauka by Paku's land, - Waialua side by Kalamana's land, - makai by Paukoa's land. Claimant has no kula land in Kawela. His House site is near the kalo land and is not enclosed. He has held the land for about ten years....
The Konohiki consented to this claim." (Foreign Testimony v.10:156)

Translated survey boundaries for LCA 2784 are:
"Parcel 1. 2 taro patches. Commence at the south angle and run N. 14 W. 100 links along Kauaula's lot
then N. 82 E. 122 " " the Konohiki's land
then S. 70 E. 41 " " Paukoa's lot
then S. 20 E. 59 " " Kalamana's lot
then S. 70 W. 165 " " Paku's lot to the point of commencement. .13 acre..
"Parcel 2. Houselot. Commence at the south-west angle and run N. 2 W. 158 links
then N. 88 E. 158 "
then S. 2 E. 158 "
then S. 88 W. 158 " . It is surrounded by Konohiki lands. ¼ acre." (Survey Notes RP 512)

5. Claimant Kawi (LCA 2850)
"My houselot is at Kawela, bounded on the north by a fresh water pond, on the east by Moo's house, on the south by a land fence, on the west by the sea.
My right of occupancy is from the time of Kamehameha II." (Native Register v.3:663)

"Kalakua, sworn, says he knows the kalo patch claimed by Kawi in Kawela. It is a Kuele of the Konohiki. Witness /sic/ knows the House site of claimant in Kawela. It is near the sea side and not enclosed. Claimant has lived there some ten years.
The Konohiki consented to the claim for a House Lot, but claimed the kalo patch." (Foreign Testimony v.10:155)

Translated survey boundaries are:
"Houselot. Commence at the south angle and run
N. 3½ W. 133 links
then N. 79 E. 173 "
then S. 30 E. 90 "
then S. 60 W. 228 " along the stone wall. It is surrounded by Konohiki land. .23 acre." (Survey Notes RP 515)

6. Claimant Makaino (LCA 2770:2)
"I, Makaino, am a claimant for land at Keokea /a land division in Kawela just mauka of Kamehameha Hwy./. There is one taro lo'i and a kai /fishery/ and a kula...
My House claim is at Kawela. My right of occupancy was from the time of Kamehameha II." (Native Register v.3:628)

"Claimant's House site is near the sea side, and not enclosed. Claimant has had this land about ten years. He got it from Kaeo.

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The Konohiki consented to this claim." (Foreign Testimony v.10:155)

Translated survey boundaries for LCA 2770:2 are:
"Parcel 2. Houselot. Commence at the south-western angle and run N. 158 links
then E. 158 "
then S. 158 "
then W. 158 " . It is surrounded by Konohiki land. ¼ acre." (Survey Notes RP 513)

7. Claimant Kekua (LCA 2878:2)
"I, Kekua am a claimant of land at Kamoiki,...My house is at Kawela...." (Native Register v.3:676)

"Claimant's House site is in Kawela. It is near the sea side and is not enclosed. Claimant got his land from Kaeo, some 8 or 10 years ago.
The Konohiki had no objections to this claim." (Foreign Testimony v.10:155)

Translated survey boundaries are:
"Parcel 2. Houselot. Commence at the south-western angle and run N. 158 links
then E. 158 "
then S. 158 "
then W. 158 " . It is surrounded by Konohiki land. ¼ acre." (Survey Notes RP 516)

8. Claimant Paukoa (LCA 2734:3)
"I, Paukoa, have a claim for land at Kawela...The houselot is for my kaikua'ana, I dwell in the house. My claim is from my makuas, from the time of Kamehameha I to the present." (Native Register v.3:612)

"He /Paukoa/ has a House site makai of the land. It is not enclosed. He has held the land about ten years.
The Konohiki consented to this claim." (Foreign Testimony v.10:158)

9. Claimant Kauwahi (LCA 2838:2)
"My /Kauwahi's/ house claim is at Kawela, bounded on the north by the sea, on the east and south by kula, on the west by Kekua's /land/. My right of occupancy is from the time of Kamehameha I." (Native Register v.3:658)

"He /Kauwahi/ has a House site which is not enclosed...Claimant has held the land in Kawela for about ten years.
The Konohiki consented to this claim." (Foreign Testimony v.10:159)

Translated survey boundaries are:
"Parcel 2. Houselot. Commence at the south angle and run
N. 15½ W. 225 links along Paukoa's houselot
then N. 74½ E. 120 "
then S. 15 E. 225 "
then S. 74½ W. 120 " " the Konohiki's land. ¼ acre." (Survey Notes RP 510)

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10. Claimant Paku (LCA 2724:3)
"My /Paku's/ house is at Kawela. My right of occupancy was from Kinau." (Native Register v.3:608)

"Kalakoa, sworn, says he knows the land claimed by Paku in Kawela...
His House Site is near the sea side and is enclosed with a wooden fence. Claimant has held the land for over ten years.
The Konohiki consented to this claim." (Foreign Testimony v.10:156)

Translated survey boundaries are:
"Parcel 3. Houselot. Commence at the south-western angle and run N. 250 links along Kuheleloa's parcel
then E. 100 " " the Konohiki's land
then S. 250 " " " " "
then W. 100 " " " " " to the point of commencement. ¼ acre." (Survey Notes RP 514)

11. Claimant Kuheleloa (LCA 2835:3)
"Claimant's House Lot is in Kawela. It is not enclosed. She has held the land since the time of Kaeo (10 years). The land belongs properly to Lono the wife of Kuheleloa, who divorced her husband for adultery.
The Konohiki consented to this claim." (Foreign Testimony v.10:157)

Translated survey boundaries are:
"Parcel 3. Houselot at Kawela. Commence at the south angle and run N. 250 links
then E. 100 "
then S. 250 "
then W. 100 . It is surrounded by Konohiki land. ¼ acre." (Survey Notes RP 509)

12. Claimant I (deceased) (LCA 2682)
According to the Native Register (v.3:588), I claimed 2 lo'i and a houselot in Kawela. However I passed away before the claim could be awarded or surveyed, thus we have no record of the exact location of either the lo'i or the houselot.

"Kalakoa, sworn, says he knows the kalo patch claimed by I, in Kawela. It reverted to the Konohiki recently, on the death of I." (Foreign Testimony v.10:157)

Hanakaoe Ahupuaa

1. Claimant Kamakai (LCA 2617)
"I, Kamakai, hereby state my claim for land at...Hanakaoe is a kaheka pa'akai /salt pool/." (Native Register v.3:658)

2. Claimant Pailalau (LCA 3815)
"...My occupancy of these claims was since the time of Kamehameha II...At Hanakaoe /sic/ is a fishery and a salt bed..." (Native Register v.4:176)

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3. Claimant Kalili (LCA 235 M)
"Revd James Kekela, sworn, says at the time he was drawing up claims for the people of Kawela, the son of Kalili came to him and got Kalili's claim drawn up by witnefs /sic/. It was put in a parcel with other claims and given to Rev^d Mr. Emerson to bring to Honolulu.
Kane, sworn says, he knows the land of Kalili in Kawela. It consists of 5 kalo patches in two pieces.
The first piece, of 3 patches, is bounded on Nauula side by the Konohiki, Mauka by Kookoo's land, Waialua side by the Konohiki, Makai, by Kauula's land.
The second piece, of 2 patches, is bounded on Nauula side by the Konohiki, Mauka by Kookoo's land, Waialua side by the Konohiki, Makai by Kelemana's land.
Claimant's House site is makai of the land. It is enclosed with a wooden fence - there is one house in it. Claimant held the land for about 12 years. He died in March 1849, leaving his property to his daughter Nahuli." (Foreign Testimony v.11:239)

Translated survey boundaries are:
"Parcel 1. 5 taro patches. Commence at the south angle and run N. 16 W. 110 links along Paku's lot
then N. 73 E. 325 " " Kamahi's lot
then N. 45 E. 56 " " the Konohiki's land
then S. 20 E. 155 " " " " "
then S. 73 W. 383 " " Kookoo's lot to the point of commencement. .41 acre.

"Parcel 2. Houselot at Hanakaoe. Commence at the south angle and run N. 14 E. 158 links
then S. 76 E. 158 "
then S. 14 W. 158 "
then N. 76 W. 158 " . It is surrounded by Konohiki lands. ¼ acre." (Survey Notes RP 508)

Olo Ahupuaa

1. Claimant Pakanaka (LCA 2744:2)
"I, Pakanaka, the konohiki of Olo, hereby state my claim for land at Olo. It is...and kalt bed land...
My houselot is at Olo, bounded on the north by that of Kauhikai, on the east by kula, on the south by I's /land/, on the west by the sea. My right of occupation is from the time of Kamehameha I." (Native Register v.3:617-8)

"The land claimed in Olo has not been cultivated for some time.
Claimant's House Lot is in Olo. It is not enclosed...
The Konohiki consented to the claim for one patch and House Lot." (Foreign Testimony v.10:177)

2. Claimant Kauaihikai (LCA 2936:2)
"I, Kauaihikai, hereby state my claim for land at Olo, some melei of 'awa, banana, wauke, sugar cane, two koa canoe trees, and some malei of sweet potato and gourd from the upland to

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the sea...My house claim is at Olo, bounded on the north by a pig pen, on the east by a kula grove, on the south by Pakanaka's /land/, on the west by the sea.
My right of occupancy is from the reign of Kamehameha III." (Native Register v.3:701)

"The other patches claimed, have been abandoned. The cultivation of the kula land has been abandoned.
Claimant's House site is in Olo, and is not enclosed... He died in 1848, leaving his land to Upai his widow, who now claims it.
The Konohiki consented to this Claim." (Foreign Testimony v.10:186)

3. Claimant Hoolae (LCA 2716:2)
"I, Hoolae, hereby state my claim for land at Olo...My houselot is at Olo and is bounded on the north by Kekohai's houselot, on the east by a kula, on the south by Kekuauli's lot, on the west by the sea. My right of occupancy is from the time of Kamehameha II." (Native Register v.3:601-2)

"Claimant's House site is in Olo, near the sea side, not enclosed. He has held the land for a long time. He says he has no kula land in Olo.
The Konohiki consented to this claim." (Foreign Testimony v.10:161)

4. Claimant Kekuauli (LCA 2935)
"My houselot is at Olo, bounded on the north and east by kula, on the south by a land fence, on the west by the sea. My right of occupancy is from the reign of Kamehameha III." (Native Register v.3:700)

Ulupehupehu Ahupuaa

1. Claimant Waauui (LCA 2858:2)
"I, Waauui, hereby state my claim for land at...Ulupehupehu are some gardens of sweet potato and gourd. My houselot is at Ulupehupehu. On the north is the sea, on the east and the south is kula, on the west is the houselot of Kane.
My right of occupancy is from Kamehameha III." (Native Register v.3:595-6)

"Claimant's House site is in Ulupehupehu. It is not enclosed. He has also a patch of noni in that land, which is bounded on all sides by the Konohiki.
The Konohiki consented to this claim." (Foreign Testimony v.10:165)

Translated survey boundaries are:
"Parcel 2. Houselot. Commence at the south-western angle and run S. 158 links
then E. 158 "
then S. 158 "
then W. 158 " to the point of commencement; it is surrounded by Konohiki land. ¼ acre." (Survey Notes RP 340)

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Punalau Ahupuaa

1. Claimant Hanakeekeo (LCA 2781:1)
"I, Hanakeekeo, hereby state my claim for land...My house claim is also at Punalau and is bounded on the north by Kachale's lot, on the east by a kula, on the south by the land fence, on the west by a kula. I have had the right of occupancy on these places from the year of our Lord 1842." (Native Register v.3:632-3)

"Claimant's House site is in Punalau. It is not properly enclosed. He has held the land for about ten years.
The Konohiki consented to the claim for kalo land and a House Lot." (Foreign Testimony v.10:177)

Translated survey boundaries are:
"Parcel 1. Houselot at Punalau. Commence at the south angle and run N. 19 W. 158 links
then N. 75 E. 158 "
then S. 15 E. 158 "
then S. 75 W. 158 " along the stone wall; it is surrounded by Konohiki land. ¼ acre." (Survey Notes RP 533)

2. Claimant Kekua (LCA 2913:2)
"I, Kekua, hereby state my claim for land at Punalau. There is one lo'i bounded on the north and east by kula land, on the south by Kaopuahi's /land/, on the west by Kanehekili. There is cultivated kula and shore land....
My right of occupancy is from the time of Kamehameha I." (Native Register v.3:690-1)

"Claimant's House site is in Kahuku /in Punalau/, and is not enclosed...Kekua died about 2 years ago, leaving his land to Luiki who now claims it.
The Konohiki consented to this claim." (Foreign Testimony v.10:180)

Translated survey boundaries are:
"Parcel 2. Houselot. Commence at the south-western angle and run N. 158 links
then E. 158 "
then S. 158 "
then W. 158 " ; it is surrounded by Konohiki land. ¼ acre." (Survey Notes RP 337)

3. Claimant Kachele (LCA 2861:2)
"I, Kachele, hereby state my claim for land at...Punalau is a cultivated kula...My house claim is at Punalau, bounded on the north by a kalawenne /curved beach, bigger than a cove, smaller than a bay/, on the east by Kaiaalu's lot, south by a land fence, on the west by a kula.
My right of occupancy is from the time of Kamehameha II." (Native Register v.3:667-8)

"Kailiuku, re-examined, says claimant's House site is near his kalo patches. It is not properly enclosed.
The Konohiki consented to this claim." (Foreign Testimony v.10:153)

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Translated survey boundaries are:
"Parcel 2. Houselot. Commence at the south-eastern angle and run N. 4 E. 158 links along the taro patch
then N. 86 W. 158 "
then S. 4 W. 158 "
then S. 86 E. 158 " along the Konohiki's land to the point of commencement. ¼ acre."(Survey Notes RP 524)

4. Claimant Kaopupahi (LCA 2869)
"I, Kaopupahi, hereby state my claim for land at Punalau. There is one lo'i, bounded on the north by Kekua's /land/, on the east by Iosua's /land/, on the south by the kula, on the west by Maulua's /land/. There is also a kula land, from the mountain to the sea...My house claim is at Punalau, bounded on the north by the sea, on the east by a sedge kula, on the south by a land fence, on the west by a kula. My right of occupancy is from the time of Kamehameha I." (Native Register v.3:671)

"Kiha, sworn, says he knows the kalo patch claimed by Kaopupahi in Punalau. Its cultivation has been abandoned. Lo has the cultivation of the kula land mentioned in this claim. Claimant resides lately in Honolulu. He has a House site in Punalau. It is not enclosed. He has held this House site for about ten years.
The Konohiki consented to the claim for a House Lot, but claimed the land." (Foreign Testimony v.10:181-181a)

Translated survey boundaries are:
"Parcel 1. Houselot. Commence at the south angle and run to the N. 45 W. 158 links along the Konohiki's land then
S. 45 E. 158 " " " stone wall then
S. 45 E. 158 " " " Konohiki's land then
S. 45 W. 158 " to the point of commencement. ¼ acre."
(Survey Notes RP 6324)

5. Claimant Iosua Kiha (LCA 2864:2)
"I, I. Kiha, the konohiki of Punalau, hereby state my claim for land at Punalau. There is one lo'i, bounded on the north by a kula land, on the east and south by kula, on the west by Kaopupahi's /land/. There is also kula land, mountain land and shore land...My house claim is at Punalau, bounded on the north by the sea, on the east by the kula, on the south by the land fence, on the west by Kainalu's /land/.
My right of occupancy is from the time of Kamehameha I."
(Native Register v.3:669)

"Kailiuku, sworn, says he knows the 2 kalo patches claimed by Kiha, one in Kahuku and one in Punalau. Neither of them are planted...
The kula land claimed is nahelehele /overgrown with weeds --ed/. It has not been cultivated for some time. Claimant's House Lot is in Punalau, and is not enclosed...
The Konohiki consented to this claim." (Foreign Testimony v.10:179)

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Translated survey boundaries are:
"Houselot. Fenced in - Commence at S. angle and run N. 73 E. 140 links along the Konohiki's land
then N. 17 W. 177 " " " " "
then S. 73 W. 140 " " " " "
then S. 17 E. 177 " " " " " . Area ¼ acre." (Survey Notes RP 520)

6. Claimant Kamalama (LCA 2909)
"I, Kamalama, hereby state my claim for land at Punalau. There are three lo'i, surrounded by kula, a kula cultivated in sweet potato and gourd...My house claim is at Punalau, bounded on the north by the sea, on the east by Kainalu's fence, on the south by a land fence, on the west by Kaohele's fence.
My right of occupancy is from the reign of Kamehameha III."
(Native Register v.3:888-9)

"Kiha, sworn, says he knows the kalo land of Claimant in Punalau. Ic consists of one patch. Ic cultivation has been abandoned, as also that of the kula land mentioned in this claim.
Claimant's House Lot is in Punalau and is not enclosed.
..Kamalama died a few months ago, leaving a widow, Kaloema.
The Konohiki consented to the claim for a House Lot only."
(Foreign Testimony v.10:182)

7. Claimant Kainalu (LCA 2892:2)
"I, Kainalu, hereby state my claim for land...My houselot is at Punalau, bounded on the north by the sea, on the east by Kika's /sic-Kiha's-ed/ houselot, on the south by a land fence, on the west by Kaohele's houselot. My right of occupancy is from the time of Kamehameha II." (Native Register v.3:881)

"Claimant's House Lot is in Punalau and is not enclosed.
The Konohiki consented to the claim for kalo land and a House Lot." (Foreign Testimony v.10:183)

Translated survey boundaries are:
"Parcel 2. Houselot at Punalau. Commence at the south-western angle and run to the N. 158 links
then E. 158 "
then S. 158 "
then W. 158 " ; it is surrounded by the Konohiki's land. ¼ acre." (Survey Notes RP 252)

8. Claimant Kupihea (LCA 2885)
"I, Kupihea, hereby state my claim for land at Punalau, consisting of one lo'i bounded on the north and west by a kula, on the east by Kaopupahi's /land/, on the south by Maulua's /land/. There is also a kula land, mountain land, and a kai /shore area or fishery/...My house claim is at Punalau. My right of occupancy is from the time of Kamehameha I."

"Kailiuku, sworn, says he knows the land claimed by Kupihea. There is one patch in Kahuku and one in Punalau...The patch in Punalau has not been cultivated for a long time. Claimant has no kula land, - he had no House Lot, but lived with some

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friend. He held the kalo patch in Kahuku several years. He left Kahuku some months ago and gave his land to Kiha.
The Konohiki consented to this claim." (Foreign Testimony v.10:181)

9. Claimant Maulua (LCA 2771 - unawarded)
"I, Maulua, hereby state my claim for land at Punalau. There are two lo'i, bounded on the north by Kupihea's /land/, on the east by Kaopupahi's /land/, on the south by kula land, on the west by a kula. There are a fish pond /aimoi/ Puakahi, a kula land, and a mountain /land/ and a shore land...My house claim is at Punalau, bounded on the north by the sea, on the east by a pond, on the south by the kula, on the west by a row of hala. My right of occupancy is from the time of Kamehameha III." (Native Register v.3:629)

"Kiha, sworn, says he knows the 2 kalo patches claimed by Maulua in Punalau. One of them is a Koela and belongs to the Konohiki, and the cultivation of the other has been abandoned. The cultivation of the kula land mentioned has been abandoned.
Claimant has no House Lot - he lives with some one else.
The Konohiki claims all the land mentioned in this claim."
(Foreign Testimony v.10:182)

Kahuku Ahupua

1. Claimant Kauhawale (LCA 2928:2)
"I, Kauhaiwale, hereby state my claim for land at Kahuku... a salt land, and one koa canoe tree. My houselot is at Kahuku, bounded on the north by a mala of weeke, on the east by a taro lo'i, on the south and west by a kuka.
My right of occupancy is from the reign of Kamehameha III." (Native Register v.3:697)

"...Claimant's House site is distinct from his land, and is not enclosed....
The Konohiki consented to the claim for...a House Lot."
(Foreign Testimony v.10:168)

Translated survey boundaries are:
"Parcel 2. Houselot. Commence at the south-western angle and run N. 158 links
then E. 158 "
then S. 158 "
then W. 158 " . This parcel is surrounded by Konohiki land. ¼ acre." (Survey Notes RP 251)

2. Claimant Umeme (LCA 2679:2)
"I, Umeme, hereby state my claim for land at Kahuku...Here at Kahuku is a puna pa'akai /brackish spring?/ and my two hala trees. My houselot is here in Kahuku. Its boundaries are surrounded by kula." (Native Register v.3:2679)

"...Claimant's House Lot is distinct from his land, and is enclosed with a wooden fence...He has held his land in Kahu-

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ku for over 15 years.
The Konohiki consented to this claim." (Foreign Testimony v.10:174)

Translated survey boundaries are:
"Houselot. Commence at North West angle and
run East 220 links along a Road
then South 110 " " Konohiki
then West 220 " " same
then North 110 " " same to the point of Commencement. Area ¼ acre." (Survey Notes RP 259)

3. Claimant Malailua (LCA 2775:2)
"I, Malailua, hereby state my claim for land at Kahuku...A row /or cluster/ of hala trees is at Amo, at Luahine...A salt land is at Luahine. My house claim is here in Kahuku, bounded on the north by a land fence, on the east, south and west by a hala grove. My right of occupancy was from the time of Kamehameha II." (Native Register v.3:630)

"...Claimant's House site is distinct from his land and is not enclosed.
He has held the land for over twenty years...
The Konohiki of Kahuku consented to this claim." (Foreign Testimony v.10:166)

Translated survey boundaries are:
"Parcel 2. Houselot. Commence at the north angle and run S. 68 E. 158 links along the stone wall
then S. 22 W. 158 "
then N. 68 W. 158 "
then N. 22 E. 158 " " " Konohiki's land to the point of commencement. ¼ acre." (Survey Notes RP 534)

4. Claimant Waamui (LCA 2698:1,3)
"I, Waamui, hereby state my claim for land at Kahuku. The name of the mo'o is Puaakea, and I have two lo'i. On the north is Lokea's, on the east is Kailiuku's, on the south is Kaukaha's land, on the west is Kapoe's land.
My right of occupancy is from Kamehameha III." (Native Register v.3:595-6)

"Kailiuku, Sworn, says he knows the two kalo patches claimed by Waamui in Kahuku.
They are bounded on Hanola side by Pahanui's land, - Makua by Kaukaha's land, - Waialua side by Hea's land, - Makai by Pua's land.
...He has held the land in Kahuku for over ten years.
The Konohiki consented to this claim." (Foreign Testimony v.10:145)

Translated survey boundaries are:
"Parcel 1. 2 Taro Patches at Kahuku. Commence at the south angle and run N. 13 W. 71 links along the Konohiki land
then N. 81 E. 250 " " " " "
then S. 8 E. 74 "
then S. 81 W. 241 " " " " " .

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.18 acre...

"Parcel 3. Open flat lands. Commence at the south angle and run N. 10 W. 168 links
then N. 77 E. 205 "
then S. 15 E. 170 "
then S. 80 W. 215 " ; it is surrounded by Konohiki land. .32 acre." (Survey Notes RP 340)

5. Claimant Lokea (LCA 3859)
Waanui also assumes this claim as Lokea had passed away before it was completely processed and awarded.

"I, Lokea, am a claimant for land and kula at Puaakea, consisting of seven taro la'i and the kula...My house is at Puaakea. My right of occupancy is from the time of Kamehameha I." (Native Register v.4:174)

"Kailiuku, sworn, says he knows the kalo land claimed by Lokea in Kahuku. There are 3 patches planted. They are bounded on Hauula side by Pahanui's land, - Mauka by Kaukaha's land, - Waialua side by Hana's land, - Makai by Fun's land. The kula land claimed by Lokea is mahelehele /overgrown with weeds - es/. Claimant's House lot has been abandoned. He held the land for about 12 years. He died the present year leaving his land to Waanui who now claims it.
The Konohiki consented to this claim." (Foreign Testimony v.10:165)

Translated survey boundaries are:
"3 Taro Patches. Commence at the south-western angle and run N. 103 links along the Konohiki's land
then S. 81 E. 241 links along Waanui's land
then S. 8 E. 122 " " Kanahana's land
then S. 85½ W. 256 " " Fun's land to the point of commencement. .23 acre." (Survey Notes RP 334)

6. Claimant Holoaia (LCA 2706:2)
"Kailiuku, sworn, says he knows the kalo land of Holoaia in Kahuku...
Claimant's House site is near the sea side and is not enclosed.
Holoaia held the land for over ten years. He died recently, and his daughter Kaleikini is his Heir.
The Konohiki consented to this Claim." (Foreign Testimony v.10:186)

Translated survey boundaries are:
"Parcel 2. Houselot. Commence at the south angle and run N. 10 W. 158 links
then N. 80 E. 158 "
then S. 10 E. 158 "
then S. 80 W. 158 " ; it is surrounded by Konohiki land. ¼ acre." (Survey Notes RP 244)

7. Claimant Kaukaha (LCA 4341:2)
"I, Kaukaha, hereby state my claim for land in Kahuku...My house claim is at Kahuku. It is bounded on the north by the pasture and on the east, south and west by kula. My right of occupancy is from the time of Kamehameha I." (Native Register v.4:266)

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"Pahanui, Sworn says, he knows the kalo land of Clt. in Kahuku...
Claimant's House lot is makai of his land - not enclosed. He has held the land for over ten years.
The Konohiki consented to this claim." (Foreign Testimony v.11:320)

Translated survey boundaries are:
"Parcel 2. Houselot. Commence at the south angle and run N. 42 E. 165 links
then S. 54 E. 150 "
then S. 38 W. 143 "
then N. 81 W. 184 " along the stone wall; it is surrounded by Konohiki land. ¼ acre." (Survey Notes RP 326)

8. Claimant Makilo (LCA 2779:2)
"I, Makilo, hereby state my claim for land at Kahuku...The kula land is Kuhiva, also Koahale. My right of occupancy is from the time of Kamehameha III." (Native Register v.3:632)

"...Claimant has also a piece of kula land fenced in. It is bounded on all sides by the Konohiki's land. It is planted with wauke, banana' &c. Claimant has held the land over 3 years.
The Konohiki consented to this claim." (Foreign Testimony v.10:167)

Translated survey boundaries are:
"Open flat land. Commence at the south angle and run N. 70 E. 190 links
then N. 5 W. 367 "
then S. 54 W. 310 "
then S. 23 E. 280 " ; it is surrounded by Konohiki land. 3/4 acre." (Survey Notes RP 530)

9. Claimant Nauluhao (LCA 3958:2)
"I, Nauluhao, hereby state my claim for land...My right of occupancy, to this day, is from the time of Kamehameha I. My house is at Kalimalea..." (Native Register v.4:200)

"Kahikapu, sworn, says he knows the land claimed by Nauluhao in Kahuku...
Claimant's House site is in Kahuku, but it is distinct from the land. It is not enclosed. Claimant derived the land from his parents and has held it about 30 years.
The Konohiki consented to this claim." (Foreign Testimony v.10:151)

Translated survey boundaries are:
"Parcel 2. Houselot. Commence at the north-western angle and run N. 84 E. 158 links along the stone wall
then S. 6 E. 158 "
then S. 84 W. 158 "
then N. 6 W. 158 " ; it is surrounded by Konohiki land. ¼ acre." (Survey Notes RP 254)

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10. Claimant Palu (LCA 2738:3)
"I, Palu, hereby state my claim for land in Kahuku...There is a salt land at Ahuaua, a wauke garden and a row of hala trees. My houselot is at Kahuku, and is surrounded by kula.
My right of occupation is from the time of Kamehameha I." (Native Register v.3:614)

"...Claimant's House site is distinct from the land and is not enclosed. He held the land since the time of Kam. II.
Palu died about 2 years ago, leaving his land to his widow, Theibai.
The Konohiki consented to the...House site." (Foreign Testimony v.10:183)

Translated survey boundaries are:
"Parcel 3. Houselot. Commence at the south-western angle and run N. 158 links
then E. 158 "
then S. 158 "
then W. 158 " ; it is surrounded by Konohiki land. ¼ acre." (Survey Notes RP 518)

11. Claimant Luiki (LCA 2690:2)
"I, Luiki, hereby state my claim for land at Kahuku...My house claim is at Kahuku and is bounded on the north by the land fence, on the east by the weed grown kula, and likewise on the south, on the west, a kula.
The occupation of my claim has been from the time of Kamehameha I." (Native Register v.3:591-2)

"...Claimant's House site is distinct from the kalo land and is not enclosed. He derived the land from his ancestors who held from the time of Kam. I...
The Konohiki consented to this claim." (Foreign Testimony v.10:164)

Translated survey boundaries are:
"Houselot. Commence at south angle and run
N. 28 W. 200 links along the Konohiki's land
then S. 62 W. 125 " " " same
then S. 28 E. 200 " " " same
then N. 62 E. 125 " " " same to point of commencement. Area ¼ acre." (Survey Notes RP 339)

12. Claimant Kupau (LCA 2860:2)
Luiki /Luika/ also assumes this claim as Kupau had passed away before it was completely processed and awarded.

"I, Kupau, hereby state my claim for land at Kahuku...A kula land is planted in sweet potato, noni, sugar cane and bananas ...My right of occupancy is from the time of Kahahana." (Native Register v.3:675)

"...Claimant has a piece of cultivated kula land also. It is planted with wauke, bananas &c. It is bounded on Hauula side by a path, - on all the other sides by the Konohiki...
...Kupau has held the land in Kahuku since the time of

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Kam. I. He died the present year, leaving his land to Luiki who now claims it.
The Konohiki consented to this claim." (Foreign Testimony v.10:164)

Translated survey boundaries are:
"Parcel 2. Open flatland. Commence at the south angle and run N. 76 W. 115 links
then N. 20 E. 140 "
then S. 71 E. 100 "
then S. 12 W. 120 " ; it is surrounded by Konohiki land. .14 acre." (Survey Notes RP 338)

13. Claimant Kaohele (LCA 2861:1)
"I, Kaohele, hereby state my claim for land at Kahuku. The name of the mo'o is Lanaha. There are five lo'i bounded on the north by Kalua's holua /a sliding place for sports/, on the other three sides by kula....
My right of occupancy is from the time of Kamehameha II." (Native Register v.3:687-8)

"Kailiuku, sworn, says he knows the land claimed by Kaohele in Kahuku. It consists of 5 kalo patches, in one piece, bounded on Hauula side by the Konohiki, - Mauka and Waialua side by kula land, - Makai by Makoli's land...Claimant has held the kalo land for over 20 years...
The Konohiki consented to this claim." (Foreign Testimony v.10:153)

"Parcel 1. 5 taro patches. Commence at the north-south angle and run S.25 E. 74 links along the Konohiki's land
then S.61 W. 132 " " Pakanaka's land
then S.27 E. 81 "
then N.76 E. 216 " " " "
then S.8½ E. 196 " " the Konohiki's land
then W.64 links
then N.57 W. 105 links
then S.12½ W. 90 "
then N.87 W. 84 "
then N. 2 E. 170 "
then S.70 W. 277 "
then N.35 W. 117 " along the Konohiki's land
then N. 5 E. 188 "
then W.42 E. 73 "
then S.53 E. 122 "
then S.34 E. 83 "
then N.15 E. 70 " along the Konohiki's land
then S.88 W. 122 " " Makole's land to the point of commencement. 1.36 acres." (Survey Notes RP 524)

NOTE: Kaohele's houselot (LCA 2861:1) adjoins the above-described taro patches. This houselot is listed under Punalau ahupua; see description for claimant #3.

14. Claimant Pakanaka (LCA 2744:1)
"I, Pakanaka, the konohiki of Olo, hereby state my claim for land...At Kahuku is one lo'i adjoining those of Kaihiholoa

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and Lonoopuakautia...
My right of occupation is from the time of Kamehameha I." (Native Register v.3:617-8)

"Kailiuku, Sworn, says he knows the kalo patch claimed by Pakaneka in Kahuku.
It is bounded on Hauula side by the Konohiki, - Hauka and Waialua side by Keinalu's land, - Hakui by Hakole's land....
...He has held the patch in Kahuku ten years.
The Konohiki consented to the claim for one patch..." (Foreign Testimony v.10:177)

15. Claimant Kapaisala (LCA 2868.2)
"I, Kapaisala, hereby state my claim for land at Kahuku... My house claim also is surrounded by kula." (Native Register v.3:670)

"Kailiuku, sworn, says he knows the land claimed by Kapaisala in Kahuku...The House site of claimant is distinct from his land. It is not enclosed. Claimant has held the land for 20 years or more.
The Konohiki consented to this claim." (Foreign Testimony v.10:153)

Translated survey boundaries are:
"Houselot. ¼ acre.
N. 20 E. 158 links along the Konohiki's land
S. 70 E. 158 links " " " "
S. 20 W. 158 links " " " "
N. 70 W. 158 links " " " " " (Survey Notes RF 531)

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RECOMMENDATIONS

Additional research hours should be expended in locating more references, specific in nature, that will serve to expand what has been presented both mythologically and historically.

Land records relating to individual awards need to be analyzed and a sketch mapping land use should be drafted from the raw data presented herein.

Early government correspondence and court records relative to land-owners and lands within project boundaries should be examined for new historical and cultural material.

Finally, a cohesive narrative utilizing available data should be developed; this final report should be fairly comprehensive and well-documented.

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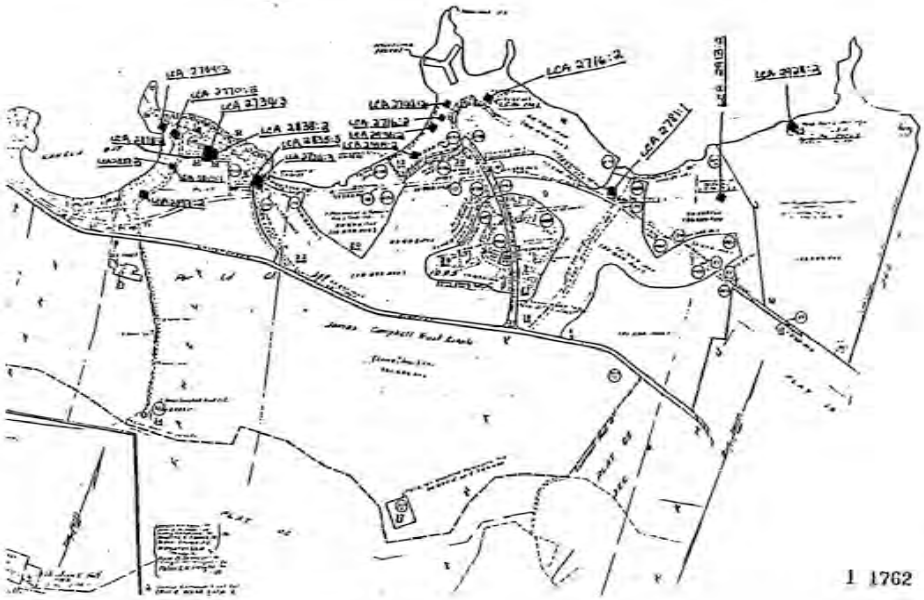
Figure 16.

TAX MAP AND LAND COMMISSION AWARDS (LCA): KAWELA BAY TO KAHUKU POINT

137-100784



C-42

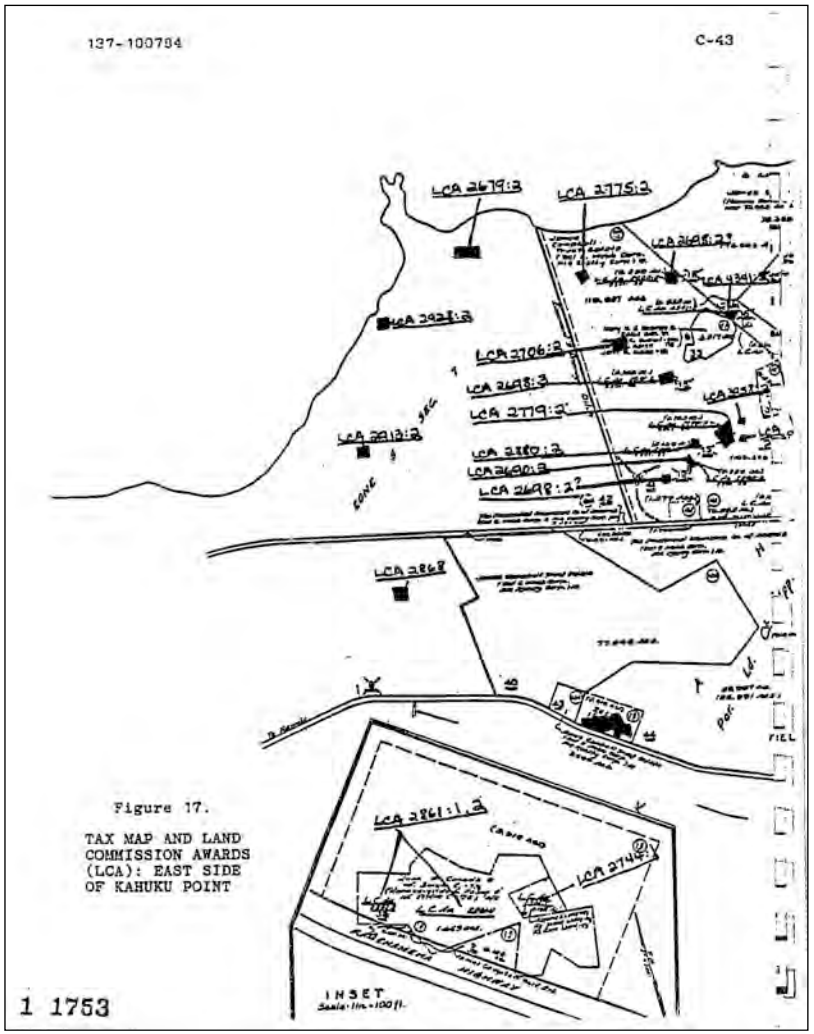


Figure 17.

TAX MAP AND LAND COMMISSION AWARDS (LCA): EAST SIDE OF KAHUKU POINT

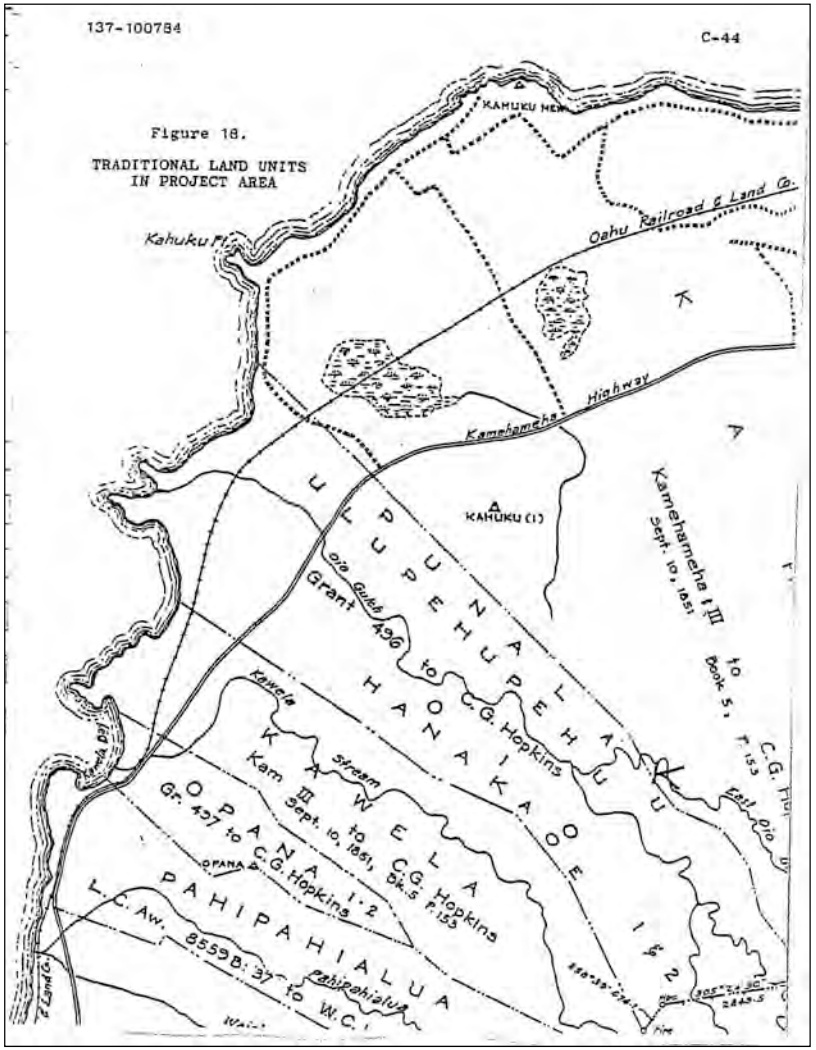
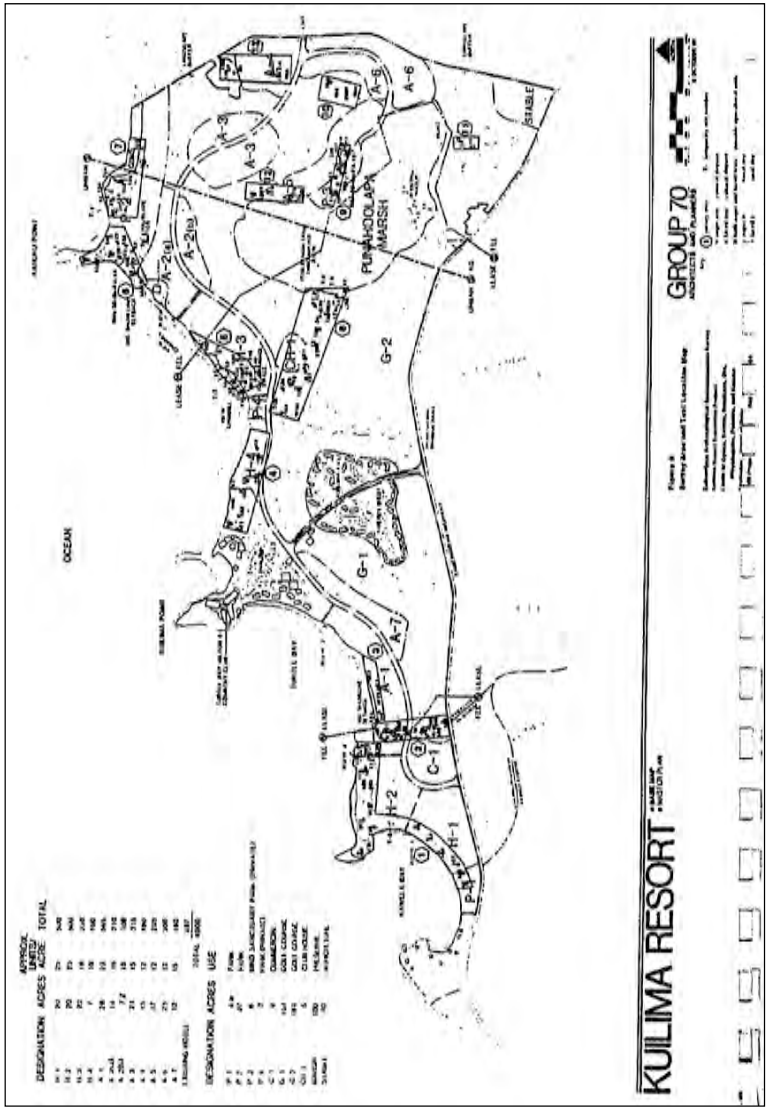


Figure 18.

TRADITIONAL LAND UNITS IN PROJECT AREA



483-040489

APPENDIX A:

PRELIMINARY HISTORICAL DOCUMENTARY RESEARCH PUNAMANO AND MALAEKAHANA GOLF COURSES LAND OF KAHUKU, ISLAND OF O'AHU

by Helen Wong Smith, B.A.

The following presents the findings of a preliminary historical literature search in connection with the five ahupua'a in which the project area is situated. The ahupua'a are Ulupehupehu, Punalau, Kahuku, Malaekahana, and Laie. There is some disagreement as to whether the South project area extends into Laie ahupua'a; however, according to the USGS map, it does, and for this reason a few references to Laie are included within this study. Preliminary historical documentary research on the lands of Opana, Kawela, Hanakaoe, Oio, Ulupehupehu, Punalau and Kahuku, Koolauloa, Island of Oahu was conducted by Carol L. Silva in 1984. Much of Silva's findings on the ahupua'a of Kahuku are presented in this report; in regard to Kahuku, the author has merely attempted to expand on Silva's work.

MYTHOLOGY

Kahuku is an ahupua'a rich with legends, ranging from legends of its one-time separation from the island of Oahu, to legends concerning its hala groves. The following legends are presented here in order to give an indication of how Kahuku was perceived by the ancient Hawaiians.

The natives of the windward side of Oahu, where Kahuku is located, relate a legend that tells of how Kahuku, the northeast point of Oahu, drifted in from the sea and was caught by the people of the Koolauloa district by its two loko (landlocked body of water), and was drawn in to shore and made fast. In evidence thereof, the hollow sound of a section of Kahuku as one rides over the ground is mentioned, and the coastal character of an alleged ancient shore now far inland is referred to as conclusive proof (Thrum 1902:178).

An important legend about Kahuku, similar to the one above, tells how its shore area to the middle of Waialee once formed a small island that floated separate from Oahu at the mercy of strong north to northeast winds. The island had been struck apart from Oahu by Lonokaeho, leaving an open gap at Kalaiokahipa Ridge, now located a mile inland, and leaving the Kahuku plain under water so that ocean waves lapped about Kalaiokahipa.

In reference to these legends concerning Kahuku as an island and Kahuku Plain as submerged, geologists verify that ancient coral reefs are found inland and that a white lime soil covers the flats near the sea (Wilcox 1975). In addition, while touring Oahu in 1928, Levi Chamberlain recorded this tale which gives us more insight into the nature of the land:

> The natives tell a marvellous story respecting the origin of this destrict [sic], which they say floated in from the sea, and attached itself to the ancient shore of the island, that there was a subterranean communication between the sea and the ancient shore, by which a shark used to pass, and make depredations up on land. The basis of the tract, which is from five to seven miles in length, and from one to two miles in breadth, appears to be of coral; and it was evidently redeemed from the sea, as a good deal of land, in many places along the shore around the whole circuit of the island, evidently has been (Chamberlain 1957:35-6).

McAllister (1933) tells another tale of the time when Kahuku was submerged:

> Kane and Kanaloa lived in the vicinity of the ridge (Kalaiokahipa ridge); but that was at the time when the Kahuku plain was still under water, and waves lapped about Kalaiokahipa. The brothers are said to have obtained fish by dipping into two holes on opposite sides of a large rock which now lies in the cane field (Sterling and Summers 1978).

There are many stories which explain the linking of Kahuku to Oahu. Here are two:

> Legend tells us that Kahuku was a floating island situated several miles out to sea. For a long time, the people of O'ahu had planned to make the island a part of their land, for they saw it come close to O'ahu's shores. The floating island of the Menehune did not have any fresh-water springs because there were no high mountains covered with verdure and trees to capture the rains. So, the Little Folk used to paddle their islet into the bays of O'ahu at night to haul water from the springs of the large island.
>
> One day, a resident of Kahuku suggested that all the people gather together to make strong hooks of whalebone and attach then to a stout rope made of sacred Olona fibres. This was done.
>
> The Menehune came to take water as usual, then the residents of O'ahu attached the large hooks to the floating isle while the Little Folk were off at the water-springs. When the water was loaded, the Menehune started to paddle off again, but they could not move their islet or free it from the ivory hooks and Olona ropes.
>
> Today, many people who travel Kahuku section on O'ahu and see the many islets seeming to float off shore, and hear the sea singing its songs, they say, 'Listen to the Menehune grumbling while they try to move their island that used to float!'

> The rumbling and grumbling is heard only at night, for that is the time for the Menehune to be working at Kahuku (Faki 1972:53).

Kamakau's version of the story gives a totally different perspective to the joining of the two land masses. According to him, it was Oahu that did the floating:

> According to traditions of some people, Oahu was said to have once been a floating land, he 'aina lewa o Oahu. The Kahuku side was a wide open gap (puka hamama) and this was called Ka puka o Kahipa a me Nawaiuolewa. "The opening of Kahipa and Nawaiuolewa." The piece of land that closed it up was called Kahuku, and the hooks that made fast the piece of land and joined it to the island were called Kilou and Polou (Kamakau 1974:38-9).

Kalaiokahipa Ridge, within the project area in the ahupua'a of Kahuku, is rich with its own legends. You will notice in the following legends concerning Kalaiokahipa that there is non-concurrence as to the gender of the characters in the legends. The following references concerning Kalaiokahipa Ridge are found in Sterling and Summers (1978):

> Nawai-o-lewa is on the northwest side of the rocky brow of Kalaeokihipa and now only one breast is left to move in the gusty winds of Kahuku-lewa. The other was broken off by that supernatural son of Ku and Hina...Between Kalaeokahipa and Nawaiuolewa, just above is a small round opening to a secret cave...The small secret cave belonged to Ka-alae-huapi (Red head mud hen) and others in the first Kahuku that was covered by a hala grove (J.K. Apuakehau, Kuokoa, June 29, 1922).
>
> The many caves in the porous formation were used as places of burial by the old Hawaiians. On the Waimea side is an overhanging ledge where formerly hung two stalactites from which water continually dripped. They very closely resembled the breasts of a woman, and this was said to be Nawaiolewa, a goddess of the region. Some years ago, a white man removed one of the stalactites, or breasts, according to the story, and the water immediately stopped dripping down from the other (McAllister 1933).
>
> It is here that the breasts of Lewa were set aswy at the brow of the cliff Kahipa (J.A. Kahiona, Oahu Places, Kuokoa, Nov. 28, 1919).
>
> The Hole of Kahipa and Nawaiuolewa is pointed out today but the story is lost. Kanui, a woman 105 years old, told Mary Pukui that the two were brother and sister. In order to make it one, the two sat down and hooked their fingers together and drew the islands together. The hole marks the place where they sat (Kamakau Part II, Moolelo o Hawaii, Note 4, Chap 12; IN Sterling and Summers 1978).

Kahipa, said to be the name of a mythological character, now applied to a place in Kahuku where the mountains present the form of two female breasts.

Kahipa, na waiu olewa	Kahipa with pendulous breasts
Lele ana, ku ka mahiki akea	How they swing to and fro

(Emerson, Unwritten Literature, p.205).

On Nov. 28, 1919, the newspaper Kuokoa published this item (concerning the hooks [loko]) by J.A. Kahiona:

> It was a land that moved to and fro and it was Maui who pinned it down again. Polou and Kalou are deep water holes...All of the islands know the tale that Kahuku was an unstable land (Sterling and Summers 1978).

These water holes are mentioned in the creation myth of the sacred princess, Laiekawai:

> Kahuku district, according to legend, was once a floating island blown about by the winds. As it banged against Oahu, it made noises which disturbed the old women guarding the Princess Laiekawai. The old women grappled the island with fishhooks and attached it securely to Oahu. Polou pool on the sea side of the Kahuku mill is one spot where the hook was fastened. The other end was fastened at Kukio pond, 300 feet inland at Kahuku Point (Boswell 1958:66).

It is through Kamakau and others that we learn of Kahuku's various underground structures and their connections:

> There is only one famous hiding cave, ana huna, on Oahu. It is Pokukaina. The opening on Kalaeoka'o'io that faces toward Ka'a'awa is believed to be in the pali of Kanehoalani, between Kualoa and Ka'a'awa, and the second opening is at the spring Ka'abu'ula-punawai. This is a burial cave for chiefs, and much wealth was hidden away there with the chiefs of old. On the Kona side of the island the cave had three openings, one at Hailikulamanu—near the lower side of the cave of Koleana in Moanalua—another in Kalihi, and another in Pu'iwa. There was an opening at Waipahu, in Ewa, and another at Kahuku in Ko'olauloa. The mountain peak of Konahuanui was the highest point of the ridgepole of this burial cave "house," which sloped down toward Kahuku. Many stories tell of people going into it with kukui-nut torches in Kona and coming out at Kahuku. Within this cave are pools of water, streams, creeks, and decorations by the hand of man (hana kinohinoh'ia), and in some places there is level land (Kamakau 1974:38).

> Two stones known as Kahoa in the water about 250 ft. from the

> beach just opposite from Kalaehila heiau, Kahuku Point. Many years ago a woman who lived on this beach was frequently seen to swim to these stones and disappear. At times she would be gone for as much as a week. Sometimes she was seen to put her clothes in a watertight calabash and swim away. When she returned she usually wore a kou lei. It was finally discovered that this was the entrance to another land, known as Ulukaa or Kahuna Moku (McAllister 1933).

Streams are said to connect Kahuku with Waipahu. In Olelo Noeau (1983), Pukui writes:

Pukana wai o Kahuku.	The water outlet of Kahuku.

> Refers to the outlet of an underground stream that once flowed from Kahuku to Waipahu, O'ahu (Pukui 1983:299)

T.G. Thrum, while touring the Kahuku area by train in the early 1900s, gives us the possible background to the proverb in Pukui.

> A kapa-beating log of peculiar sound, unlike any other known on the island, which was placed in its waters at the close of a kapa-making season to keep it smooth and free from cracks that would impart an impression to the cloth in its manufacture, was missed, and believing it to have been stolen, search was made all through the Koolau, Waialua and other districts till at last it was found in use at Waipahu. Recognizing it by its resonant tone, it was claimed by the searching owner, and right thereto by those in possession was vigorously maintained. To test the truth of ownership as claimed, the Ewa people accompanied the claimant back to Kahuku to visit the scene and witness a test of the underground stream theory. A bundle of ti leaves were gathered, which was wrapped together and consigned to the waters of Punahoolapa (makai of the present project area). In the course of a few days they were lost to sight, whereupon the party set out for Ewa, and after careful watching, as predicted, the bundle of ti leaves came forth on the bosom of the waters of the Waipahu stream. The kapa log was thereupon recognized as the rightful property of the Kahuku claimant (Thrum 1911:130).

Although one thinks of sugar and pineapple when one thinks of Kahuku, this was not always so. Both legendary and early historic references cite the hala groves of Kahuku.

> ...he flew to Kahuku and adorned his neck with wreaths of the pandanus fruit and his head with the flowers of sugar cane." [This showed that he had come from Kahuku] (Thrum 1912:100).

> This is the land of the hala tree..."I sent out word...among the people that there should be no one leaving here (Kahuku) for Waimea or Waialua who had not a wreath of hala-fruit..." (Cummins 1913:241-2).

...men from Kahuku were identified by leis of the orange hala fruit which they wore by order of their chief when they left their ahupua'a... (Wilcox 1975).

Halemano*, while attempting to win back the attention of his wife, composes a chant (Elbert 1965:280-281):

A kukui au a Kahewahewa
Ku au nana i laila,
Haloiloi kuu waimaka e uwe,
Nani na hala ka oiwi o Kahuku,
I ka lawe a ka makani he mikioi.

As I reported to Kahewahewa
I stood and gazed, then
Tears filled my eyes causing me to weep.
How beautiful are the hala, native trees of Kahuku,
As they are being fanned by the Mikoioi wind

Kahuku hala is also mentioned in Emerson (1915:97-98), who relates a story of Hiiaka's trek to Kauai to bring back Lohisu for her sister Pele. Hiiaka encounters two rude creatures who refuse the goddess the slightest acknowledgment. Their discourtesy causes Hiiaka to compose a chant using a word play on "hala" which according to Emerson may be translated to mean "a fault, a sin".

Komo i ka nahele ulu hinalo
Nahele hala o Po'o-kaha-lulu;
Oia nahele hala maki o Kahuku
Heaha la ho'ika hala
I kapu ai o ka leo, e?
I Hookuli ai oe i ka uwalo, e?
E uwalo aku ana au;
Malcko mai oe, e!

We enter the fragrant groves,
Hala groves whose heads make a calm
Wild growths by the sea of Kahuku,
But what, indeed, are your halas?

*Halemano was a mortal who is credited with the evolution of hula. Born in Waianae, Oahu, he becomes "faultless in beauty" (Beckwith 1970:524). He marries the beauty of Puna, Kamalalawalu, who is sought by the chiefs of Puna and Hilo. While seeking refuge at the court of Kukuipahu, ruling chief of Kohala, Kamalalawalu leaves Halemano several times for a new lover. His sister, the sorceress Laenihi, suggests that he win her back by learning the hula. It is during this wooing that the above chant is relayed. Kamalalawalu returns to him only to find that now he is weary of her love.

Shall their murmur forbid you speech?
Make you dumb to my salutation?
I make this kindly entreaty
To you who sit in the grove.

Punamano is the name of a spring and swamp (makai of the project area) (Pukui 1974). McAllister (1933) provides some information on this spring and swamp:

Small water hole, called Punamano, pointed out by Kahione, Kaleo, and Luika Kaio in the flat limestone plain of Kahuku Point. It is about 15 ft. in diameter and brackish in taste. My informants told this story:

One time when the people of Kahuku were fishing they caught a small shark. Putting him in a calabash of water they carried him to their houses near the beach. Here he was cared for and put in larger and larger calabashes as he grew bigger. Finally having outgrown even the largest calabash that could be found, it was decided to place him in one of the pools of brackish water which came to be known as Punamano. A man and woman living near the pool became guardians. They had lived in their grass huts with a breadfruit tree near the pool and taro and potato patches near the mountains for several years when the brother of the woman came to live with them. Sometime after, the man and his wife went to the mountains to gather taro and potatoes. The brother, who was staying at home, thought that he would like to have some food prepared when his sister and her husband returned. He climbed the breadfruit tree and gathered several, throwing the fruit into the water instead of on the ground, where it would have been bruised in the fall. After picking enough for a few days he descended the tree and gathered most of the fruit from the bank. Two had floated to the middle of the pond and he could not reach them. Now this man knew of the shark that lived in the water, but he had frequently bathed in the pool and no thought of fear crossed his mind as he swam to the breadfruit. He did not know, however, that his sister had warned the shark not to allow anyone to steal breadfruit when they were gone. When the sister and her husband returned they could not find the brother. Neither was the shark to be found, but they saw the breadfruit floating in the pool and a reddish color to the water. They guessed what had occurred. For nearly a mile they followed the bloody trail until they came to the spring known as Punahoolapa. Not only was the brother never seen, but the shark has never been seen to this day. A plantation pump now marks the site of the spring, near the sea side of the road.

Another version by S. Kaupuo, recounted in the newspaper, Ka Hae Hawaii in 1861, portrays the brother as a thief, taking the breadfruit for his own needs. At the site of his own home, about 10 fathoms away, the spring had newly appeared, also reddened with his blood.

Thrum (1911:128) also mentions Punamano:

> ...water-holes of the district with certain of them furnishing catches of fish, but only on the nights of Kane. One called Punamano is famed for a shark-man's exploits, and another as having underground stream Ku's rock spring, a lone rock out upon the plain, distant from hill connections, which gives forth its trickling stream of pure spring water.

J.A. Kahiona gives us a version of the same story, placing the focus of the tale at Punahoolapa. He also portrays the shark as a sinister being who can change form at will.

> Nanahu-ka-mano was a pool in which a shark lived and Puna-hoolapa was the pit where he watched for men to eat to fill his stomach. He asked, "Where are you going?" "To the beach for sea weeds, sand crabs, papi crabs and shell fish." "The shark has not yet had his breakfast." When these passed on, he questioned others and told them the same thing that the shark has not yet breakfasted. He, himself was the shark he was talking about that had not eaten breakfast. The mouth of the rascal was on his back, a little below..." (Kuokoa 1919) (eligible for NRHP)

Two other sites in Kahuku ahupua'a, Kukio Pond, a natural basin filled with brackish water located about 300 ft from the sea, and Kasuhelemos Fishpond, once located on the Waimea side of Kahuku, are mentioned by McAllister (1933).

> The pond (Kukio) was formerly much larger and contained many kinds of fish. It is said to have been surrounded by a large Hawaiian settlement. Mrs. John Kaleo is probably the only survivor and her former friends and relatives have been buried in shallow graves in the sand between the pond and the sea.

> Old fishpond known by the name of its guardian (mo'o), Kasuhelemoa, who was half man and half chicken, a being of supernatural power who could change himself at will into a man or chicken. The pond is said to have been fed by a spring. The area has now been turned into cane.

Another site, Waiapuka, situated just outside the South project area, is mentioned by Beck (1970:526) in relation to Laie-i-ka-wai (Laie in the water), mentioned earlier in this study, and her twin sister. The twin sisters were born at Laie on Oahu of Kahauokapaka the father, chief of the northern lands of the island, and Malaekahana. Kahauokapaka had made it known that he should bear a son before a daughter. So when Malaekahana gave birth to the twin daughters, she gave them to close relatives who hid the babies. Laieikawai was given to Waka, who first hid her in a cavern in Laie. Waiapuka pool has a small crevice which is said to open into the cavern where Laieikawai was hidden. The pool was described by McAllister (1933:156-157) as being oval in shape and measuring 30 feet by 60 feet. On Jackson's 1884 map of Laie (IN Bath 1985), a small pond labeled "Laieikawai" is shown on the grassy plain.

A final legend for the Laie-Malaekahana area, which ties mythology with occurrences during the post-contact years, is found in Yent and Estioko-Griffin's report on Malaekahana (1980:12):

> Manuwahi, the keeper of the gods at Laie, lived in a house at Malaekahana with his son and grandson, all three men possessing supernatural powers (Rice 1923:113). At this time, Malaekahana was the only part of Oahu not conquered by Kamehameha I. Kamehameha I had sent his bodyguard Ka-hala-iu with his bravest soldiers to conquer Malaekahana but during the first attempt, Manuwahi had deceived them. On the second attempt, Manuwahi summoned the help of the akua from the North, South, East and West and killed all the soldiers except Ka-hala-iu. Manuwahi sent him back to Kamehameha I who in turn, sent Ka-hala-iu back with more soldiers. This third attempt was again unsuccessful and Malaekahan was never subdued by Kamehameha I. Manuwahi spared Ka-hala-iu's life and Ka-hala-iu decided to stay and help Manuwahi clear the land and plant 'awa.

EARLY HISTORICAL ACCOUNTS

Two of the earliest voyager descriptions of the northwestern part of Oahu mention expanses of cultivated fields and well-inhabited communities. Cook's officers, who assumed command of his ships after his death, provide the following impressions:

> SUNDAY 28th. ...Run round the Northern Extreme of the Isle which terminates in a low Point rather projecting; off it lay a ledge of rocks extending a full Mile into the Sea, many of them above the surface of the Water; the Country in this neighbourhood is exceedingly fine and fertile; here is a large Village, in the midst of it is run up a high Pyramid doubtlessly part of a Morai. I stood into a Bay just to the Westward of this point the Eastern Shore of which was far the most beautifull [sic] Country we have as yet seen among these Isles, here was a fine expanse of Low Land bounteously clothd with Verdure, on which were situate many large Villages and extensive plantations; at the Water side it terminated in a fine sloping, sandy Beach...(Clerk IN Beaglehole 1967:I:572).

> WOA'HOO We saw this Island the beginning of last year, but only just as a high lump. We this Time sailed along its NE & NW sides but say nothing of the Southern part. What we did see of this Island was by far the most beautiful country of any in the Groupe; particularly the Neck that Stretches to the Northward and its NW side. Nothing could exceed the verdure of the hills, nor the Variety which the face of the Country dispaly'd. It /s north-eastern/ parts were cliffy, & rugg'd to

> the Sea side, but the Valley look'd exceedingly pleasant, near the N point we were charmed with the narrow border full of Villages, & the Moderate hills that rose behind them...(King IN Beaglehole 1967:I:610).

In 1794, British captain, George Vancouver, says of Kahuku and the surrounding territory:

> Our examination confirmed the remark of Capt. King excepting that in point of cultivation or fertility, the country did not appear in so flourishing a state, nor to have been at that time, occasioned most probably by the constant hostilities that had existed since that period (Vancouver 1798(3):71).

Besides constant hostilities, a probable reason for a decline in the population of Kahuku and thus decline in cultivation was what one author has called the "devastating scourge of Western diseases" (Lind 1938:40). Venereal disease was introduced at the island of Niihau by the Cook expedition in January 1778 (Kuykendall 1938:14-15). Captain King, on Cook's third voyage, was shocked by its rapid spread in Hawaii between this first contact and the second contact later that same year (Beaglehole 1967:498). Depopulation was general by the time Vancouver returned to the islands in 1792, 1793, and 1794. Kahuku, being at the north point of the Oahu, may have been seriously affected by the disease. Between 1778 and 1823, when the first missionaries compiled estimates of the Hawaiian population, the population had declined from an estimated 300,000 persons to 134,925 (Schmitt 1968:10).

This population decline had severe repercussions. A missionary census (Schmitt 1973) shows a Laie population of 452 in 1831, out of a total Koolau population of 2,891. It is noted that a population loss of 210 for the entire district occurred between 1831 and 1835. In 1838, Hall makes the general statement in regard to Koolauloa: "Much taro land now lies waste, because the diminished population of the district does not require its cultivation" (McAllister 1933:153).

E.S. Craighill Handy (1940:156) notes that, although taro was cultivated at Kahuku, "sweet potato was the primary food in most of the districts of this section...". Handy (1972:287) mentions clusters of houses encircling the small bays along the windward coast at Laie, Kahana, Kaneohe, and Kailua. It is probable that Malaekahana conformed to this coastal pattern but with a smaller population than Laie (Yent and Estioko-Griffin 1980:16). Handy (1940:88) also mentions agriculture in lands mauka of the project site:

> Inland from Kahuku ranch house in Kasinapele Spring. Terrace symbols are shown south of the ranch house, but Judge Rathburn says that there flats were built by Chinese before 1890 for rice paddies. They were irrigated with artesian water, but the water turned brackish and the paddies were abandoned. They were never used for taro. The 1917 map show extensive terrace

> areas in the swampland seaward of Oahu Railway, stretching 1.5 miles south of Kukio Pond. These were originally terraces, were later planted to rice, and are now under sugar cane. According to John Kaleo, there is a small group of terraces up Kahuku Stream or Kaohiaae, its upland branch. Kaleo knew the names of 11 localities where terraces were formerly cultivated.

In Malaekahana ahupua'a, Handy states that there were terraces that were irrigated by Kaukanalaau Stream (1940:89).

In 1828, missionary Levi Chamberlain completed his second circuit of the island of Oahu, during which he had examined students and had generally evaluated the effectiveness of teachers and education upon the native populace. His remarks demonstrate that within Kahuku at that time there still existed a viable and fairly progressive community (Chamberlain 1957:35-6).

> Tuesday Feb. 5th. After breakfast I examined two schools, belonging to Laie & Malaekahana, and was pleased with the appearance of the scholars. At a quarter before 11 A.M. we set out for Kahuku, and after travelling about two hours over a level sandy country, arrived at the school house, where we found 83 scholars assembled, waiting to be examined...A good hog had been cooked for us & when the examination closed, dinner was waiting...my attendants made a heartly meal; and the remainder of the food was placed in the calabashes of our natives, and carried along to furnish food for us when we should be again in need.

LAND USE CHANGES

In 1848, the Mahele, in which Kamehameha III relinquished absolute ownership of all lands, drastically changed the land tenure system in Hawaii. Individuals were given a chance to register legal verifiable claims to their house and agricultural plots. The land that the king received as a result of the Mahele, after the division with the 245 konohiki (high-ranking chiefs) was concluded, was divided into two parts. One part was reserved for the kings and came to be called "Crown lands," while the other part was given over to the Hawaiian government and came to be called "Government lands" (Kuykendall 1938:288-289). As part of Crown Lands, the king (under the name of Victoria Kamamalu) retained the entire ahupua'a of Kahuku, excepting the rights of the native tenants. This amounted to 4,752 acres (Indices 1929:27-8).

The ahupua'a of Malaekahana was awarded to A. Keohokalole, the mother of King Kalakaua, Queen Liliuokalani, Miriam Likelike Cleghorn, and William Pitt Leleiohoku. The 3,280 acres that constituted Malaekahana were parceled out in the following manner during the Mahele (names are tenants who retained the right to cultivate the alii's land):

LCA	Acreage	Awardee	Book	Page
8452	3280	Keohokalole	10	414
8355	.55	Kakau	4	680
8537	.38	Kahawaii	6	14
3870	.22	Puu	6	15
7727	.13	Paukoa	6	15

Three testimonies are given here to give an indication of the agricultural practices in Malaekahana:

LCA 8537 AWARDEE Kahawaii (Deceased) - Kuhapa, sworn, says he knows the land claimed by Kahawaii in Malaekahana. Part of it is planted in wauke. This part is bounded on all sides by the Konohiki's lands. The house site of claimant is not enclosed. Claimant held land from his youth. He died last April (1840). His wife is his heir. Paakahi, sworn, says he knows of 3 kalo patches claimed by Kahawaii in Laie. The Konohiki took this land away because claimant did not got he poalima. The konohiki of Malaekahana consented to this claim.

LCA 7727 AWARDEE Paukoa (Deceased) - Kuhapa, sworn,...in Malaekahana. Part of it has been given up to the Konohiki by claimant's widow. The portion retained by her is planted with wauke. It is bounded on the Hauula sideby Kahoowaha's land, Mauka by Kuhapa's land, Waialua side by Kananui''sland, makai by Nawai's land. Paukoa died in the present year.

LCA 8355 AWARDEE Kakau - ...is not presently cultivated. Part of it was planted last year with bananas, wauke (about half an acre). Claimant occupied these lands since the time of Kamehameha I...

Ulupehupehu and Punalau, which the North project area barely overlaps, were considered part of the ahupua'a of Hanakaoe and were classified as Government lands during the Mahele (Indices 1929:41-43). A tally by Silva (1984) helps in assessing early land use in the following ahupua'a:

Ulupehupehu contained:

15+ kula plots and gardens planted with wauke, sweet potato, gourd, banana, sugar cane
7 koa canoe trees
2 cultivated upland plots planted with wauke, banana, orange trees
1 banana plantation
1 cluster of hala
1 houselot

Punalau contained:

10 taro patches
1 fish pond named Puekahi
10 kula plots and gardens planted w/sweet potato, banana, noni, ulu
4 cultivated upland plots
8 houselots
4 coconut trees
3 shore areas/fisheries
2 koa canoe trees

Kahuku contained

162 taro patches
39 kula plots & gardens planted w/awa, banana, wauke, gourd, sweet potato, sugar cane, noni, watermelon, pili grass
7 cluster of hala
6 salt lands
4 koa canoe trees
2 fishponds
10 houselots
1 sweet potato parch cultivated upon cliffs
1 watercourse bank
3 cultivated upland plots
1 brackish spring
1 wooded upland area of ulu, ohia, kukui, koa, ti,noni, etc...

Testimonies given for the above three ahupua'a can be found in Silva's report (1984:26-36). Bertell Davis (1981) notes that "...the only Land Commission Awards recorded in 1848 for this [general] region are located on the coastal plains (Indices 1929). With the exception of Crown Lands at Kawela and Kahuku, Government Lands at Hanakaoe...there are no Land Commission Awards in the uplands (Davis 1981:9).

The ahupua'a of Laie (6,194 acres) was awarded to King William C. Lunalilo. The Hawaiian historian John I'i (1959) recorded the succession of chiefly control in Laie after the battle of Nu'uanu in the last decade of the 1700s. Kamehameha I gave Laie ahupua'a to his half-brother Kalaimamahu. From Kalaimamahu, control passed to his daughter, Kekauluohi o Mano, and finally to his grandson, Lunalilo (Bath 1985:7). Laie ahupua'a too was subject to the rights of the tenants, and several kuleana were awarded to those who improved small areas for their own purposes. A look at the list of awards indicate that most of the claimants in Laie grew sweet potato and bananas and cultivated taro patches.

As a result of the Mahele, western entrepeneurs eventually acquired large tracts of Hawaiian lands; this later was to have a profound effect on the course of Hawaii's development (Walker 1986). R. Moffitt, an Irish

cattleman, gained control of the konohiki land in Kahuku from the chief in 1846. (Nakamura [1981] dates Moffitt's purchases as late 1850s and early 1860s, which is probably more accurate.) His pastures extended along the shore for 12 miles and inland to the mountain range. His blooded herds and flocks ran over small homesteads scattered here and there through his land, stripping them of verdure. The Hawaiians asked in vain for protection of their (hala) trees and vegetable patches. They wrote to the missionary, Emerson, who urged them to build fences and appealed to authorities in their behalf asking that government pounds be set up to enforce newly established trespass laws. With the disappearance of their hala forests, the people also began to disappear. Once well populated, Kahuku became a lonely sheep and cattle ranch famous for its prize English breeds and its imported water fowl (Wilcox 1975).

In 1850-51, only three years after the Mahele, Englishman Charles Gordon Hopkins, agent for the rental and sale of the Crown lands (Korn 1958:208), purchased over 8,000 acres of Hawaiian lands, some from Moffitt and some in Malaekahana from A. Keohokalole, and founded Kahuku Ranch, a cattle and sheep ranch. In 1861, Laie was conveyed to Henry H. Howland. Other Englishmen who acquired large tracts of Kahuku lands at this time include R.C. Wyllie and H.A. Widemann. By 1873, Kahuku Ranch was owned solely by H.A. Widemann and included the ahupua'a of Kaunala, Pahipahialua, Opana 1 and 2, Kawela, Hanakaoe, Oio 1 and 2, Ulupehupehu, Punaluau, Kahuku, Malaekahana, Keana, and a part of Laie—a total of c. 15,000 ac. Previous archaeological surveys and Loebenstein's 1890 map of Kahuku Ranch indicate that scattered remains of the ranch have also been identified in the vicinity of Punahoolapa Marsh (Bath 1984:33,50; Davis 1986:7-8). In 1874, Kahuku Ranch, was renamed Kahuku and Malekahana Ranch, and was sold to Julius L. Richardson for $45,000 (Thayer 1934:138), and in 1876 Richardson sold the ranch for $63,000 to James Campbell (Wilcox 1975).

The following portion of a news article provides a brief overview of the particulars of Campbell's purchase:

> ...It includes 25,000 acres in fee simple, and large tracts of mountain land under long leases, with $34,000 worth of live stock, including 3,000 head of cattle, with the choice band of merino sheep and horses now on it. It is unquestionably the best stock ranch on these islands, and it has been brought to a high state of perfection under the management of the late proprietors, who divided the plain into ten or twelve large paddocks, walled with heavy stone walls. It stretches from Laie to Waimea, a distance of thirteen miles, and those who have ever visited it must have admired its lovely green pastures of manienie grass so fattening to stock. It is the intention to Mr. Campbell to increase his band of sheep to 30,000 of the choicest breed. The price paid is a handsome one, securing to its present proprietor the most desirable ranch on the Islands, and to Mr. Richardson a comfortable fortune, the result in part of his industry and good management, and in part of the Reciprocity Treaty, the first fruit from which he has been so fortunate as to reap... (Hawaiian Gazette 10/4/1876:3:2).

During the mid-19th century, the isolation of the Kahuku area from the city of Honolulu was being alleviated with the construction of roads. A description is provided by Kuykendall (1835:25):

> On Oahu, what came to be called the "round-the-island road"--ancestor of Kamehameha Highway--extended from Honolulu to Ewa, thence across the central plateau to Waialua; from that place it ran along the coast past Kahuku and Kualoa to Kaneohe, where it joined the road which came over the Nuuanu pali from Honolulu. In 1856, for the first time, a four-wheeled carriage drawn by a pair of horses was driven over the portion of this road between Honolulu and Kahuku. Three years later, a Captain Coffin is reported to have driven with a carriage and span of horses from Honolulu to Kahuku one day in ten hours and to have returned the following day in eight hours.

Campbell had a land colonization scheme to develop and acquired Ewa ranch lands. Meanwhile, Benjamin F. Dillingham spearheaded construction of a railway circling the island. Dillingham and Campbell found that they could best implement their goals by working together. Campbell leased his Kahuku lands to Dillingham for 50 years, the lease commencing Jan. 1, 1890 and concluding Dec. 31, 1939, at an annual rate of $50,000 (Kuykendall 1967:69). Dillingham sub-leased land and water rights to Castle (Liber 128:143), and Castle assigned the sublease to Kahuku Plantation Co., which was incorporated Jan. 30, 1890, to grow cane and produce sugar. Castle was the first president of the Kahuku Plantation Co. (Wilcox 1975).

At first, the plantation relied on pumped spring water, stream water, and rain to irrigate the sugarcane, but these sources were found to be insufficient. Thereafter, the company resorted to artesian wells, which came to be the main source of water (Kuykendall 1967:69).

For its first nine years Kahuku Plantation Co. relied on little coastal vessels which anchored offshore from Kahuku Landing to bring supplies and return raw sugar to Honolulu. Five miles of 36-inch gauge railway, some of it portable, had been laid in 1890 to haul the cane through the plantation fields to the Kahuku mill and thence to the landing. The plantation track extended south opposite Laie and the Mormon settlement, which sent its cane to be ground at Kahuku (Wilcox 1975).

The plantation's Manager's Report of Aug. 31, 1898 (in abbreviated form) is presented here:

> Planted last year...a total of 872 acres of cane--5200 tons of sugar could be expected. Besides these 5200 tons I expect 500 tons more of sugar from short ratoons, on 150 acres from the mauka portion of Malekahana, making crop total of 5700 tons; but then the 500 tons do not come in now, owing to change in rotation of crops caused by the flood, but will be made up in the two following crops as is shown hereafter. I had concluded to crop again, this year, the mauka portion of Malaekahana,

> about 150 acres, to come off next crop, together with field 4/10,by running this mauka portion of Malaekahana into short ratoons and after that raise it for long ratoons so as to bring this part of Malaekahana and field 4/10 into one cane field of about 500 acres. All to come of as long ratoons in 1900. Due to flood, prevented, and the mauka portion of Malaekahana a plant cane crop in 1900 and short ratoons in 1901. (Flood was March 27, Sunday) and for a while it looked as if there would be nothing left of the plantation but a few buildings...There was not a Government Road Bridge left in the district and our two Rail Road Bridges were carried away. Approximate Costs and Repairs of Damage done by Flood:
> Labor - $5,954.52; Railroad and Repair of Bridges: labor - $607.50, material - $392.61, manager - $1,000. Treasurer's Report: sold 4,140 tons at $71.24; Receipts $315,551.59; Expenses $311,370.86

In 1899, the Oahu Railway finally laid track to a terminal at Kahuku. It hauled sugar and the agricultural freight products back and forth across the windward part of Oahu. The Koolau Railway Co. laid tracks from Kahana to Kahuku and served as a common carrier until 1931. From then until the 1950s, its sole function was to carry cane from the northeastern field of the island (Hungerford 1963:77).

In 1900, Alexander & Baldwin, Ltd. (with Castle as its treasurer) became agent for Kahuku Plantation Co., which Castle still headed as president. In 1906, Castle sold his interest to A&B, which then became the largest stockholder, and Henry P. Baldwin, president of A&B, became president of Kahuku Plantation Co. (Wilcox 1975).

The Kahuku community flourished during its plantation day. The plantation's hospital was the only medical facility from Waialua to Kaneohe. The plantation pioneered concrete stoves for laborer's cottages and sanitation drains that were used as models for other plantations. The first plantation day nursery and high school were established by Kahuku Plantation Co. The town of Kahuku boasted the biggest baseball diamond and the first golf course. The company laboratories pioneered the carbonation of white raw sugar, using the native limestone around Kahuku for filter. The company devised the money-saving use of molasses as mill fuel. The company also discovered that night lighting of the fields prevented tasseling and increased sugar yield of cane (Wilcox 1975).

In 1916, the Kahuku Plantation Co. leased 171.5 acres of land to C. Okayama at a rate of ten dollars per acre, per year, for pineapple cultivation (Liber 443:364). Subsequently, the Oahu Railway & Land Co. leased land to several small individual pineapple growers; these growers, through signing "chattel mortgages," were obligated to sell their crops to Hawaiian Pineapple Co., Ltd; Libby, McNeill & Libby of Honolulu, Ltd; and California Packing Corporation. Eventually, large tracts of Kahuku land were leased to California Packing Corporation (later Del Monte Corp.); the Del Monte Corp in 1956 subleased nearly 200 acres in Kahuku to the United

States government, which wanted to use the land for a military training facility. In late 1956, Campbell Estate leased to the U.S. government over 3,000 acres of Kahuku land for military training activities which continue today. In the post-World War II period, sugar experienced fluctuations in value of sales (Schmitt 1977:165). The Kahuku Plantation Co. lasted for about 80 years, officially closing in 1971. A detailed history of the company can be found in the Honolulu Star Bulletin (October 19, 1935) (Nakamura 1981:11).

POST PLANTATION

What does one do with abandoned cane fields? An evaluation, "Kahuku Whole Plant Sugarcane Greenchop as a Ruminant Feedstuff," was conducted in 1973. The conclusion was that "although chopped sugarcane may have a slightly lower digestibility than pineapple greenchop, sugarcane contains considerably more dry matter on a fresh-chopped basis. Based on the results of this study, it can be concluded that chopped whole sugarcane plant from Kahuku is a fairly high quality fodder and should be at least equal to pineapple green chop on a fresh-chopped basis" (Olbrich, Koshi, and Wayman 1973).

Population densities in the Kahuku vicinity changed dramatically after the close of the plantation and is expected to continue changing. The Neighborhood Data Book filed these population trends during the 1970s:

> The population percentage increase between 1970-79 is more than double that for total Oahu for the same period. Predominately young; Filipino and Caucasian...Kamaainan in character...a majority of the residents have resided in Hawaii over 20 years...Over half of the households are below the Oahu median income and 3 out of 5 have incomes in the moderate-lower range. Housing units increased at a greater rate than Oahu's percentage housing units. Three-fourths of land is classified as agricultural and [is] predominately planned as agricultural and open space. Agricultural zoned lands are those with the capacity for intensive cultivation and a minimum lot size of one acre. It is regulated by the State Land Commission, but administered by the counties.

In 1975, the State of Hawaii began purchasing the <u>ma kai</u> acreage of Malaekahana from Campbell Estate for the development of Malaekahan a State Park. The areas that concern the project area are still used as ranch and pasture land. The South project area, which borders Malaekahana and Laie <u>ahupua'a</u>, contains small parcels that are leased to Cackle Fresh Egg Farms, Amorient Aquafarm Inc., and two businesses that run cattle on the lands.

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APPENDIX C

- PACIFIC LEGACY COMMUNICATION LOG - ORGANIZATIONS AND INDIVIDUALS CONTACTED
- KUIWALU CONSULTATION SUMMARY
- KUIWALU APPLICANT'S CONTACT LIST

PACIFIC LEGACY - TURTLE BAY EXPANSION CULTURAL IMPACT ASSESSMENT - CULTURAL INFORMANTS

Name	Affiliation/Association	Contact Log
Ah Quin, Norland	Referred by Dawn Wasson	No contact info obtained
Ah Quin, Samuel	Grew up in Kahuku, brother of Deedee Aki, referred by Ralph Makaiau and Dawn Wasson	Requested contact info from KOOLAULOA NEIGHBORHOOD BOARD NO. 28 members 5/10/11; the Colburn s are neighbors of Sam and elected to talk with him about an interview 6/14/11; called phone number provided by Pua Colburn and the number has been disconnected;
Ah-Quin, William	Referred by Dawn Wasson	No contact info obtained
Ahuna, Gladys Pualoa "Auntie Gladys"	La'ie Community Association; Ko'olauloa Neighborhood Board; Hawaiian Civic Clubs; Lanihuli Hawaiian Civic Club, co-founder; family has lived in La'ie for seven generations	Sent letter to Lanihuli Hawaiian Civic Club address 5/10/11; sent another request letter 6/15/11; 6/10/11Aunty Gladys called the office, but her number was not recorded; letter resent to her to make contact 6/13/11; on 6/17/11 Aunty Gladys called my cell to make contact and left a message for me to call ; 6/17/11 called Aunty Gladys back and we set a date for 12 pm Wed. 6/22/11 to meet in La'ie for interview; Interviewed Aunty Gladys with Junior Primacio at Tita's Café in Kahuku 6/22/11 at 12pm;
Aki, Dee Dee	Grew up in Kahuku, sister of Sam Ahquin; referred by Ralph Makaiau	Requested contact info from KOOLAULOA NEIGHBORHOOD BOARD NO. 28 members 5/10/11
Ako, Buddy	Former. Resident of Kahuku and current TBR employee, familiar with sites	Requested contact info from KOOLAULOA NEIGHBORHOOD BOARD NO. 28 members 5/10/11; 8/22/11Got Uncle Buddy's phone numbers from Uncle Ralph Makaiau; Called Uncle Buddy and asked if he was interested in participating in an interview and he said yes – he thinks that other fishermen who are actually from the area should be interviewed as well, says he's going to coordinate a meeting with the other fishermen to do a joint interview

PACIFIC LEGACY - TURTLE BAY EXPANSION CULTURAL IMPACT ASSESSMENT - CULTURAL INFORMANTS		
Name	**Affiliation/Association**	**Contact Log**
Anamizu, Carol	Cultural practitioner who lived and farmed *ti* in adjacent lands to east (Anamizu Farms); also knowledgeable on Japanese Cemetery; referred by Dawn Chang and Ralph Makaiau	Sent letter to home address 5/10/11; found out from Ralph Makaiau that Carol was living on Molokai for some time, but came back to Oahu to care for an elderly relative who lives in Honolulu (staying at their residence in Honolulu); Pua Colburn did not have contact info for Carol; Called Ms. Anamizu 6/27/11 10 am and she was upset that I had been given the phone number reserved for family and patients – asked me to delete that phone number and call her on a different line later this evening; Called Aunty Carol again at 5:50pm and spoke with her about an interview, she said she would like to participate and that she is booked until the week of July 16th – asked me to call her again Monday of that week; 7/27/11 called Aunty Carol to set a date for an interview and she said she would not return to Oahu until the 10th of August and I said I would call her on the 12th or 15th to set a date; 8/22/11 spoke with Aunty Carol on the phone and she said that my persistence got me into her schedule and she would like to take me for a walk on the TBR premises to introduce me to the *la'au* plants and salt collected by her and several others – she says that she would like to bring Aunty Pua along - will call me back when she gets a hold of Aunty Pua.; Talked to Aunty Carol and she says that she's sick and can't make it on Saturday, but would like me to come out to the project area for the *la'au* plant collection and to attend the TBR development meeting with her; Interview with Aunty Carol at her house on 9/6/11; called Aunty Carol 9/20/11 to see if she was able to make it out to TBR on the weekend; 10/05/11 called – no answer, left message on machine; 10/27/11 called and talked to her daughter (not Joy) and she said she would be in Japan until the end of December, I asked if she could pass on my email address and to have her contact me to let me know if she had a chance to make it out to Kahuku for the *la'au* plant pictures or if she thinks it will be possible to do so after she returns; the daughter said she would pass on info; called 1/10/12 and left a message on answering machine; called 1/30/12 and left another message on answering machine; 2/1/12 left another message on answering machine telling her that I could not add her info into report; 3/8/12 met with Aunty Carol at Turtle Bay so she could show me the locations of the *la'au* and share their medicinal and traditional uses. Took pictures of some plants, but became too dark and rainy to continue taking pictures (was unable to record the uses as I was driving the golf cart and it was sprinkling the whole time). Aunty Carol said we could go over the details over the phone or at her house. As she was sick, she had to conclude the field trip early; 3/15/12 called Aunty Carol to see if she'd like to go over the *la'au* uses, no answer – left message; 3/19/12 called Aunty Carol to see if she'd like to go over the *la'au* uses, no answer – left message; 3/21/12 called Aunty Carol to see if she'd like to go over the *la'au* uses, no answer – left message; 3/23/12 called Aunty Carol again, no answer – left message; called Aunty Carol's cell phone and spoke with her (bad connection – call kept getting dropped), she said she'd call back to set a time before the end of the day Monday 3/26/12; 4/11/12 an interview was conducted to summarize and conclude previous meetings with Aunty Carol; 4/13/12 meet with Aunty Carol to go over interview summary, she had some edit requests, ORF was signed with the agreement that I would make the edits to the interview summary prior to releasing the document for review
Au, Kawika	Aunty Betty Referred him to Corlyn Orr for North Shore 5yr Plan CIA	No contact info obtained
Deceased Awai, James	Lifelong Kahuku resident; family goes back for many generations in the Waialua District	called 11:30 am 5/2/11, wrong number; Requested contact info from KOOLAULOA NEIGHBORHOOD BOARD NO. 28 members 5/10/11; 5/11/11 were informed that Mr. Awai is deceased by Mike Lyons and Tomas Shirai Jr. of the KOOLAULOA NEIGHBORHOOD BOARD NO. 28
Awai-Lennox, Gladys "Honey"	Lifelong Kahuku resident; family goes back many generations in Waialua District; Wai`alua Hawaiian Civic Club .	Sent letter to Wai`alua Hawaiian Civic Club address 5/10/11; sent another request letter 6/15/11
Beirne-Keawe, Danielle Ululani	Ko`olauloa Hawaiian Civic Club, President	Sent letter to Ko`olauloa Hawaiian Civic Club address 5/10/11

PACIFIC LEGACY - TURTLE BAY EXPANSION CULTURAL IMPACT ASSESSMENT - CULTURAL INFORMANTS		
Name	**Affiliation/Association**	**Contact Log**
Bloomfield, Tinker	North Shore Kama`aina, worked in Waimea Valley (25+ yrs) 1978-2003	called 11:35 am 5/2/11, spoke with Ms. Bloomfield was given names and phone numbers of three potential informants: Bob Nakata, Margaret Primacio, and Mark Manley; advised me to attend; Ms. Bloomfield emailed me 6/2/11 the following: "My part-Hawaiian family living at Kawela is the 5th generation who has lived there, and fished there, to supplement our diet." On 6/3/11 I replied to ask if any of these family members would be interested in interviewing with me and she said she would ask and gave me more contact info for Mark Manley, Margaret Primacio, and the Mattoon's
Bridges, Cy	Cultural practitioner of North Shore; Kumu hula; Cultural Director at the Polynesian Cultural Center; resident of Hau`ula	During the phone conversation with Ms. Kela Miller, she asked C. Bridges if he knew of any cultural practitioners gathering materials in the TBR area (as they work in the same office) and he said he did not know of any currently practicing in the area
Chock, Al Keali'i	Adjunct UH Professor of Botany, Ethnobotany of Hawaii	emailed 5/2 2:35pm; Dr. Chock responded via email 5/5/11 3:08pm - Stated that he had no experience in Ko`olauloa District; Dr. Chock sent another email w/ reference to Ms. Katie Kamelamela Master's Defense: Contemporary Native Hawaiian Gathering Practices in Culturally Vibrant Communities; I replied w/ a thank you email 5/7/11
Colburn, John and Pua	Has kuleana land adjacent to project area; Kahuku Burial Committee; referred by Ralph Makaiau and Dawn Wasson	Requested contact info from KOOLAULOA NEIGHBORHOOD BOARD NO. 28 members 5/10/11; D. Wasson gave me the Colburn's phone number during interview 5/18/11; called the Colburn residence phone and reached Ms. Colburn 5/24/11; she said she had done several interviews and that she would like a letter outlining what the interview goals are and then she will call me; sent letter to PO Box address 5/24/11; Ms. Colburn called me at the office 1:15 pm 5/31/11 agreeing to participate in interview, set date for 6/10/11 at 10 am at the Colburn Residence; Called Aunty Pua to ask for contact information for Sam Ah Quin or any other Ah Quin family member, she gave me her latest phone #; called to touch base with the and make sure they know that I haven't forgotten about them and that I'd get resume the Turtle Bay project in a couple weeks; 10/05/11 called to check status, she says she has made some corrections and has to have Uncle John okay them, but he's in the hospital; 10/27/11 called to see what the status is on the summary and she said she's going to send the marked up copy asap; 11/15/12 called and spoke with Aunty Pua, she said she had made some edits to the summary and will send it soon; called 11/30/12 left a message on machine; called 1/6/12 and left a message on machine; called 1/6/12 and left a message on machine
Gemeno, Wayne	Born and Raised in North Shore (Waimea), has been fishing at TBR over 50 years; Member of North Shore Pole Benders & Waialua Casting Club (won many tournaments in area); family fishing here for generations	Approached Mr. Gemeno in the Public Beach Parking at TBR as he was loading his fishing gear into his truck; after a short discussion about his experiences fishing in the area, he agreed to be interviewed; called Wayne and spoke with him about sending him a summary of interview for his review and he agreed 7/27/11.
Cole, Doug	North Shore Community Land Trust, referred by Tim Tybuszewski	Emailed Doug Cole 6/2/11 requesting participation
Hee, Maka`io	Kahuku North Shore Health Center, healer	Called health center 5/2 2:45pm, not in, but will be in tomorrow; spoke with Mr. Hee 5/3 at 9:30am and he expressed his concerns about his practice and the lands of Ku'ilima; sent request letter 5/10/11 to the health center; called Mr. Hee to follow up on request letter and he was not available, receptionist said he may be on leave and gave me the Admin ph #; called Admin # no answer, no machine
Helemano, Butch	Na Hoa o Pu'u o Mahuka, member/volunteer; Hui Malama O Pupukea, member; Pupukea Marine Life Conservation Cultural Practitioner: Kahu, caretaker of ancient sites	Called home or cell number 5/10/11 11:00 am and left a message on machine; called number again 6/1/11 2:15 pm and left another message on machine; Mr. Helemano called office phone and spoke to me 6/1/11 @ 4:45pm, says he will be in Los Angeles until the 22 June, but would like to participate after his return; he requested that I send him an email outlining the goal of the interview and I agreed; 6/2/11 sent email outlining the goals of the CIA and my contact info; called 6/27/11 at 10:55 am and left a message; 7/28/11 received an email reply from B. Helemano apologizing for not getting back to me sooner, says he's been extremely busy – suggests that the best time to reach him for interviews is when he is teaching my Hawaiian class in Waimea Valley on Sundays; emailed Butch 8/22/11 to tell him I'd like to interview him this Sunday before or after his Hawaiian class at Waimea Valley – awaiting response; 8/22/11 later in the day got a response to my email saying that this Sunday would be perfect.

PACIFIC LEGACY - TURTLE BAY EXPANSION CULTURAL IMPACT ASSESSMENT - CULTURAL INFORMANTS		
Name	**Affiliation/Association**	**Contact Log**
Heron, Deedee	Regularly picked limu and fished around Turtle Bay; Referred to me by Tinker Bloomfield	No contact info obtained
Jenkins, Betty "Auntie"	Kumu/Kupuna: Hālau o Hale'iwa, co-founder; OHA, HIDOE, Hawaiian Studies Program, NHEC, Oahu Audubon Stewardship Board ; Active in North Shore, more in Waialea side	Called NHEC office and left message for Ms. Jenkins; Sent letter to home address 5/10/11; 5/14/11 letter returned "no mail receptacle"; called the home phone number and left a message on answering machine 5/18/11 10:50am; 6/1/11 11:24am called Aunty Betty and got through to her, she said that he is interested in participating, but would like to first attend a meeting regarding this issue later this week, she asked me to email her and send a letter to her mailing address; sent letter and email 6/1/11; sent another email 6/15/11
Jonathan Napela Center for Hawaiian and Pacific Studies	Possible knowledge of cultural practices and practitioners in TBR	Sent email 5/10/11; sent another email 6/2/11
Judd, Nanette PhD.	Fmr. director/instructor in, Imi Hoʻola post-BA program at UH, School of Medicine; Center of Excellence (NHCOE) Native Hawaiian dissertation was on laʻau lapaʻau	Called 5/2/11 2:05 pm - Dr. Judd is retired, so I was transferred to Mele Look (Waimanalo Health Center, Board of Directors).
Kahalewai, Sam	Born and raised in Haleiwa, has worked for and against TBR	6/14/11 Was given Mr. Kahalewai's contact info by Kuʻiwalu (Shirlyn Hookano), who said he replied to the TBR notice posted in the newspaper by Kuʻiwalu; 6/20/11 called Mr. Kahalewai to request an interview, but he declined due to health reasons – said he would be interested in sending info at a later date when he is feeling better
Kaluaʻu, Moana	Ko`olauloa Neighborhood Board, Treasurer	called 5/2/11 4:12 pm; Spoke with Moana - she referred me to the Kahuku Neighborhood Board and told me to ask for Didi (no last name provided); also to look into "Keep the Country Country"
Kaluhiokalani, Naomi	Referred by Dawn Wasson	No contact info obtained
Kaluhiokalani, Norman A.	Ko`olauloa Neighborhood Board, member	called 5/2/11 4:12 pm, left message on machine; Sent letter to home address 5/10/11; called home number 6/1/11 and left a message on machine; called business phone and it's no longer in service
Kaluhiokalani, Walter	Referred by Dawn Wasson	No contact info obtained
Kamelamela, Katie	MS Defense: Contemporary Native Hawaiian Gathering Practices in Culturally Vibrant Communities UHM Botany Department; referred by A. Chock	Emailed K. Kamelamela 6/2/11 to ask for participation in assessment; Ms. Kamelamela replied 6/2/11 at 5:21pm and stated that she did know of practitioners in the area, but said that she is busy and doesn't know if her contacts will be interested or have the time. I wrote back 6/3/11 requesting that she pass on my contact information to anyone who might be interested in participating
Kamauoha, Burke and Wanda	Referred by Dawn Wasson	Called phone number provided by Ms. Wasson and reached Burke Kamauoha; he said he was at work but agreed to have me send a request letter to his PO Box; sent letter to PO Box 5/24/11; called 6/1/11 @ 3pm, says he didn't get letter yet, but hasn't checked PO Box in a while, says he will look again for letter and call me when he gets it
Kapua, Charles	`Aha Moku, `Aha Kiʻole Advisory Committee (O`ahu); Cultural Practitioner: Mahiʻai and lawaiʻa, lei maker, weaver; fishing, gathering, agriculture	Sent email 5/2/11; sent another email 6/1/11
Kasuga, John	Referred by Dawn Wasson	No contact info obtained
Kealoha, Jonathan	Referred by Dawn Wasson	No contact info obtained
Keliiluli, Eugene	Referred by Dawn Wasson	No contact info obtained
Keliikuli, Odetta	Referred by Dawn Wasson	No contact info obtained
Kenui, Edna	Referred by Dawn Wasson	No contact info obtained
Kruse, Tyler	Referred by Aimee Vogelsang; Polynesian Cultural Center Public Relations	6/3/11 3:15 pm T. Kruse emailed me, possibly Aimee Vogelsang had given him my info ; wanted to know more about the CIA process and what types of people I was interested in interviewing; I replied 6/5/11 with an outline of the CIA process and my contact info

PACIFIC LEGACY - TURTLE BAY EXPANSION CULTURAL IMPACT ASSESSMENT - CULTURAL INFORMANTS		
Name	**Affiliation/Association**	**Contact Log**
Leota-Pascual, Dannette Kaliko "Sista"	Ko`olauloa Hawaiian Civic Club, Vice President & Historian	Sent letter to Ko`olauloa Hawaiian Civic Club address 5/10/11
Logan, Roland Maiola "Ahi "	Lifelong Ko`olauloa resident; Fisherman	Sent letter to home address 5/10/11; called home phone and left a message on machine 6/1/11 @ 11am; Aunty Gladys and Junior Primacio said they would try to talk to Uncle Ahi to see if he is interested 6/22/11; called home phone and left a message 6/27/11
Logan, Bula	Cultural Practitioner: Malama Na Pua Healing Center, Kahuna; Raised in Laʻie; Hoʻoponopono, E Lua Hoʻolomilomi, Laʻau Lapaʻau,Pule & Spiritual Counseling	called 5/2/11 4:10 pm, left message on machine; Mr. B. Logan returned my call 5/9/11 at 10 am; He expressed that he was not supportive of the expansion and that he is not practicing on Oahu currently; he suggested that I talk to the homeowners on kuleana lands on the SE end of project area, Pua Colburn, & the Ah Quins; Explained the traditional story of Kahuku being originally an island and how it's still not fully rooted onto Oahu; He expressed his concerns about the fragile reef and coastline ecosystem being contaminated by runoff & ground contaminates from the expansion
Look, Mele	Center for Native and Pacific Health Disparities Research; Waimanalo Health Center, Board of Directors	Ms. Look advised me to contact the Ko`olauloa Community Health Center and Ke`ola Mamo (Nat. Hwn. Health Care Systems); gave me Ms. Jenkins email address, advised me that she communicates via email regularly
Maghanoy, Sonny	Referred by Dawn Wasson	No contact info obtained
Makaiau, Ralph	Turtle Bay Resort, Sr. Proj. Manager; Lifelong Kahuku resident; Kahuku Community Association	called 5/2/11 11:15am; would like to be interviewed, set interview date for Friday 5/6/11 at 11 am; interviewed Ralph Makaiau on 5/6/11 at 11 am; Mr. Makaiau toured me through the resort grounds 5/11/11 for nearly 2 hours; 6/1/11called Mr. Makaiau again to see if I could get contact information for Sam Ah Quin and Carol Anamizu, he said he did not have either, but would look into it for me; 8/22/11 called Uncle Ralph to give an update on TBR CIA and that i would get an interview summary to him by the end of the week and asked for Buddy Ako's contact info; called 10/05/11 and 10/27/11 leaving messages to ask what the status is on the summary
Manley, Mark	Kahuku Resident, Defend Oahu Coalition	Called 5/10/11 and number was disconnected or no longer in service; New contact given to me by T. Bloomfield 6/3/11; called Mark 6/6/11 at 4pm and we spoke about CIA and he agreed to participate, but his schedule is tight this week – wants me to call this Friday to make a date after the 13th; called Mark on Monday 6/13/11 and we agreed to meet on Friday 6/17/11 at 4pm; called Mark 7/27/11 to let him know that I hadn't forgotten about him and that I would get his summary to him sometime around mid-August, he says it works out better for him with his hectic schedule; 10/05/11 called, left message; 10/27/11 called, left message; 11/8/11 called, left message and sent an email containing letter and oral release form
Martin, Beverly	Referred by Dawn Wasson	No contact info obtained
Matsuda, Melvin	Kahuku Farms, Co-owner; 3rd generation farmer in Kahuku; Referred by Dawn Chang	Sent letter to home address 5/10/11; 5/14/11 letter returned "no mail receptacle"; faxed letter to Kahuku Farms 5/17/11 4:45 pm; called 6/1/11 and spoke to Clyde – said to call Kylie
Matsuda, Kylie	Kahuku Farms, entrepreneur; 4th generation farmer in Kahuku; Referred by Dawn Chang	Sent letter to home address 5/10/11; 5/14/11 letter returned "no mail receptacle"; faxed letter to Kahuku Farms 5/17/11 4:45 pm; called 6/1/11 and left message on answering service; Kylie called me back 6/3/11 at 11 am to ask about how long an interview would take and that she had already interviewed with Dawn Chang, and I explained that the interview would not take too long and that my interview would differ from D. Chang's in terms of the type of questions asked; Agreed to interview Friday 6/10/11 sometime around noon, but to call at around 9:30am first to make sure.
Mattoon, Creighton Ualani	Ko`olauloa Neighborhood Board, Chair; Fmr. Punaluʻu Community Association	called 5/2/11 3:30 pm, left message on machine; Sent letter to home address 5/10/11; called residence phone 6/1/11 and left a message on machine; T. Bloomfield emails me new contact email address 6/3/11
Mattoon, Cathleen Piʻilani	Ko`olauloa Hawaiian Civic Club, Recorder & Former President	Sent letter to home address 5/10/11; Ms. Mattoon sent a letter outlining concerns about burials 6/13/11

PACIFIC LEGACY - TURTLE BAY EXPANSION CULTURAL IMPACT ASSESSMENT - CULTURAL INFORMANTS		
Name	**Affiliation/Association**	**Contact Log**
McKenzie, Nova-Jean	Former resident of the Kuleana property located on the coast within the TBR property – moved from the area in the 1940's	Was given contact info via email from Ku'iwalu (S. Hookano) 6/23/11; 6/27/11 called Ms. McKenzie and left a message on machine; emailed Ms. McKenzie 6/27/11; Ms. McKenzie returned my call and left a message (with Lisa) saying she was interested in speaking with me, but I was in field for two weeks (KMA project); called Ms. McKenzie 7/27/11 and spoke with her regarding project and we set an interview for August 25, 2011; 8/26/11 sent a thank you email to Aunty Nova-Jean; sent an email 10/30/11 to get in touch w/Kumu McKenzie
McQuivey, Jace L.	Ko`olauloa Burial Council, member; Hawaii Reserves, Inc., Vice President & General Legal Counsel; active in Native Hawaiian cultural and economic affairs	called bus. ph. 5/2/11 3:37 pm, left message on machine; Sent letter to home address 5/10/11; 5/14/11 letter returned "no such number"; resent to Hawaii Reserves address 5/17/11; sent email to Hawaii reserves email address 6/2/11
Merlin, Mark PhD.	UH Professor of Botany, Ethnobotany of Hawaii	Called and left message on machine 5/10/11
Miller, Antya	North Shore Chamber of Commerce, executive director; Neighborhood Board Member, Sunset Beach; lives in Pupukea	called NS Chamber of Comm. 5/2/11 4:05 pm, left message on machine; was called back 5/5/11, told me to call Bob Nakata and Betty Jenkins
Miller, Kela	Ku'ilima North Shore Alliance; Kumu hula; La'ie Kupuna Council; Kahuku resident; resident of La'ie	Spoke with Ms. Miller on 5/9/11 and she said that she does not know of anyone using the property to gather plants or other materials for medicinal or traditional craft purposes for quite some time; Ms. Miller suggested I talk to the Ah Quins, Hanalei Fong, and Pua Colburn. She said she would ask around to see if others knew of cultural practitioners relying on the area.
Nakata, Reverend Bob	referred to me by T. Bloomfield, Dawn Chang, & Kathleen Pahinui as a knowledgeable individual	called 5/2/11 3:58 pm, left message on machine; Sent letter to home address 5/9/11; spoke with B. Nakata 6/1/11 on phone and he agreed to an interview 6/7/11, gave me directions etc.; Interviewed Rev. Bob Nakata 6/7/11 at 9:30 am to 11:00 am, which went well, although not many specifics about the project area; gave me some interesting insights about the history of TBR Development; Called 7/27/11 to let him know that I had not forgotten him and that I would send him a summary along with his copy of the CSH 2006 report that I promised soon (left message on machine); called 11/15/11 spoke with Rev. Nakata and he said he would get to the interview summary and send it to me; called 12/9/12 called Rev. Nakata and he said he would send me an email copy of his amended statement; 1/12/12 called Rev. Nakata and left a message; 1/30/12 called and asked what the status was on the interview summary and statement, he said he thought he'd already emailed it to me and I said I never received it and gave him my email addresses again; 2/2/12
Napeahi, Josanda	Recreation and Security Officer at TBR; 11 years at TBR; Lives in Kahuku (ca. 11 years)	Approached Ms. Napeahi who was attending the information booth with M. Pawn at swimming beach on east side of TBR Hotel; after a few initial questions about fishing etc. in the area, I realized she had a wealth of knowledge about the area's marine resources and cultural practices taking place within and decided to conduct an onsite interview (joint interview with M. Pawn); emailed Ms. Napeahi to let her know that I would be sending the summary in mid-August and apologized for the delay 7/27/11;
Paglinawan, Richard	Cultural Advisor to the Kahuku Burial Committee	Sent letter to home address 5/10/11; no response
Pahinui, Kathleen	North Shore Chamber of Commerce, member/fmr. Chair; The Waialua Community Association, trustee	called 5/2/11 3:56 pm, left message on machine; Ms. Pahinui returned my call @ 4pm and she said she'd like to help; K. Pahinui called 5/10/11 9:45 am and said she would like to email me a few names and she'd like to meet at the Talk Story 3 forum; called Kathleen again and left message on machine 6/1/11; 6/2/11 8:50 am K. Pahinui called back and left message; 6/2/11 I called K. Pahinui back and she told me that she was going to introduce me to the Mattoons, but we did not connect, says those are the people I want to talk to

PACIFIC LEGACY - TURTLE BAY EXPANSION CULTURAL IMPACT ASSESSMENT - CULTURAL INFORMANTS		
Name	**Affiliation/Association**	**Contact Log**
Pawn, Marshall	Recreation and Security Officer at TBR; 7 years at TBR; born in area, lives in Hau'ula; family has been fishing at TBR/Marconi for generations	Approached Mr. Pawn who was attending the information booth with Ms. Napeahi at swimming beach on east side of TBR Hotel; asked him a few questions about fishing etc. in the area, when I realized he had a wealth of knowledge about the area's marine resources and is himself a cultural practitioner who regularly fishes in the area (family doing so for generations) I decided to interview him on the spot (joint interview with Ms. Napeahi); emailed Marshall to let him know that I would be sending the summary in mid-August and apologized for the delay 7/27/11.; emailed him 9/15/11, 10/5/11, 10/27/11
Primacio, John Junior	5th Generation Kahuku Resident	Sent letter to home address 5/10/11; 5/14/11 letter returned "no such number"; resent letter 5/17/11 to PO box ; sent a follow up email 6/2/11; Jointly interviewed with Aunty Gladys Pualoa Ahuna 6/22/11 12pm at Tita's Café in Kahuku; 7/27/11 called Junior and let him know that I had not forgotten him and that I would be sending him a summary of our interview in a couple of weeks, he said that it would be fine ; 09/15/11 sent the interview summary letter; called him 10/5/11 and he said he did not get the letter, so I resent the letter 10/5/11
Primacio, Margaret	Kahuku Villages Association (no longer working here), fmr. Vice President; Kahuku High & Int Account Clerk; 7 generations in Kahuku	called 5/2/11 3:40 pm, left message on machine; Sent letter to Kahuku Villages Association address 5/10/11; 6/1/11spoke to KVA member and they said she no longer works there and that I should try to contact her via Kahuku High; sent letter to Kahuku high 6/1/11; T. Bloomfield passes on new contact info in email 6/3/11; Called M. Primacio 6/6/11 4:15 pm and spoke with her briefly – said she was in a meeting, but got my letter and would call me back
Saunders, Davina Iese	Referred by Dawn Wasson	No contact info obtained
Saunders, Jane Kenui	Referred by Dawn Wasson	No contact info obtained
Saunders, Lonnie	Referred by Dawn Wasson	No contact info obtained
Tybuszewski, Tim	Surfrider Foundation :Possible contacts - Kahuku area surfers	Sent email to Oahu Chapter general email address, was contacted by Tim Tybuszewski [surfrideroahu@gmail.com], who referred me to Doug Cole of the North Shore Community Land Trust: dougcole@hawaii.rr.com or Tim Vanderveer of the Defend Oahu Coalition: tvandeveer76@hotmail.com
Vandevere, Tim	Defend Oahu Coalition	Sent email 6/2/11 requesting participation or info on potential participation
Vogelgesang, Aimee Polynesian Cultural Center Public Relations	Cultural informants for other Polynesian groups	Sent email 5/10/11 2:07 pm; sent a follow-up email to Aimee 6/2/11

PACIFIC LEGACY - TURTLE BAY EXPANSION CULTURAL IMPACT ASSESSMENT - CULTURAL INFORMANTS		
Name	**Affiliation/Association**	**Contact Log**
Wasson, Dawn Kahala Taotafa	Hau'ula Elementary - Kupuna; Ko'olauloa Hawaiian Civic Club, Member; Ko'olauloa Health and Wellness Center, Kupuna Council; Ko'olauloa Neighborhood Board No. 28, Culture Committee, chair	called 5/2/11 3:40 pm, left message on machine; Sent letter to Ko`olauloa Community Health & Wellness Center address 5/10/11; Received call from Ms. Wasson 5/18/11 at 11am who received the letter and would like to interview today because she leaves tomorrow for Alaska until the end of June; Interviewed Ms. Wasson 5/18/11 2-5pm at Denny's Restaurant in Kaneohe; interview not audio recorded by Ms. Wasson request; see CONF D. Wasson int. summary and report section 4.1.2 for details; Sent an email touching base with Aunty Dawn 7/27/11, told her that I would not be able to work on TBR until after mid-may; 7/28/11 received an email from Aunty Dawn stating that she has comments and for me to call her ; 8/22/11 called two times, but message service would not accept new messages – so I emailed Ms. Wasson to respond; 10/5/11 called and talked to her, she said she did not get the next email, resent email; 10/30/11 called her on the phone and said she'd like for me to come meet with her; went to North Shore 11/13/11 to pick up oral release form and she was not available, told me to snail mail it to her; 11/18/11 sent her another copy of interview summary and oral release form to her PO Box; 11/30/11 called and left a message on her phone; 1/30/12 called 852-8778 and her phone was not accepting messages; 1/30/12 called 692-6901 and spoke with Aunty Dawn, she said her computer was down and was unable to view the emailed version of the interview summary, asked me to mail her another hard copy asap and she would get back to me before the 3rd of February (sent letter with printed letter emailed to her in Sept. 2011); called both phone numbers 2/2/12 to see if she received the mail and if she would give me her verbal agreement to use her testimony in the report – left messages; 3/1/12 called both numbers and left message on home phone, reached her on her cell phone and she said she had information to share, but was at a restaurant and would call me back at the office – NEVER CALLED BACK; 3/6/12 sent email letting her know that I would be in Kahuku on 3/8/12 and offered to meet her and that this might be the last chance to add her statement to the CIA, NO REPLY; called 3/15/12 reached Aunty Dawn, she said she has experienced some misfortunes as of late and was unable to receive my messages, letters, and emails; would like to meet with me on Thursday 3/22/12 to go back over the interview summary; 3/22/12 meet with Aunty Dawn in Punaluu to go over interview summary, she advises me to edit some statements and signs the ORF under the agreement that those changes would be made prior to the submittal of the document for review

KUIWALU COMMUNITY CONSULTATIONS

1.0 COMMUNITY ENGAGEMENT PROCESS

1.1 Basis for Consultation

In 2008, the Hawaii Supreme Court determined that the Environmental Impact Statement prepared by Turtle Bay Resort's predecessor was inadequate and required that the EIS be supplemented if TBR was to proceed with its development plans. In the face of this decision, TBR recognized the necessity to "step back" and re-evaluate the existing Master Plan but more importantly to genuinely engage the community in the development process.

It became very evident to the TBR Project Team that the legal challenge to the adequacy of the EIS was merely the "tip of the iceberg" of the community's frustration in unclear engagement from the land owners regarding this stretch of land in Kahuku known fondly to so many as Kuilima or Turtle Bay. For many, places like Kawela Bay represented a pristine ocean resource once full of vibrant marine life, places like Kahuku Point were known as a native Hawaiian burial site, and Kuilima Hotel was a favorite get away for many local families.

The TBR Project Team acknowledged these frustrations and emotions, and recognized that a process of meaningful engagement and dialogue was necessary to re-establish trust and confidence that the TBR would honor and respect this land. Thus over the past two years, TBR and its project team has engaged in proactive community outreach, meeting with over 200 individuals and groups even before the Draft SEIS was announced. Appendix A is a table of the individuals and groups who were engaged in the outreach. Need to check with Lee for the list that was attached to the SEISP prep notice or Debbie may have an updated list of all contacts.

There was a concerted outreach to the Hawaiian community who for many called this land home for many generations before western contact, who continue to exercise traditional and customary practices, and who expressed concerns about potential discovery of iwi kūpuna or human burial remains. The TBR Project Team appreciated that the protection and preservation of cultural resources is not only based upon past practices but the Hawaiian culture is a living culture. Thus, this Cultural Impact Assessment provided the opportunity to incorporate the extensive community outreach that involved not only native Hawaiian cultural practices but emerging cultural practices (i.e. surfing, waterman sports, agricultural uses) into a comprehensive CIA.

1.2 Consulted Parties and Stakeholders

There are a number of families and organizations who have an active and in some cases geneaological relationship to the TBR lands. Key stakeholders with documented cultural, legal, or community affiliation with TBR have been consulted and their views and perspectives given careful consideration. They include the following:

Kahuku Burial Committee who represent families or individuals who have a cultural or lineal connection to these lands and have accepted the kuleana to malama i na iwi kūpuna.

Ku'ilima North Shore Strategic Planning Committee who was established when Kuilima Hotel was initially built and was active in the development of the Unilateral Agreement.

Ko'olauloa North Shore Alliance who is composed of various environmental and public interest organizations whose mission is to preserve "Keep Country Country."

Native Hawaiian Organizations, including Office of Hawaiian Affairs, O'ahu Island Burial Council, Ko'olauloa and Ko'olaupoko Hawaiian Civic Clubs, Malama 'Ohana, Kahuku Community Association, Ko'olauloa Neighborhood Board, etc.

Elected Officials who serve the Kahuku community at the county and state levels.

Government agencies that have regulatory oversight of the resources on the lands to be developed at TBR, including State Historic Preservation Division, Army Corp of Engineers, U.S. Fish & Wildlife Services, Department of Transportation.

1.3 Consultation Process and Methods

TBR sought to re-establish a meaningful community relationship with the general public and particularly with the range of stakeholders involved with the lands at TBR. To achieve this goal, a multi-faced consultation process was undertaken. A deliberate attempt was made by the TBR Project Team to initiate the request with various stakeholders to "listen" them in settings or forums of their choosing. The following is a brief description of the approaches that were engaged in to reach out to the community and some of the results of that engagement.

Individual and small talk story sessions. For many Hawaiians who previously dissociated themselves from community dialogues, requests were made to meet them in informal, one-on-one small talk story sessions. Similarly, elected officials and government agencies were given individualized briefings. For various Hawaiian families, cultural practitioners and resource gatherers, requests were made for small talk story sessions where the discussions could be confidential and respectful.

Group meetings. TBR project team attended regular public meetings of the Ko'olauloa Neighborhood Board and Kahuku Community Association. Presentations were made to various organizations including the Ko'olauloa and Ko'olaupoko Hawaiian Civic Clubs to provide them a briefing of the Revised Master Plan and to get their mana'o on cultural practices or issues and concerns they may have about the project. The Association of Hawaiian Civic Club held their annual convention at Turtle Bay on October 26, 2011 and hosted a panel discussion including Pi'ilani Smith, Creighton Mattoon, Dawn Chang, and Senator Clayton Hee that was moderated by Na'u Kamalii.

Traditional Public Meetings. In an effort to reach out to the broader community, TBR held a large public forum hosted at Turtle Bay Resort on September 15, 2011. The TBR project team convened a public open house and informational meeting. The event was well attended with over 100 people.

Cultural Advisory Council. The TBR Project Team convened a Cultural Advisory Council composed of Hawaiian cultural practitioners, educators, cultural experts, and individuals who could provide cultural guidance to TBR as it revised its Master Plan and SEIS.

Kahuku Burial Committee. Several years ago, TBR convened a group of individuals who have lineal and cultural connections to these lands who accepted the kuleana to malama (care for) any iwi kupuna that may be discovered on the project site as well as within the Ahupua'a of Kahuku. The KBC has met regularly and several may seek formal recognition as lineal or cultural descendants by the O'ahu Island Burial Council for any iwi kupuna discovered on the project site. The KBC's Kahu has been Richard and Lynette Paglinawan, well respected cultural practitioners.

Established a website. The TBR project team established website *www.turtlebayseis.com* to keep the public informed of the progress of the Revised Master Plan and the SEIS. The website also provided opportunity for the community to provide specific input or mana'o on cultural practices and resources in the area.

Publication. The TBR Project team voluntarily published a notice in the StarAdvertiser on, and in the Office of Hawaiian Affairs *Ka Wai Ola* informing the public of its intent to develop specific lands identified by tax map keys, also listing the names of the land commission awardees on the property, requesting any information about cultural resources including potential burials. The publication is attached as Appendix B. We received several responses from the publication and followed up with the respondees.

Ethnographic Interviews. Pacific Legacy conducted 16 ethnographic interviews of individuals who had a personal association with Turtle Bay Resort. Their methodology and results are forthwith.

Table 1. Kuiwalu's Consulted Parties and Stakeholders

Groups	Agencies	Individuals
Adopt-A-Beach Hawai‘i	Board of Water Supply	Bill Paty
Association of Hawaiian Civic Clubs	Councilmember Ernie Martin	Bob Leinau
Beach Access Hawai‘i	Department of Land and Natural Resources	Bob Nakata
Brigham Young University of Hawai‘i	Department Of Transportation	Brett Lee
Building Industry Association	Department of Planning and Permitting	Buddy Ako
Campbell Estates	Governor Neil Abercrombie	Carol Anamizu
Carpenters Union	KHPR - Townsquare	Charlie Toguchi
Continental Pacific/Marconi Point	Land Use Research Foundation	Chhorvy Oung
Defend O‘ahu Coalition	Office of Environmental Quality Control	Christino Bumanglag
Electricial Workers Union	O‘ahu Island Burial Council	Chue Vang Outtaphone
Friends of Kewalo Basin	Office of Hawaiian Affairs	David Arakawa
Friends for Waialua Town	Representative Jessica Wooley	David Baker
Hale‘iwa Community Association	Representive Gil Riviere	Doug Cole
Hau‘ula Community Association	Senator Clayton Hee	Fong Sourivong
Hawai‘i Reserves Inc.	State Historic Preservation Division	Fred Hemmings
Hawai‘i State Body Surfing Association	State Water Commission	Fred Trotter
Hi‘ipaka LLC	U.S. Army Corp of Engineers	Hans Hedeman
Hui Mālama O Pūpūkea Waimea	U.S. Army Garrison Hawai‘i	Inhta Saysiri
Ilioulaokalani Coalition		Jim Anthony
ILWU		John Morgan
Jeanies Fine Jewelry		Junior AhYou
Ka‘a‘awa Community Association		Kathleen Pahinui
Kahana Community Association		Kela Miller
Kahuku Burial Committee		Kent Fonoimoana
Kahuku Community Association		Keona Marks
Kahuku Farmers Association		Kylie Matsuda
Kahuku Healthcare Family Medical Center		Lonnie Sanders
Kahuku Intermediate and High Schools		Manichanh Phongphila
Kahuku Village Association		Mitch Coztino
Kawailoa Ranch		Nainoa Thompson
Kawela Community Association		Nova Jean McKenzie
Keep Kahuku Country		Paul Cleghorn
Keep the North Shore Country		Pete Delacruz
Kohala Collections		Peter Cole
Ko'olau Loa City Neighborhood Board, District #28		Pua Colburn
Ko'olau Loa City Sustainable Community Plan		Ran Sok
Ko'olau Loa City Watershed Plan		Randy Rarrick
Ko'olau Loa Hawaiian Civic Club		Ricardo Rabago
Ko'olau Loa North Shore Alliance		Richard Paglinawan

Groups	Agencies	Individuals
Ko‘olaupoko Hawaiian Civic Club		Roger Corpuz
Kualoa Ranch		Ron Valencia
Groups (continued)		**Individuals (continued)**
Kuilima Estates East Community Association		Samay Sourivong
Kuilima Estates West Community Association		Steve Hoag
Kuilima North Shore Strategic Planning Committee		Sunny Greer
Labors Union		Teo Soukhaseum
Lā‘ie Community Association		Tim Law
Lā‘ie Kūpuna Council		Tom Kiely
Lamont's Sundries		Virgilio Tomas
Lei Lei's/Ian and Mike		Warren Soh
Les Enderton/ Oahu Visitors Bureau		Will Schoettle
Local 5		You Soukaseum
Mālaekahana West Mauka		
Mālama ‘Ohana		
Mason/Bricklayers Union		
North Shore Chamber of Commerce		
North Shore City Neighborhood Board, District #27		
North Shore Community Land Trust		
North Shore Health & Wellness Center		
North Shore Moto Cross Track		
North Shore Outdoor Circle		
NORTH SHORE WEDDINGS & FLOWERS		
Ocean Villas		
Operating Engineers Local 3		
Operating Engineers Local 3 Training School		
Pacific Resourses INC.		
Painters Union		
Paradise Helicopters		
Park Dedications, City Parks and Recreation		
Plumbers Union		
Polynesian Cultural Center		
Punalu'u Community Association		
Pūpūkea Community Association		
Queen Lili‘uokalani Childrens Center, Punalu'u		
Save the Monk Seals		
Save the Sea Turtles		
Shaka Kayaks		
Sierra Club, Hawai‘i Chapter		
Sunset Community Association		
Surfrider Foundation, O‘ahu Chapter		

Groups	Agencies	Individuals
Teamsters Union		
Trust for Public Lands		
Turtle Bay Golf Employees		
Groups (continued)		
Turtle Bay Resort Cultural Advisory Council		
Turtle Bay Resort Hotel Employees		
UH School of Law/Alliance		
U. S. Fish & Wildlife Service		
VAN's Triple Crown		
Waialua Community Association		
Waialua Hawaiian Civic Club		
Waialua Intermediate and High Schools		
Waimea Valley		

APPENDIX D

ETHNOGRAPHIC INTERVIEW QUESTIONNAIRE

Pacific Legacy, Inc.
Cultural Impact Assessment (CIA)
Ethnographic Interview Form

Job Name/#:_____ Interviewer Name:_____

Location:_____ Date/Time:_____

Permission to Record Audio (Y/N):_____

Interviewee Full Name:	Birth Name:
Birth Date:	Occupation/Title:
Current Residence:	Birth Place & Place of formative years:
Years spent in or near subject area:	Affiliation with subject area:
Parents:	Informants/Mentors:

1) How familiar are you with the subject area?

2) What is this area traditionally called? Can you recall any other names of the area?

3) What stories or mythologies have you heard of this area?

4) How would you describe the physical characteristics of the area from your earliest memory?

5) Are there any significant or special features (i.e. landmarks or unique topography) in this area as it relates to land use and/or its history?

6) How was the area used by people in the past?

Land Use Details:

Activity	Types (specific names)	When	Intensity and Frequency	By Who
7) Hunting/ Fishing				
8) Gathering				
9) Agriculture/ Aquaculture				
10) Habitation				
11) Ceremonial				
12) Burial				
13) Other				

3 of

14) Have you observed changes to the land or its resources? Please Explain.

15) What are your thoughts about the project proposal?

16) Additional Comments by the Interviewee:

17) Additional Comments:

Would you like to view the synopsis of the interview prior to CIA report submittal(Y/N)?_____

Time Interview Concludes :_____

Interviewee Signature: _____ Date: _____

APPENDIX E

SIGNED ORAL HISTORY RELEASE FORMS

PACIFIC LEGACY, INC.

ORAL HISTORY STUDY
PERSONAL RELEASE OF INTERVIEW RECORDS

Project: TURTLE BAY CIA

Date of Interview: 6 MAY 2011

I, RALPH MAKAIAU, have been previously interviewed by KIMBERLY MOONEY of Pacific Legacy, Inc. for the above referenced project. I have reviewed the typed summary of the interview and agree that this documentation is complete and accurate, except for the clarifications and corrections noted below. I further agree that the interview information may be used in a report that may be made public, subject to my specific objections and restrictions set forth below.

CLARIFICATIONS AND CORRECTIONS:

SPECIFIC OBJECTIONS AND RESTRICTIONS:

Interviewee Signature

11/29/11

Date

PACIFIC LEGACY, INC.

ORAL HISTORY STUDY
PERSONAL RELEASE OF INTERVIEW RECORDS

Project: Turtle Bay CIA

Date of Interview: 25 August 2011

I, Nwa-Jan McKenzie, have been previously interviewed by Kimberly Mooney of Pacific Legacy, Inc. for the above referenced project. I have reviewed the typed summary of the interview and agree that this documentation is complete and accurate, except for the clarifications and corrections noted below. I further agree that the interview information may be used in a report that may be made public, subject to my specific objections and restrictions set forth below.

CLARIFICATIONS AND CORRECTIONS:

SPECIFIC OBJECTIONS AND RESTRICTIONS:

Interviewee Signature

12-8-11

Date

ORAL HISTORY STUDY
PERSONAL RELEASE OF INTERVIEW RECORDS

Project: Turtle Bay Resort CIA

Date of Interview: 6/14/11

I, Rua John Colburn have been interviewed by Kim Mooney of Pacific Legacy, Inc. for the above referenced project. I agree that the interview information may be used in a report that may be made public.

Rua Colburn
Interviewee Signature

2/2/12
Date

PACIFIC LEGACY, INC.

ORAL HISTORY STUDY
PERSONAL RELEASE OF INTERVIEW RECORDS

Project: TURTLE BAY CIA

Date of Interview: 22 JUNE 2011

I, JUNIOR PRIMACIO, have been previously interviewed by KIMBERLY MOONEY of Pacific Legacy, Inc. for the above referenced project. I have reviewed the typed summary of the interview and agree that this documentation is complete and accurate, except for the clarifications and corrections noted below. I further agree that the interview information may be used in a report that may be made public, subject to my specific objections and restrictions set forth below.

CLARIFICATIONS AND CORRECTIONS:

SPECIFIC OBJECTIONS AND RESTRICTIONS:

Junior Primacio
Interviewee Signature

12/10/11
Date

PACIFIC LEGACY, INC.

ORAL HISTORY STUDY
PERSONAL RELEASE OF INTERVIEW RECORDS

Project: CIA of the Turtle Bay Resort Expansion

Date of Interview: 22 June 2011

I, Gladys K. Pualani Akana have been previously interviewed by Kimberly M. Mooney Pacific Legacy, Inc. for the above referenced project. I have reviewed the typed summary of the interview and agree that this documentation is complete and accurate, except for the clarifications and corrections noted below. I further agree that the interview information may be used in a report that may be made public, subject to my specific objections and restrictions set forth below.

CLARIFICATIONS AND CORRECTIONS:
Name correction: Gladys Kuulei Pualani Kekahuna Pualani - Akana
Father: Peter McRae Enos
Mother: Sophie Naimoa Ka'ili

SPECIFIC OBJECTIONS AND RESTRICTIONS:

Interviewee Signature

30 Sept 2011

Date

ORAL HISTORY STUDY
PERSONAL RELEASE OF INTERVIEW RECORDS

Project: TURTLE BAY RESORT CIA

Date of Interview: 11 APRIL 2012

I, _____, have been interviewed by K. MOONEY of Pacific Legacy, Inc. for the above referenced project. I agree that the interview information may be used in a report that may be made public.

Interviewee Signature

11 April 12

Date

PACIFIC LEGACY, INC.

ORAL HISTORY STUDY
PERSONAL RELEASE OF INTERVIEW RECORDS

Project: Turtle Bay "Koi Oman

Date of Interview: 28 August 2011

I, Butch Kalamau, have been previously interviewed by Kimberly Mooney of Pacific Legacy, Inc. for the above referenced project. I have reviewed the typed summary of the interview and agree that this documentation is complete and accurate, except for the clarifications and corrections noted below. I further agree that the interview information may be used in a report that may be made public, subject to my specific objections and restrictions set forth below.

CLARIFICATIONS AND CORRECTIONS: None

SPECIFIC OBJECTIONS AND RESTRICTIONS: None

Kalu Butch Kalamau
Interviewee Signature

11/23/2011
Date

PACIFIC LEGACY, INC.

ORAL HISTORY STUDY
PERSONAL RELEASE OF INTERVIEW RECORDS

Project: Turtle Bay Cultural Impact Assesment

Date of Interview: 2 February 2012

I, Raymond Ako, have been interviewed by Kimberly Mooney of Pacific Legacy, Inc. for the above referenced project. I agree that the interview information may be used in a report that may be made public.

Raymond A. H. Ako
Interviewee Signature

2/6/12
Date

PACIFIC LEGACY, INC.

ORAL HISTORY STUDY
PERSONAL RELEASE OF INTERVIEW RECORDS

Project: Turtle Bay Resort CIA

Date of Interview: May 18, 2011

I, Dawn K. Wasson have been previously interviewed by Kim Mooney of Pacific Legacy, Inc. for the above referenced project. I have reviewed the typed summary of the interview and agree that this documentation is complete and accurate, except for the clarifications and corrections noted below. I further agree that the interview information may be used in a report that may be made public, subject to my specific objections and restrictions set forth below.

CLARIFICATIONS AND CORRECTIONS:

See corrections and/or changes as dictated.

SPECIFIC OBJECTIONS AND RESTRICTIONS:

Dawn Wasson
Interviewee Signature

03/22/12
Date

PACIFIC LEGACY, INC.

ORAL HISTORY STUDY
PERSONAL RELEASE OF INTERVIEW RECORDS

Project: Turtle Bay Resort Expansion Archaeological Mitigation Plan

Date of Interview:

I, Robert S. Nakata, have been interviewed by Kimberley Mooney of Pacific Legacy, Inc. for the above referenced project. I agree that the interview information may be used in a report that may be made public.

Robert S. Nakata
Interviewee Signature

Feb. 2, 2012
Date

PACIFIC LEGACY, INC.

ORAL HISTORY STUDY
PERSONAL RELEASE OF INTERVIEW RECORDS

Project: TBR

Date of Interview: TURTLE BAY CULTURAL IMPACT ASSESS. 11/5/11

I, MARK K. MANLEY, have been previously interviewed by KIMBERLY M. MOORE of Pacific Legacy, Inc. for the above referenced project. I have reviewed the typed summary of the interview and agree that this documentation is complete and accurate, except for the clarifications and corrections noted below. I further agree that the interview information may be used in a report that may be made public, subject to my specific objections and restrictions set forth below.

CLARIFICATIONS AND CORRECTIONS:

SPECIFIC OBJECTIONS AND RESTRICTIONS:

Mark Manley
Interviewee Signature

12/1/11
Date

11:52:58 p.m. 11-08-2011

Pacific Legacy

ORAL HISTORY STUDY
PERSONAL RELEASE OF INTERVIEW RECORDS

Project: Cultural Impact Assessment (CIA) of Turtle Bay Resort Expansion

Date of Interview: August 2011

I, Josanda Nagasaki, have been interviewed by Kimberly of Pacific Legacy, Inc. for the above referenced project. I agree that the interview information may be used in a report that may be made public.

Josanda Nagasaki
Interviewee Signature

11/08/11
Date

ORAL HISTORY STUDY
PERSONAL RELEASE OF INTERVIEW RECORDS

Project: Cultural Impact Assessment

Date of Interview: 9/22/11

I, Marshall K Pawn, have been interviewed by Kimberly M. Maroney of Pacific Legacy, Inc. for the above referenced project. I agree that the interview information may be used in a report that may be made public.

Interviewee Signature

11/10/11

Date

PACIFIC LEGACY, INC.

ORAL HISTORY STUDY
PERSONAL RELEASE OF INTERVIEW RECORDS

Project: Proposed Turtle Bay Resort expansion

Date of Interview: June 10, 2011

I, Kylie Matsuda, have been previously interviewed by Kimberly Maroney of Pacific Legacy, Inc. for the above referenced project. I have reviewed the typed summary of the interview and agree that this documentation is complete and accurate, except for the clarifications and corrections noted below. I further agree that the interview information may be used in a report that may be made public, subject to my specific objections and restrictions set forth below.

CLARIFICATIONS AND CORRECTIONS:

1st paragraph: I started Kahuku Farms in 2005 specifically for our agtourism project, not to be confused with our farming operation - Matsuda - Fukuyama Farms in which our generations of farming is built on. (Just want to clarify so people dont think I have taken over farming operation of 300 acres) all else looks ok.

SPECIFIC OBJECTIONS AND RESTRICTIONS:

My interview can be used for Turtle Bay Expansion Research, but I do not wish to make it public information.

Kylie Matsuda

Interviewee Signature

11/30/11

Date

APPENDIX F

ADDITIONAL STATEMENTS SUBMITTED

REVEREND ROBERT NAKATA
CATHLEEN PI'ILANI MATTOON

From: [redacted]
To: [redacted]
Sent: 11/12/2011 8:21:07 A.M. Hawaiian Standard Time
Subj: Turtle Bay Archaeological Mitigation Plan

11/12/11

Turtle Bay Archaeological Mitigation Plan of August 2006
Must Be Formally Submitted

The owners of Turtle Bay Resort submitted an archaeological mitigation plan in August 2006 to replace the one officially accepted and approved by the State Historic Preservation Division (SHPD) in March 2005. This 2006 plan was done and submitted, in all likelihood, because Turtle Bay was caught grubbing along the Alpha Road without required SHPD permit in late 2005 or early 2006, as a close reading of correspondence between Turtle Bay and SHPD reveals.

After being caught doing this illegal grubbing, Turtle Bay goes to SHPD, offering to do a new mitigation plan, in spite of having the approved March 2005 Plan. SHPD agrees to this, chastising Turtle Bay for not getting a permit for the Alpha Road grubbing but not fining or punishing Turtle Bay in any way for it. The impression is left that the new plan is agreed to by Turtle Bay in lieu of a fine or other sanctions. Turtle Bay agrees to strict guidelines for preconstruction survey work to identify archaeological sites, especially burials. These guidelines call for much trenching work at all proposed construction sites, with strong probability ratings for possible sites.

When the August 2006 Plan was submitted, SHPD Administrator Melanie Chinen's response is to ask Turtle Bay to completely redo its resort master plan because of the high probability of burial sites at all construction sites, a 200 meter shoreline setback, which is extraordinarily large again because of the high probability of running into burial sites. So the August 2006 Plan paid for by Turtle Bay must have been damning for Turtle Bay.

After Chinen's response was publicized by the Advertiser (but not the Plan itself), Turtle Bay withdrew the 2006 Plan from SHPD, saying Chinen's

response was unwarranted and would jeopardize its 400 million dollar financing package. The State Attorney General agreed to allow Turtle Bay to withdraw the August 2006 Mitigation Plan (remember, done and paid for by Turtle Bay), so it has not been officially seen by the Oahu Island Burial Council). Neither has SHPD itself processed it for approval, so the March 2005 approved mitigation is still the officially approved plan. Turtle Bay has therefore not been punished for its illegal grubbing in 2005-2006 because SHPD has not ruled on the acceptability of the August 2006 Mitigation Plan. Turtle Bay should be required to resubmit it for approval before the Supreme Court ordered SEIS is approved. It has been several years since Turtle Bay changed hands and the 400 million dollar financing plan was abandoned, more reason the new owners should be required to have a new, approved mitigation plan before the SEIS is done and approved.

The Defend Oahu Coalition (DOC) acquired the August 2006 Mitigation Plan through the Freedom of Information Act and has widely disseminated it and the correspondence between SHPD and Turtle Bay that led to its creation, Melanie Chinen's response, Turtle Bay's response to her response, the Attorney General's response. These documents have been given to you, Mr. Aila, DLNR Director, for your action.

It should also be pointed out that the section of the August 2006 Plan dealing with the Alpha Road grubbing in 2005-2006, if carefully read, indicates the three previously (1980's) identified sites could not be found, leaving the strong suspicion that the sites were destroyed by the grubbing. This should be addressed in the SEIS.

Ko'olauloa Hawaiian Civic Club

PO BOX 532
HAUULA, HI 96717

June 13, 2011

Kimberly M. Mooney, Archaeologist
Pacific Legacy
Aulike Street, Suite 301
Kailua, Hawaii, 96717

Dear Ms. Mooney,

Attached is a letter dated May 10, 2006 which summarizes my affiliation with The Ko'olauloa Hawaiian Civic Club. Included here also is a copy of the KHCC resolution of April 20, 2006 opposing the planned development at Kuilima. The action taken by the organization is necessary to meeting the objectives of KHCC.

At the meeting of the Oahu Island Burial Council, June 14, 2006 I requested recognition of KHCC as claimant to the iwi kupuna at Kuilima and requested to be considered cultural advisors. We also supported the need to reassess the mitigation measures Kuilima was following at that time. We supported the Kuilima Archaeological Mitigation Plan summited by Hallet Hammatt of Cultural Surveys Hawaii, August 2006. We are familiar with CSH work and have high regard for their staff.

Of major concern to KHCC is the impact development has had on the burial sites of our ancestors. We have had to malama too many iwi desecrated by developers in Ko'olauloa. We will object to the removal of any kupuna for the purpose of construction of structures including roads. To thrive the Hawaiian needs both land and sea, therefore the impact on cultural practices by development must be recognized and mitigated.

Presently, KHCC is participating in meetings with Turtle Bay Representative Drew Stotesbury of Replay Resorts. We look forward to review of your findings and recommendations.

Sincerely,

Cathleen Pi'ilani Mattoon
Ko'olauloa Hawaiian Civic Club
Past President and Board Member

enclosures: reso 5/11/06 and letr. OIBC 6/10/06

To: Ko'olauloa Neighborhood Board No., 28
From: Ko'olauloa Hawaiian Civic Club
Subject: Opposition to the Turtle Bay Resort expansion
Date: May 11, 2006

Ko'olauloa Hawaiian Civic Club was founded in 1924 by William Isaac Kanakanui a highly respected leader in the Hawaiian community. We are dedicated to the preservation and practice of our culture and we support the well being of our people through participation in government, health, education and economic development.

On April 20, 2006 the following resolution was passed by the Association:

The Ko'olauloa Hawaiian Civic Club opposes the planned Turtle Bay expansion for the following reasons:

1. *The 20 year old plan did not take into account any cultural impact of the project. There is concern that na iwi kupuna and other burial items will be disturbed and that native Hawaiian traditional and customary practices will be restricted.*
2. *The plan did not address the social impact of the development*
3. *The Lead Oahu Archeologist for the State Historic Preservation Division of the Department of Land & Natural Resources has informed us that after ten years a new archeological study would be conducted for the area to be developed.*
4. *A development of this size (4,000 hotel and condominium units) would severely impact the two lane Kamehameha Highway from Kahalu'u to the North Shore.*
5. *The plan does not take into account the cumulative impact this development along with planned hotel and housing developments in La'ie will have on the infrastructure, highway, water supply, emergency services, schools, etc. in Ko'olauloa and the North Shore.*

This planned development would affect not only the life style of the North Shore but all of O'ahu since it will have removed the last bit of country that island residents as well as visitors have come to enjoy. Changes have occurred in the past 20 years and common sense would seem to indicate that, at the very least, a thorough reevaluation of this plan is in order.

In closing we wish to emphasize the fact that we will not accept the removal of na iwi kupuna for reburial elsewhere. Our burial grounds are as sacred as any cemetery and we will not accept their desecration for the sake of tourism.

Cathleen Mattoon, President

Ko'olauloa Hawaiian Civic Club

June 10, 2006

Chairman
Oahu Island Burial Council
601 Kamokila Boulevard, Rm 555
Kapolei, Hawaii 96707

Re: Kuilima Resort Expansion Plans

Aloha,

This is a request for recognition of the Ko'olauloa Hawaiian Civic Club as a cultural claimant to Na Iwi Kupuna in the Ko'olauloa moku and more specifically to Na Iwi Kupuna threatened by the expansion plans of Oak Tree at Kuilima, Oahu. KHCC is an acknowledged claimant for Na Iwi Kupuna of Kualoa Regional Park and Mokapu on the Marine Corps Base in Kaneohe. KHCC is included in the repatriation and reinterment processes at both sites. Additionally, KHCC is a consulting party to the Department of Transportation and the Board of Water Supply for all projects in Ko'olauloa.

Ko'olauloa Hawaiian Civic Club was established in June 1924 with these objectives: (1) Preserve Hawaiian historic sites, mele and language. (2) Assist in the education of those of Hawaiian ancestry. (3) Participate in civic, economic and social welfare of the Hawaiian community.

The position adopted by the membership of KHCC on May 11, 2006 declares our opposition to the planned expansion at Turtle Bay. This 20-year-old plan did not include cultural or social impacts. Please be informed that KHCC takes the position that we will not accept the removal of Na Iwi Kupuna for reburial elsewhere. Our burial grounds are as sacred as any cemetery and we will not accept their desecration for the sake of tourism.

Mahalo nui,

Cathleen Pi'ilani Mattoon

Cathleen Pi'ilani Mattoon, President

APPENDIX G

PICTURES OF TURTLE BAY RESORT
LĀʻAU

Beach *naupaka(Scaevola taccada)*, east side of Kuilima Bay shoreline, facing northeast.

Beach *naupaka (Scaevola taccada)*, east side of Kuilima Bay shoreline, close up.

***Hau* (*Hibiscus tiliaceus)* tree, mauka of Lele's Restaurant, facing northeast.**

***Hau* (*Hibiscus tiliaceus)* flower, mauka of Lele's Restaurant, close up.**

***Hinahina* (*Heliotropium anomalum*), near Kahuku Point, facing north.**

***Hinahina* (*Heliotropium anomalum*), near Kahuku Point, close up.**

***Hala* tree (*Pandanus tectorius*), northeast of hotel, facing southwest.**

***Hala* tree (*Pandanus tectorius*), southwest of hotel, close up.**

***Lauwaʻe* (*Phymatosorus scolopendria*), parking lot west of Ocean Villas, facing east.**

***Pōhuehue* (*Ipomoea pes-caprae subsp. Brasiliensis*), near Kahuku Point, close up.**

APPENDIX E:

MARINE RESOURCES IMPACT ANALYSIS

E

Turtle Bay Resort

Nearshore Marine Ecosystem Survey

Prepared for:

Turtle Bay Resort

Prepared by:

Oceanit Laboratories, Inc.
828 Fort Street Mall, Suite 600
Honolulu, Hawaii 96813

September 2012

Ecosystem Survey of Nearshore Marine Resources and Water Quality Along the Turtle Bay Resort Shoreline, North Shore Oahu, Hawaii.

Prepared for:

Turtle Bay Resort

Prepared by:

Oceanit Laboratories, Inc.
828 Fort Street Mall, Suite 600
Honolulu, Hawaii 96813

September 2012

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1. INTRODUCTION

1.1 Project Description

The Turtle Bay Resort on the North Shore of Oʻahu is in the process of designing a re-development plan for the resort area fronting Kawela Bay, Turtle Bay, and Kuilima Bay (Figure 1-1). In 1985 a unilateral agreement was reached with the City and County of Honolulu that governed the density and distribution of potential development across the project site. An EIS describing the proposed development was published in 1988. "Pre-construction" water quality and marine environmental surveys were initiated by Oceanit in 1989 and carried on through 1994, but ultimately discontinued when development was halted. In 2010 efforts were initiated to update the EIS. This report represents our efforts to re-examine the water quality and nearshore marine resources along the coastline of the proposed development.

The Proposed Action suggests an approximately 60 percent reduction from the density proposed in the original expansion as formalized under the 1985 Unilateral Agreement. The proposed development concentrates higher density in the resort's existing core area - the Hanakaʻoe ahupuaʻwith two new hotel sites and a new community gathering place in proximity to the existing Turtle Bay Hotel. The sites originally proposed for hotel development in the ahupuaʻa of ʻŌpana-Kawela (to the west) and Kahuku (to the east) will be developed instead with resort-residential units and will be limited to much lower density developments. At ʻŌpana-Kawela, the proposed density is about 25 percent of what is allowable under existing zoning. Similarly, the Kahuku ahupuaʻa development is planned for affordable community housing and resort-residential with 65 percent less density than is allowed under existing entitlements. The result is the concentration of development in the central core of the SEIS Lands and the general preservation of a rural character to the east and west.

The Proposed Action provides two additional hotel sites, rather than the five approved in the current land use entitlements, and the number of hotel units is reduced from 2,500 to 625. By implementing shoreline setbacks, the development preserves public access to the entire shoreline as intended in the Unilateral Agreement.

This document reviews the nearshore ocean water quality and living marine resources along the Kawela Bay, Turtle Bay, and Kuilima Bay Shoreline, discusses where and how these resources may be unique, and offers recommendations as to how future development, particularly related to drainage, may minimize any long term adverse impacts to these resources.

1.2 Generation of Information for this Report.

The information for this report is drawn primarily from a series of studies conducted along this shoreline over the past twenty-five years including:

- Oceanit 1987. An engineering study for desilting considerations for Kawela Bay.
- Oceanit 1994. A summary of oceanographic, water quality, benthic monitoring, and sea turtle surveys conducted quarterly from 1989 through 1993 at Kawela Bay, with bi-annual water quality and benthic surveys at the West Main Drain (Turtle Bay), and East Main Drain (ʻŌʻio Stream, Kuilima Bay).
- Oceanit 2001-2004. Three reports detailing investigations of water quality and currents adjacent to the Kawela Bay, West Main Drain (Turtle Bay), and East Main Drain (ʻŌʻio Stream Kuilima Bay) conducted between 2001 and 2003 for the City and County of Honolulu as part of the Koʻolauloa Flood Protection project. Water quality included year-long measurements at half-hour intervals of physical water quality parameters fronting each outlet.
- AECOS – 2006. Preconstruction water quality summary report and proposed water quality sampling plan, Turtle Bay Resort Master Plan Development, Kahuku, Oʻahu, Hawaiʻi.
- AECOS – 2011. Results from water quality surveys fronting stormwater outfalls in Kawela Bay, Turtle Bay, and Kuilima Bay, conducted quarterly from 2006 to the present.
- Oceanit – 2011. Results of Benthic Monitoring Surveys at Kawela Bay, the West Main Drain and East Main Drain, and sea turtle observations at Kawela bay during the winter and summer of 2011.

The scope of this report is intended to fulfill the requirements of an environmental impact study to describe existing living marine resources and water quality near the project site. It also is to define likely impacts caused by the proposed development, and to outline areas where actions may mitigate any anticipated foreseen adverse impacts. The State of Hawaiʻi is obligated to protect public resources including water quality, living marine resources, and cultural and aesthetic attributes of our state for the enjoyment of all and preservation for future generations. The State also is required to enforce Federal regulations relating to endangered and protected species including sea turtles and marine mammals. To meet these requirements this study aims to understand the physical, biological, and water quality aspects of the site so that critical public resources can be preserved or enhanced and adverse impacts minimized. To understand the environment a series of surveys have been carried out to document the present condition of the nearshore marine ecosystem and to specify any unique or critically important characteristics.

Figure 1-1. Project locations

2. GENERAL SITE DESCRIPTION – KAHUKU COASTLINE

The project site extends along two miles of the "Turtle Bay Resort Shoreline" on the North Shore of O'ahu and includes Kawela Bay at the far western end, Turtle Bay, Kuilima Point, and the Kuilima Bay, to Kahuku Point (Figure 1-1).

Each of these bays and shorelines have widely different physical characteristics that impact both the normal quality of the water and the benthic habitats that support the algae, corals, invertebrates, fish, sea turtles, and marine mammals that frequent this coast. The principle factors influencing the nearshore ecosystem are the geology of the coastal plain, the four main storm water outflows across the shoreline, the nearshore bathymetry, the coastal currents and waves, extractive fisheries, and pollutant loads generated both by nature and by human activities. This section discusses features common to all three shoreline segments.

2.1 Coastal Geology and Subsurface Hydrology

The geology and geomorphology of the shoreline is extremely important to the nearshore ecology as it provides the physical substrate upon which the ecosystem exists. In addition, it directs water flow in surface channels and defines the subterranean groundwater flow. The shoreline geology also influences the areas protected or exposed to waves and currents.

From a regional perspective, the Kahuku coastline (which contains the Turtle Bay Resort Shoreline) consists of a relatively narrow, flat coastal plain backed by steep hills with steep valleys holding small flashy streams. Much of the character of the coastline is the result of past sea level elevation changes. During periods of lower sea levels, the primary streams carved channels through what is now a shallow reef area (Macdonald, et al, 1990). One such 400-foot wide channel can be clearly seen in aerial photographs cutting through the reef from the east end of Turtle Bay (Figure 2-1).

During periods of higher sea levels coral grew seaward from the abrupt coastline and formed what is now the flat coastal plain supporting the development area. The sediments that cover the coastal plain are a mixture of ancient marine deposits interbedded with alluvial deposits from the streams. Numerous portions of the plain are at low elevations and groundwater emerges at the ground surface to form wetlands, some of which are tidally influenced.

The shoreline along much of the coast is hardened by a natural formation of lithified calcium carbonate sand commonly called "beach rock." When calcareous sediments along a shoreline are exposed to alternating fresh and salt (ocean) water tidal flows, the pH differences in these waters cause the sand particles to bind together into a hard cement-like material. These calcareous formations often form abrupt shoreline faces several yards high, but in sheltered coves can support perched sand beaches (Mcdonald, et al, 1990).

The sand dunes behind the shoreline typically accrete to elevations several feet higher than much of the inland coastal plain and the aeolian sand dune structure can lead to drainage problems. During heavy or prolonged rainfall events, when surface flows are blocked by the shoreline sand dunes, ponding and flooding occurs in low-lying areas. The calcareous nature of much of the coast subjects it to the formation of karst cave systems (Macdonald, et.al., 1990). The low pH of fresh groundwater dissolves underground tunnels through which the fresh water flows to the ocean.

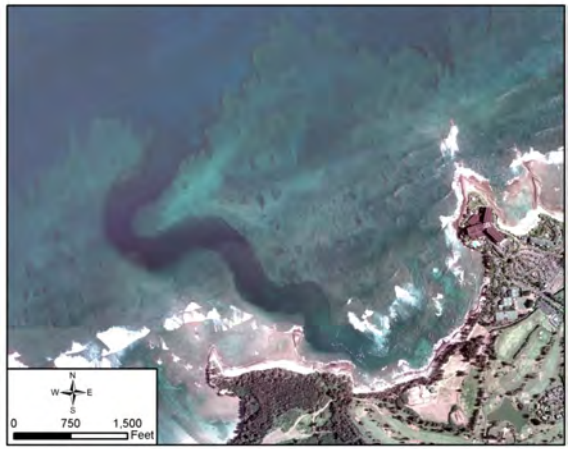


Figure 2-1. Large channel through the reef near the West Main Drain

These cave systems result in concentrated areas of freshwater flow to the ocean and form conduits through which part of the runoff from the mountains enters the sea. Under most conditions rainfall and stream flow from the mountains percolates into the groundwater and discharges into the ocean through this karst cave system.

The regional groundwater flow direction in this area is to the north or northeast and is divided between the shallow caprock flow and the deeper basal discharge. Takasaki and Mink (1985) estimated that the coastal discharge in the Kahuku area was 3.3 mg/mile, or about 80 cubic feet of fresh water per day per linear foot of coastline. This number includes both the deep bedrock and shallow cap-rock aquifers. Assuming the shoreline is similar to the 'Ewa plain caprock (Giambelluca, 1986) and has a caprock area over and above the development of 2.3 square miles, the recharge from rainfall should be 6.1 percent, with 20 percent discharge to the shallow caprock from deep basal flow. This yields a shallow discharge of about 0.66 million gallons per day per mile, or about 17 cubic feet of freshwater discharge per linear foot of coastline per day. (Appendix D Discharge Calculations.)

During periods of heavy rainfall the infiltration capacity of the soil and the capacity of the karst conduits are insufficient to carry the flow, and under these conditions significant flooding problems can result. Because the majority of the shoreline is higher than the inland areas of the plain, stormwater tends to pool and cause flooding until the shoreline dune perimeter is breached and the stormwater discharges into the ocean. When the capacity of the soil infiltration and karst system is exceeded, the additional storm water floods low-lying areas on both sides of Kamehameha Highway.

2.2 Coastal Streams

There are four principle storm-water outfalls through the coast including the Kawela Stream (in Kawela Bay), the West Main Drain, the West Drain (in Turtle Bay), and ʻŌʻio Stream at the East Main Drain along the Kuilima shoreline just west of Kahuku Point. Each of these outfalls will be discussed in subsequent sections as part of the description for each shoreline unit. The following is a more general discussion concerning drainage across the entire project site.

The Kawela, ʻŌʻio, and Hoʻolapa Streams originate from the three principle valleys directly above the proposed development (Figure 1-1). The drainage areas of these streams above the Kamehameha Highway are presently 952 acres (Kawela), 1,555 acres (ʻŌʻi), and 298 acres (Hoʻolapa). The streams are intermittent with surface flows reaching the coast only during a few significant storm events each year. Often, especially during the winter, the Kawela and ʻŌʻio streams may be flowing at upper mountain elevations but the flows percolate to groundwater and into the karst cave system as they approach the coastal plain. The Hoʻolapa Stream crosses Kamehameha Highway just west of Marconi road through a relatively old bridge structure with a width of only about ten feet and flows directly into the Punahoʻolapa Marsh. When the marsh overflows during heavy rainfall events the water flows to the ʻŌʻio stream on the golf course and out to sea through the East Main Drain.

The present alignment of Kawela Stream, with inflow to Kawela Bay, may be an artifact of plantation stream alteration to serve irrigation needs. As the Kawela Stream emerges from its valley it makes an abrupt turn to the West and roughly parallels the highway until it is aligned with Kawela Bay where it again turns and enters the ocean near the center of the bay. Kahuku Plantation maps from 1890 and 1892 (Figure 2-2) do not show the stream in this alignment but rather show the mouth of the small stream entering the bay being fed only from a cluster of Kuleana Lots apparently surrounding a spring just inland of the Bay. Because Kawela Valley is directly aligned with the large pre-historic stream channel through the reef at the west end of Turtle Bay, it is probable that this channel through the reef marks the natural historical outfall of Kawela Stream to the ocean. Of the 952 acres above the highway within the present Kawela Stream drainage area, 680-acres are within Kawela Valley above the West Main Drain, and only 272 acres are above Kawela Bay.

Stream channel diversion was a common practice among plantation managers to improve irrigation and promote efficient drainage to enhance crop growth. It is likely that subsequent stream channel realignment occurred as a result of construction of the Kahuku Airfield during WWII and subsequent conversion of these areas to a golf course in the 1960s. USGS maps from the 1950's show ʻŌʻio stream entering the ocean at what is now the small swimming cove on the east side of the existing main Turtle Bay Resort hotel building. Since the time the golf course was constructed the bed of the ʻŌʻio Stream below the highway rests within a relatively straight alignment between the mouth of ʻŌʻio Gulch and the East Main Drain. During heavy stream flow events the golf course tends to act as a storm water detention basin until the drainage channels are opened. Several of the lower ponds on the golf course are tidally influenced and therefore also act as drains to the ocean.

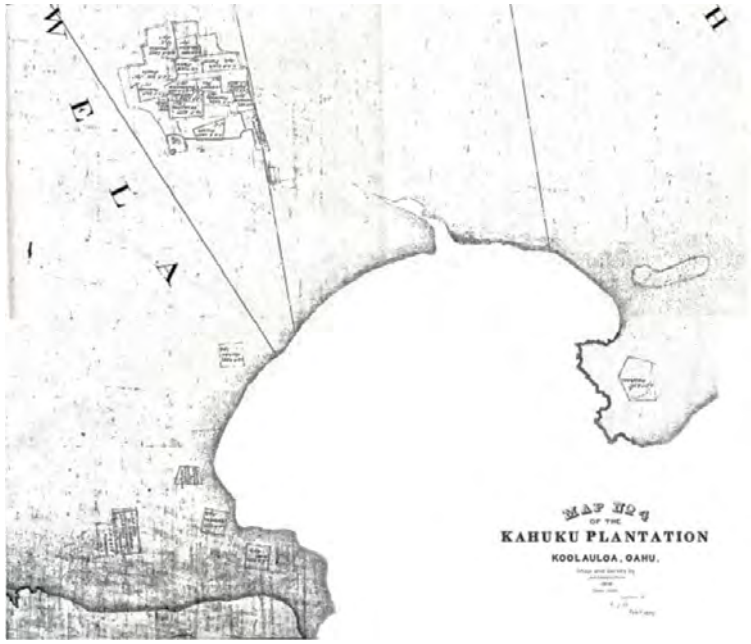


Figure 2-2. Map of Kawela Bay circa 1890

2.3 Oceanography: Waves, Tides, and Currents

Waves, tides, and currents are important to the ecology of a coastal site and are not generally impacted by coastal ocean developments. Understanding the coastal dynamics helps determine the fate of sediments, nutrients, and other substances brought into the nearshore area from land sources. Wave conditions for the entire shoreline were determined from existing offshore wave statistics (North Pacific Marine Advisers Data Set: NOAA).

Waves that approach this coastline can be characterized into two classes. The most common are trade wind generated waves approaching from the northwest (NW). In addition large winter swells from the north-east (NE) will impact the shoreline for brief periods during the winter.

Wave climate is defined by the distribution of wave heights, periods and direction. Figure 2-3 is a graphical representation termed a "wave rose" that displays wave heights and directions from which waves will approach the Turtle Bay Shoreline. The wave exposure for the Turtle Bay Shoreline is from the north between about 315 degrees (NW) to forty-five degrees (NE) with other wave directions blocked by the island. The most dominant waves are trade-wind generated waves from

the NE (45 percent) and ENE (22 1/2 percent a dominant wave height of about 5.2 feet and period of about ten seconds. The North Shore of O'ahu is famous for its large winter waves which tend to come from the NW (315°) and NNW (337.5°). These wave trains are commonly in the range of three to 10 feet high and periods between eight to 14 seconds, with heights greater than 20 feet occurring on an annual basis (Figure 2-4).

As waves approach the shoreline, they undergo deformation from shoaling and refraction. Wave shoaling is caused by bottom friction and refraction is caused by change in depth. During episodes of high surf, water may build up against the shoreline, causing a local rise in sea level by as much as ten degrees of wave height. This increased depth allows greater wave energy to cross any shallow reefs, impact the shoreline, and cause increased turbidity from re-suspended sediments. The increased depth of water along the shore also accentuates the characteristics of currents transporting water away from the coastline through passes in the reef. Wave induced impacts specific to each of the three embayments are discussed separately below.

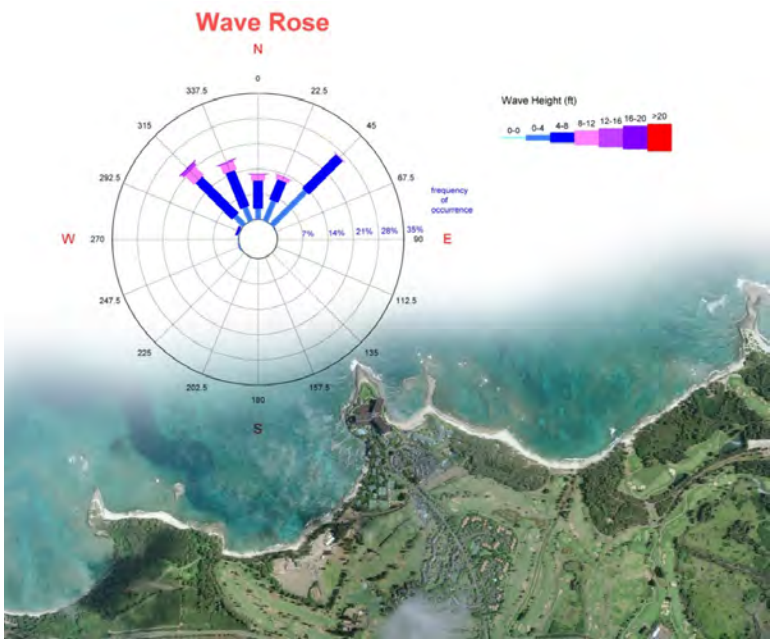


Figure 2-3. Project coastline showing dominant wave directions

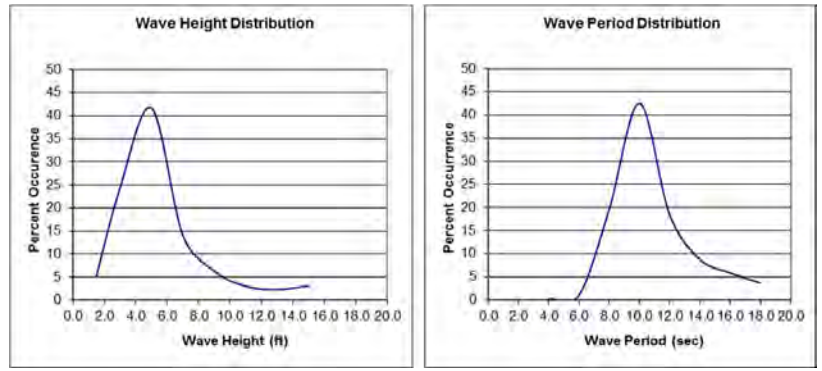


Figure 2-4. General ocean wave characteristics off the Kuilima shoreline, O'ahu, Hawai'i

O'ahu is located within the North Equatorial Current which approaches the island chain from the east. This typically results in a slow but dominant offshore current from east to west. Nearshore currents are more variable as they are largely driven by wind, waves and tides. Currents were measured in each of the bays using drogues on incoming (flood) and outgoing (ebb) tides. These results are discussed separately below.

2.4 Water Quality

The State of Hawai'i has developed a water quality standard for open coasts during dry and wet seasons that applies to this coastline. Because each of the three coastal segments are referred to as "Bays" and each may be subject to significant fresh water inflow, we also will be including the State Standard water quality for Embayments for comparison purposes. These values are shown in Table 2-1. In recognition of the fact that water quality varies naturally over a range, the State defines each standard in terms of a geometric mean, a value not to be exceeded more than 10 percent of the time (36 days per year) and a value not to be exceeded more than two percent of the time (seven days per year). Water samples taken in the field are characterized by their location, time, and depth of sample, with some measurements performed using field instruments (pH, temperature, salinity, turbidity, dissolved oxygen) additional analyses in the laboratory (Chlorophyl-a, total nitrogen, nitrate plus nitrite, total phosphorus, total suspended solids, and lab turbidity). The significance of each of these test parameters in interpreting water quality is summarized in the dialogue box "Water Quality Basics" of Figure 2-5.

Water quality data at all three bays has been examined during three separate studies over a period of two decades using a total of 724 samples analyzed for water quality parameters.

- From 1989 through 1994 surface and mid-water samples were taken at nearshore, mid-shore, and off-shore locations in each bay on a quarterly basis. The 232 samples that make up this data set form the basis from which to assess any changes in water quality over time.
- Between 2000 and 2002 studies by the City and County of Honolulu were undertaken to understand the merits of various storm-water outfall locations along the Turtle Bay

Shoreline. The purpose of this study was to establish an environmental baseline for the nearshore area and to determine the degree of mixing at each outfall location and to monitor short term changes in water quality. At each outlet site (Kawela, Turtle Bay, Kuilima Bay) a single meter was installed to record water quality at half-hour intervals, 24 hours a day for one year. In addition, six surface water sample sites closely aligned off each outlet site were monitored on a monthly basis for 11 months (198 samples total). Comparing the similarity of the six samples off each outfall to one another gives a good indication of the degree of mixing and ability to assimilate stormwater inflow at each site.

- Since 2006 quarterly water quality samples have been obtained from all three bays at stations similar to those used in prior surveys. Data from these 294 samples form the basis to examine present day water quality and changes observed during the past two decades.

Data sets from each of the above studies, with summary statistics, are included in appendices attached to this document. Usually, water quality from a common shoreline would be analyzed as one set of data. However, because of differences between each of the bays and the relative abundance of data, this report will first examine water quality within each bay, and then at the end of the report summarize any differences between the bays and their independent storm water outfalls.

Table 2-1. State Standard Water Quality Values Applicable to Project Shoreline

Open Coast Dry Season Parameter	Geometric Mean	Not to Exceed more than 10-percent of the time	Not to Exceed more than 2-percent of the time
Total Nitrogen ug N/L	150	250	350
Nitrate + Nitrite ug N/L	5	14	25
Total Phosphorus ug P/L	20	40	60
Chlorophyll-a ug/L	0.50	1.50	3.0
Turbidity NTU	0.4	1.00	1.5
Total Suspended Solids mg/L *	15	25	35
Open Coast Wet Season Parameter	**Geometric Mean**	**Not to Exceed more than 10-percent of the time**	**Not to Exceed more than 2 percent of the time**
Total Nitrogen ug N/L	200	350	500
Nitrate + Nitrite ug N/L	8	20	35
Total Phosphorus ug P/L	25	50	75
Chlorophyll-a ug/L	1.50	4.50	8.5
Turbidity NTU	1.5	3.00	5.00
Total Suspended Solids mg/L *	25	45	50
Embayment Parameter	**Geometric Mean**	**Not to Exceed more than 10-percent of the time**	**Not to Exceed more than 2-percent of the time**
Total Nitrogen ug N/L	200	350	500
Nitrate + Nitrite ug N/L	8	25	35
Total Phosphorus ug P/L	25	50	75
Chlorophyll-a ug/L	2	5	10
Turbidity NTU	1.5	3.00	5.00
Total Suspended Solids mg/L *	35	45	50

TSS standards are from original State WQ standards. This parameter is not included in the present State Standards.

Water Quality Basics

The State of Hawai'i has defined basic water quality criteria listing parameter concentration appropriate for different types of water bodies including streams, estuaries, bays, and open coasts during wet and dry seasons. The Turtle Bay Shoreline is classified as "Open Coastal" waters, although in some of the more enclosed bays the "Embayment" water quality standards may be more appropriate. Understanding that water quality varies over time in natural systems, the standards provide a geometric mean water quality, a concentration not be exceeded more than 10 percent of the time (36 days per year) and a concentration not to be exceeded more than two percent of the time (seven days per year). These quantities are given in Table 2-1 of the main report.

Nitrate plus Nitrite Nitrogen (NO3 + NO2) are reduced inorganic forms of nitrogen and are required by plants – including phyto-plankton – for growth. Nitrate and nitrite are readily soluble in groundwater, are not adsorbed by soils, and are commonly high in nearshore areas where groundwater or stream water enters the ocean. Excess nitrogen (above State Standards) is considered a pollutant because it can lead to plankton blooms or excess benthic algae growth which can adversely impact the environment. However, plants require a balance of nutrients for growth and in cases where nitrogen is already in excess of requirements, additional nitrogen is not likely to have any significant impact on algae growth.

Total Nitrogen (TN) includes nitrate plus nitrite and all other organic and inorganic forms of nitrogen in water. There are many potential sources of nitrogen in groundwater including degraded plant and animal material, fertilizers, bacterial action, and animal waste products.

Total Phosphorus (TP) includes all organic and inorganic forms of phosphorous. Unlike nitrogen, phosphorus is typically adsorbed to subsurface minerals and is therefore not usually present at high concentrations in ground water. It is usually a limiting nutrient in nearshore waters. Plants, including phytoplankton and benthic algae, require about one atom of phosphorous for every eight to 12 atoms of nitrogen to sustain growth, so, even a small quantity of phosphorus added in the presence of nitrogen-rich groundwater, will result in significant algae growth.

Chlorophyl-a (Chl-a) is a primary pigment of photosynthesis in plants, including phytoplankton. Measurement of Chl-a in water is an indicator of phytoplankton growth. High Chl-alevels are associated with nutrient rich water supporting plankton growth. Because plankton takes time to grow, high Chl-a levels are an indicator of a low circulation rate and available nutrients for growth.

Total Suspended Solids (TSS) is the physical measurement of the dry weight of suspended solids in a water sample. This parameter is measured in a laboratory by sieving a known volume of water through a fine filter, then drying and weighing the filtered sediment, expressed in terms of milligrams per liter (mg/L)

Turbidity (NTU) is a measurement of the cloudiness of water determined by measuring the amount of light reflected off of particles in the water sample and is expressed as the unit-less measure of Nephlometric Turbidity Units (NTU). Turbidity and TSS vary directly with each other but turbidity also is affected by the size, color, and reflective nature of the particles. Turbidity can be measured with an instrument in the field, but TSS analyses must be done in a laboratory.

Figure 2-5. Water Quality Basics

2.5 Sea Turtles

Sea Turtles are commonly encountered along the entire project coastline from the shoreline out to at least the 100-foot bathymetry contour. The hawksbill turtle (*Eretmochelys imbricate*) is endangered throughout its range. They were listed as Endangered under the Endangered Species Act (ESA) in 1978 (43FR32800). Hawksbill turtles in Hawai'i nest primarily on the Big Island of Hawai'i where approximately 10 to 15 turtles nest annually (Sietz 2010). Hawksbills have been reported from other locations on O'ahu's North Shore, and although there have been no verified sightings from Kawela Bay, Turtle Bay, or Kuilima Bay, this protected species likely inhabits these waters.

Figure 2-6. Green Sea Turtle, Photo: A Bruckner, NOAA

Green sea turtles (*Chelonia mydas*) in the Pacific have been listed as Threatened under the ESA since 1978. These turtles are primarily herbivorous in the wild and graze off of macro-algae. Their preferred foraging areas include protected bays, such as Kawela Bay, where a variety of macro-algae proliferate over shallow shelves and reef flats protected from large surf (Balazs et al 1987).

The National Marine Fisheries Service Honolulu office (G. Balazs, pers communication) reports that basking green turtles resting and/or sleeping on the beach are commonly reported at Kawela Bay and Turtle Bay and nesting activity also is occasionally reported. The success or failure of turtle nest hatching at Kawela or Turtle Bays has not been documented. This is not unusual as the nests are difficult to locate, and beach-goers who may witness a hatching event are not commonly present near midnight when the juvenile turtles emerge to make their escape to the sea.

Visual surveys of turtle abundance and distribution were conducted in Kawlea Bay by Oceanit for five days per quarter (seventeen quarters) between December 1989 and December 1994. A repeat of the surveys was conducted for five days in the winter and five days in the late summer of 2011. The bay was surveyed three times per day by a single observer standing consecutively at each of five points around the perimeter of the bay and staring out onto the water for a period of 25 minutes at each location to watch for surface breathing activities of turtles. This survey was conducted three times each day for 2 ½ hours after sunrise, mid-day, and before sunset. Because of the shallow nature of the bay, the small size of each zone being observed and the frequency of turtle surfacing (approximately four to six minutes), a high degree of confidence is developed regarding the number of turtles in each zone. In addition to observing turtle activity, notes have traditionally been taken on human activities within the bay during the period of observation. The results of observed human activities are discussed in the section specific to Kawela Bay. The zones are identified in Figure 3-3.

Table 2-2. Turtle Counts in Kawela Bay for 10 days, winter and summer, 2011

WINTER					Total Count						SUMMER					Total Count					
		Mornin	Noon	Evenin	Mornin	Noon	Evening						AM	Noon	PM	AM	Noon	PM			
3/15/11	Zone 2	1	1	0	7	16	8				9/19/11	Zone 2	4	1	2	11	10	13			
	Zone 5	1	4	3								Zone 5	1	0	3						
	Zone 4	1	5	2								Zone 4	1	4	2						
	Zone 3	2	2	1								Zone 3	3	4	3						
	Zone 1	2	4	2								Zone 1	2	1	3						
3/16/11	Zone 2	3	0	1	13	13	6				9/21/11	Zone 2	5	3	4	14	16	12			
	Zone 5	1	4	1								Zone 5	2	2	3						
	Zone 4	2	3	2								Zone 4	3	4	3						
	Zone 3	3	3	1								Zone 3	2	4	1						
	Zone 1	4	3	1								Zone 1	2	3	1						
3/18/11	Zone 2	2	0	1	3	8	8				9/22/11	Zone 2	3	4	5	16	19	16			
	Zone 5	0	3	2								Zone 5	3	4	3						
	Zone 4	0	2	3								Zone 4	4	3	4						
	Zone 3	0	1	2								Zone 3	3	5	3						
	Zone 1	1	2	0								Zone 1	3	3	1						
3/20/11	Zone 2	2	1	1	11	13	8				9/23/11	Zone 2	4	3	3	19	22	13			
	Zone 5	3	3	4								Zone 5	4	4	3						
	Zone 4	3	5	2								Zone 4	5	6	3						
	Zone 3	2	2	0								Zone 3	4	4	2						
	Zone 1	1	2	1				Zone Average				Zone 1	2	5	2					Zone Averages	
3/25/11	Zone 2	2	0	0	8	3	9	Zone 2	1.00		9/24/11	Zone 2	5	3	4	12	19	15	Zone 2	3.5	
	Zone 5	1	1	3				Zone 5	2.27			Zone 5	3	3	3				Zone 5	2.7	
	Zone 4	1	1	3				Zone 4	2.33			Zone 4	1	5	3				Zone 4	3.4	
	Zone 3	2	0	2				Zone 3	1.53			Zone 3	1	3	4				Zone 3	3.1	
	Zone 1	2	1	1				Zone 1	1.80			Zone 1	2	5	1				Zone 1	2.4	
Average		**1.68**	**2.12**	**1.56**							Average		2.88	3.44	2.76						
					AM	Noon	pm	Average													
			Daily Average		**8.4**	**10.6**	**7.8**	**8.9**						**Daily Average**		**14.4**	**17.2**	**13.8**	**15.1**		
			Standard Devia		**3.8**	**5.1**	**1.1**	**4.6**						Standard Deviation					**3.46**		

Between 1989 and 1993 a total of 58 observation days (174 morning, noon, afternoon observation periods) recorded an average of 7.35 turtles in the bay at any given time with 68 percent of these observations (one standard deviation) falling between 1.96 and 12.75 turtles in the bay during any time period. During eighteen time periods (approximately 10 percent) no turtles were observed in the bay, with a maximum number of turtles (24) observed on the morning of September 14, 1991. During the five winter (March) days in 2011 (15 total observations, morning, noon, and afternoon) the average number of turtles observed at any given time was 8.93 with 68 percent of these observations (one standard deviation) falling between 5.24 and 12.63 turtles in the bay at any given time. The maximum number of turtles observed in the whole bay during a 2011 winter time period was 16, and the minimum was three turtles. During the five summer (September) days of observation in 2011 (fifteen observation periods) the number of turtles in the bay at any given time ranged from 10 to 22 with an average of 15.1. Sixty-eight percent of these observations fell between 11.7 and 18.6 turtles in the bay at any given time. The average number of turtles seen in the bay during 2011 (summer and winter) was twelve. The average number of turtles has increased from a daily average 7.35 in the early 1990's to 12.0 this past year between 1993 and 2011 and the number of periods when no turtles are observed in the bay has fallen from 10 percent to zero percent. This 50 percent increase in the turtle population in the bay is statistically significant at a 95 confidence interval. There does not appear to be any difference in turtle abundance between the five observation zones or between the times of day when observations were conducted.

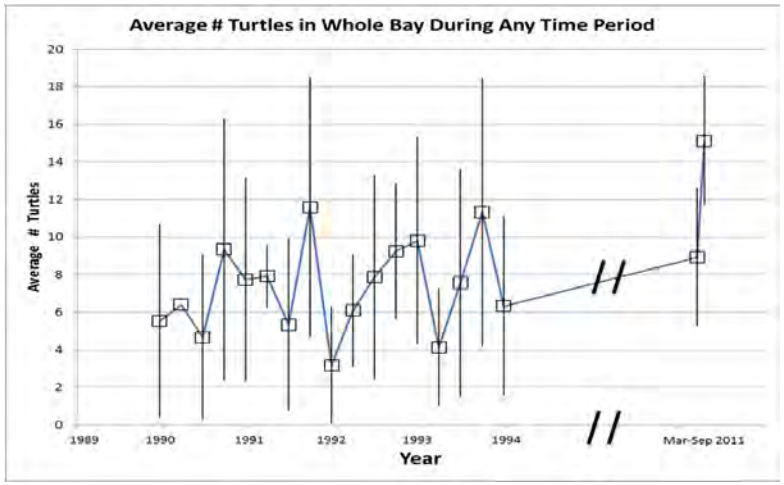


Figure 2-7. Average (+/- 1sd) number of turtles in Kawela Bay, per 2.5-hour observation period

The National Marine Fisheries Service (NMFS) does not undertake standardized in-water monitoring to assess population abundance in this region. The most relevant turtle information from this area comes from the Pacific Islands Fishery Science Center Marine Turtle Research Program (PIFSC MTRP) that records information from turtle strandings. This data set provides evidence that green turtles of all age classes utilize this coastal area, but it appears most important to juvenile and sub-adult green turtles from 40-70 centimeters with shell length (SCL). Since 1985 the NMFS has recorded a total of 85 turtles that were stranded from Kawela Bay, Turtle Bay, and the Turtle Bay Resort beaches. Forty-nine of those turtles were stranded and documented as mortalities, about half of which were of unknown etiology. Reports of stranded turtles included information on turtle size by carapace length. By graphing the length of turtles stranded over the past 25 years, we can see that the average carapace length of stranded turtles has increased from 50 centimeters (20 inches) to 62 centimeters (25 inches) (Figure 2-8). The more recent samples of stranded turtles (2005-2010) show a definite increase in the numbers of larger turtles) (Figure 2-8). This is consistent with the growth and recovery of the population over time since protected by the ESA in 1978 (Balazs and Chaloupka 2004). Green turtles in Hawai'i are expected to reach maturity at > 80 centimeters SCL (Zug et al 2002), and grow at a rate of approximately 2 1/2 centimeters per year (Balazs and Chaloupka 2004), represented in Figure 2-8 by the dashed line through the data.
by the dashed line through the data.

Fibropapillomatosis (FP), is a debilitating tumor disease of the skin and internal organs, and is the most significant known cause of stranding and mortality in green turtles in Hawai'i. FP accounts for 28 percent of stranded turtles and 88 percent mortality rate of stranded turtles (Chaloupka et al

2009). FP causes large fleshy tumor growths, often around the eyes and mouth of turtles, and typically causing mortality through starvation. While the primary cause of mortality in stranded turtles along the project coastline is unknown, the single known cause of mortality with highest prevalence (80 percent) in stranded turtles is FP. FP among the Hawai'i green turtle population appears to have peaked about a decade ago Chaloupka et al 2009), but persists in the population at varying spatial scales (Van Houtan et al 2010).

According to Van Houtan et al (2010), FP rates in the North Shore of O'ahu have declined over time, but have not declined at the same rate in Kahuku where the disease continues to persist. Importantly, Van Houtan et al (2010) suggest a potential relationship exists between the prevalence of FP and the State's land use, waste-water management practices and invasive microalgae.

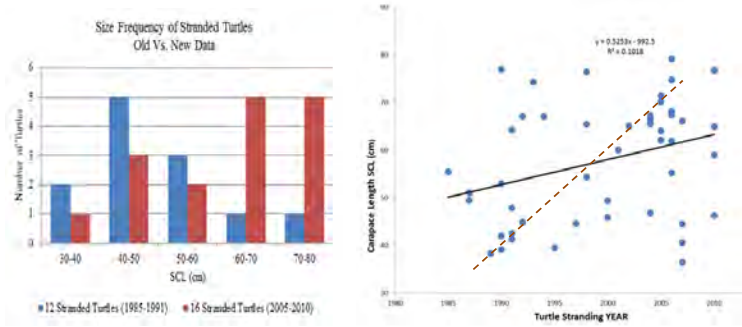


Figure 2-8. Data from NMFS turtle stranding database for project shoreline showing (left) increased prevalence of larger turtles in recent years, and (right) overall trend of increased size over entire time period. Dashed line is average growth rate of individual turtles (~2.1 cm/yr).

Reported Causes of Turtle Stranding	#	Percent
Unknown	40	48.2
Fibropapilloma (FP)	15	18.1
Net entanglement	8	9.6
FP / Vascular fluke infection	7	8.4
Fishing line entanglement	4	4.8
Rope entanglement	2	2.4
Shark attack	2	2.4
Vascular fluke infection	1	1.2
FP + Shark attack	1	1.2
FP + Trauma	1	1.2
Gunshot	1	1.2
Plastics in intestines	1	1.2
	83	100%

Table 2-3. NOAA Reported Turtle Strandings Along Project Shoreline

Combined turtle mortalities related to man's activities (net and rope entanglement, gunshot, and plastic ingestion) totals about 19 percent of all mortalities in the project area. Man's activities, particularly involving fishing activities, are a significant factor in turtle mortalities (Nitta and Henderson 1993; Chaloupka et al 200p).

Hence). care must be applied to ensure that proposed development does not increase nitrogen and other nutrient loads into the marine environment that is known to promote invasive algae grown (Smith et al 2010

It is unlikely that development of the shoreline leading to increased nearshore human activity would have any measurable adverse impact on adult sea turtles along the coast, if reasonable precautions and educational outreach programs are initiated. Two major ways that humans impact turtle mortality are from contact with boat propellers and from gill net entanglement, neither of which are likely to increase as a result of the proposed development. Sea turtles are known to habituate to the presence of humans in or on the water and would not likely remove themselves from grazing habitat due to the presence of people in the water in quantities likely to result from the planned development.

Sea turtle nesting has been documented along this shoreline, and as the population continues to recover the importance of this area to nesting turtles may increase. Artificial lighting is known to disorient hatchlings (http://www.georgiaseaturtlecenter.org/research-programs/beach-monitoring/beach-lighting/). It is likely that increased lighting and beach activity during breeding season evening hours could dissuade turtles from emerging to lay eggs on these beaches. Furthermore, when turtle hatchlings emerge from their nest in the middle of the night, they orient towards the brighter sky above the ocean. Any development that may increase relative ambient lighting contributing to lighting pollution in this area should therefore adopt a lighting plan that shields direct light away from the beach and uses longer wavelength (yellow) lights that are not attractive to hatchling turtles.

2.6 Monk Seals

Hawaiian monk seals (*Monachus schauinslandi*) have been listed as Endangered under the Endangered Species Conservation Act (now ESA) in 1973 and as of 1976 and also are protected by the Marine Mammal Protection Act of 1972. About 90 percent of the 1,161 seals estimated to be members of the total population in 2008 (NMFS 2011) live around the Northwestern Hawaiian Islands (NWHI), but a growing sub-population also is found throughout the main Hawaiian Islands (MHI) (Baker, et al 2011a).

Figure 2-9. Monk Seal

Credit: NMFS, 2007

NOAA reports that from the 1970s through 1990, Hawaiian Monk Seals in the Main Hawaiian Islands (MHI) were present but in low numbers and rarely seen. Since 1990 these populations have been increasing with an estimate of 133 individuals noted in 2001 (Baker and Johanos, 2004), and estimated 150 to 200 individual seals in 2011 (C. Littnan, NMFS, pers. comm.). These seals are primarily distributed around Niʻihau, Kauaʻi, Molokaʻi, and Oʻahu. Although survival rates appear higher in the MHI, NOAA has expressed concerns about the potential of an increased incidence of disease, fisheries interactions and intentional killings of seals as they interact with human populations in the MHI (NMFS 2007).

As part of the NMFS Monk Seal Recovery Program, 21 male seals were removed from the NWHI and released into the waters of the MHI in 1994. These males were moved as part of a successful effort to reduce male aggression and increase female survival at Laysan Island, where males previously outnumbered females by over 2:1 (Johanos et al 2010, Baker et al 2011b). Although there have been a few relocations of seals from the MHI to the NWHI for management purposes, this is the only relocation of seals from the NWHI to the MHI to date (Baker et al 2011b), and cannot account for the bulk of the increase in population documented around the MHI. All female seals in the MHI occur here naturally, and the few relocated males that remain are well over 20 years old, nearing the end of their natural life span (T. Johanos, pers. comm.).

The increasing population and good condition of pups around the MHIs is in positive contrast to the continuing dwindling populations in the NWHI. It is theorized that the lower density of seals in the MHI and the scarcity of large predators that either compete for food or predate seal pups, are key elements of the seals recovery. However, there is concern that as populations increase mortalities due to fisheries interactions (nets, hooks), boating impacts, and potential human borne diseases could adversely impact this population revival.

Estimates of Monk Seal populations along the North Shore of Oʻahu also continue to increase with 18 individually recognized individuals (seven female, seven male, four juveniles) having been sighted from the project coastline (Kahuku Point – Kawela) between 2002 and 2011 (NMFS, 2012). These eighteen individuals account for 422 of the 543 sightings during this period (Table 2-4).

Table 2-4. Number of reported Hawaiian monk seal sightings on O'ahu between Kawela Bay and Kahuku Point since 2002 (data from NMFS 2012)

Location	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total
Kahuku Pt.	0	2	0	0	0	1	6	0	11	4	**24**
Kaihalulu Beach	0	1	4	3	78	12	20	6	117	107	**348**
Kawela Bay	0	0	1	0	3	1	1	5	8	4	**23**
Kuilima Cove	0	0	2	1	6	6	0	6	11	7	**39**
Turtle Bay	1	1	6	14	17	20	14	4	22	10	**109**
Total	**1**	**4**	**13**	**18**	**104**	**40**	**41**	**21**	**169**	**132**	**543**

It is difficult to translate "sighting" data into a population abundance estimate, but it is clear that the population along this shoreline has definitely increased during the past decade. Of the three aerial surveys conducted by NMFS around the entire O'ahu shoreline in 2000, 2001, and 2008, no monk seals were sighted along the project coastline. Three monk seal births were documented from this shoreline on Kaihalulu Beach during the summers of 2006, 2010, and 2011. This compares to a total of 78 pups born in the MHI over the last two decades. It is known that the mother and pup will remain together and in the same general area for the six to seven week nursing period (NMFS, 2012). These births and the increased trend in sightings indicate that this coastline is an important habitat for Hawaiian monk seals.

As part of the turtle surveys (see above) conducted for this study, the waters of Kawela Bay were observed for 85 days between 1989 and 1994, and no seals were observed during this period. During only 10 observation days conducted in 2011, one seal was observed repeatedly on a single day. This single observation has little mathematical significance, but is in line with NOAA's conclusions that seal populations are increasing around the Main Hawaiian Islands and along the project shoreline.

No direct or delayed impacts to Hawaiian Monk seals are anticipated from the development. Around the MHIs, the human activities of greatest concern to NOAA Monk seal researchers are the potential for entanglement in fishing gear, impact from boats, or predation by fishermen who may view the seals as direct competitors for fish resources. None of these sources of mortality are likely to increase as a result of resort development because the anticipated clientele are not likely to engage in these activities.

However, indirect impacts including increased interactions with fishermen, surfers, kayakers, and other ocean recreational uses can be anticipated as a result of improved access to the public and increases in shoreline population. While direct contact or close proximity to endangered species is discouraged by NOAA, they have not attributed any measurable adverse impact from these interactions to Monk Seal populations. These potential secondary impacts may be minimized through a public education process.

2.7 General Marine Environment

The project shoreline is along the north face of O'ahu and is subject to high wave energy every winter. These waves materially impact the character of the reefs along the shore.

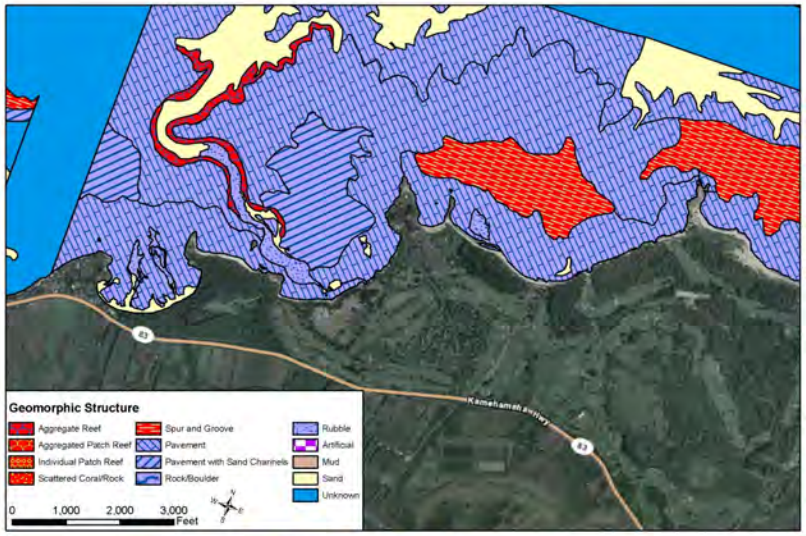
NOAA has mapped benthic structure and habitats into broad classifications using aerial survey techniques (Figure 2-10). East of Kahuku Point the majority of coastlines are dominated by an offshore reef with a distinct shallow reef crest and large finger and groove reef formations extending from the reef crest out to sea. These reefs are subject to year-round trade-wind swells, but are protected from the large North-Pacific storm swells.

However, from Kahuku point to Ka'ena Point these regular linear reef features tend to be much diminished with deeper less linear reef crest formations. The "spur and groove" reef dominated by "turf algae" as indicated in the NOAA charts (Figure 2-10) fronting Kuilima Bay does have limited deep finger and groove formations but is lacking the intact linear reef crest typical of reefs east of Kahuku Point.

The disjointed nature of the Kuilima Bay reef actually offers an increase in habitat diversity with a matrix of deeper channels interspersed with shallow reef outcroppings. Although the NOAA database indicates that the reef off of Turtle Bay is "pavement with sand channels" with benthic cover consisting primarily of "turf algae" this reef has significant coral cover and is quite similar to barrier reefs east of Kahuku Point, but with a deeper less distinct reef crest.

The dominant feature within Turtle Bay is the lagoon between the beach and the reef. At the east end of the beach the lagoon is quite shallow, but deepens rapidly towards the west end where it becomes a major deep channel out through the reef. The sides of this channel are protected from wave impact, but exposed to significant currents and support a very diverse coral community.

The deeper reefs offshore of Kawela Bay display disorganized finger and groove formations around several upraised patch reefs. These patch reefs suffice to break the energy of the large winter swells, well offshore of the shallow mouth of the bay. The mouth of the bay, only a few feet deep, has significant coral cover (estimated 30 to 50 percent), but also presents a lush algae mat over solid substrates. The character of each of the bays will be described in greater detail in later sections.



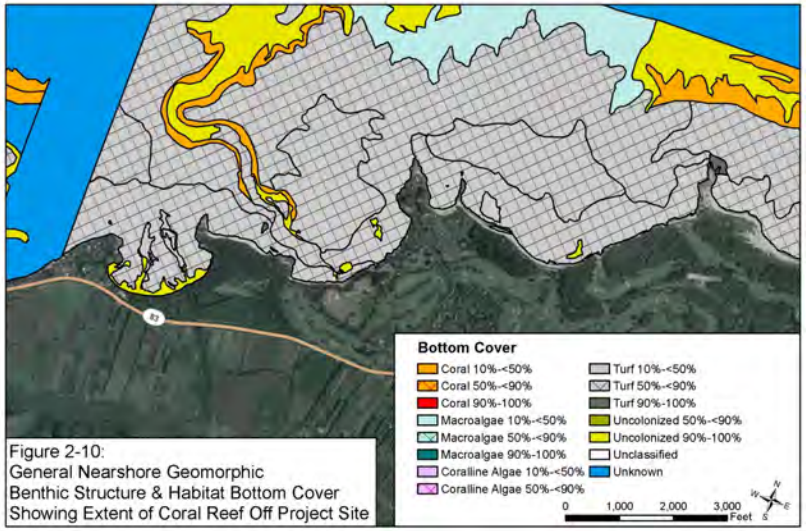


Figure 2-10:
General Nearshore Geomorphic Benthic Structure & Habitat Bottom Cover Showing Extent of Coral Reef Off Project Site

3. KAWELA BAY

3.1 General Physical Description

The development property boundary extends west to the midpoint of the Kawela Bay shoreline with the first development parcel to consist of a public park bordering the Kawela Stream mouth. The entrance of Kawela Stream to Kawela Bay is fixed in location by the break in the railroad track bed (circa ~1900) that can still be found in the Hau-bush jungle between the Kamehameha Highway and the ocean. The stream mouth is closed by a sand berm that only opens a few times per year in response to relatively intense rainfall flow events. Kawela is somewhat unique among the three bays in that the embayment is formed through a break in the beach rock shoreline. Both headlands that jut out into the ocean on the west and east sides of the bay are faced with beach rock shorelines. But the sand beach between the headlands is deep and not perched upon a hard substructure as are the other beaches along the property shoreline. This 1,500 foot break in the beach-rock shoreline is consistent with the high volume of fresh ground water entering the ocean through this embayment (see Figure 3-7).

The bathymetry of the bay is critical to the understanding of water quality within the bay and is displayed in Figure 3-1 and Figure 3-2. From a broad perspective the bay is relatively shallow, less than 10-feet, with no clear deep passage to the open ocean and a distance from the stream mouth to the 30-foot contour of about 3000 feet.

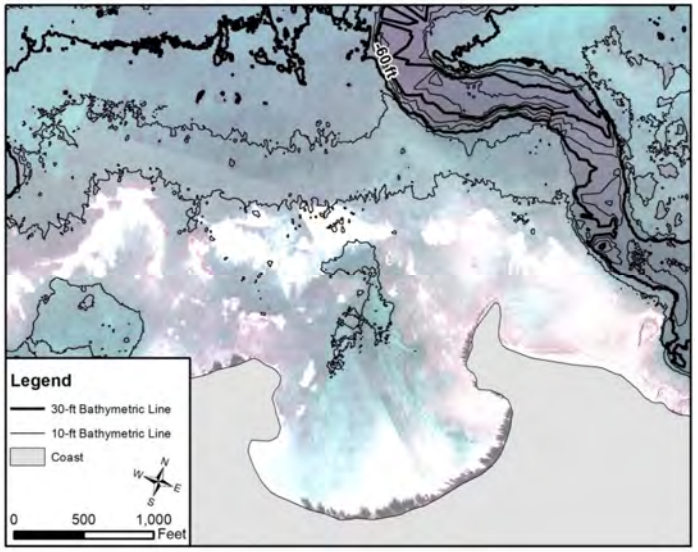


Figure 3-1. Bathymetry of Kawela Bay and offshore waters.

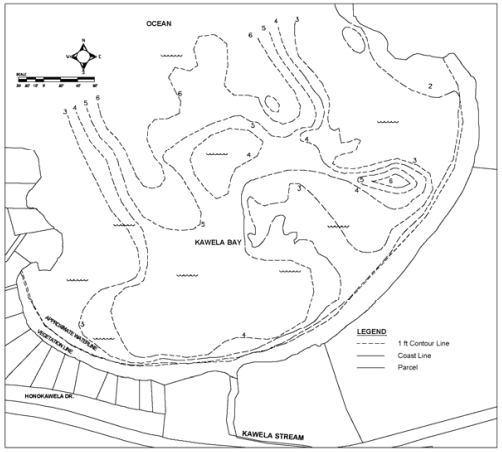


Figure 3-2. Kawela Bay fine scale bathymetry. Depths in feet at MLLW

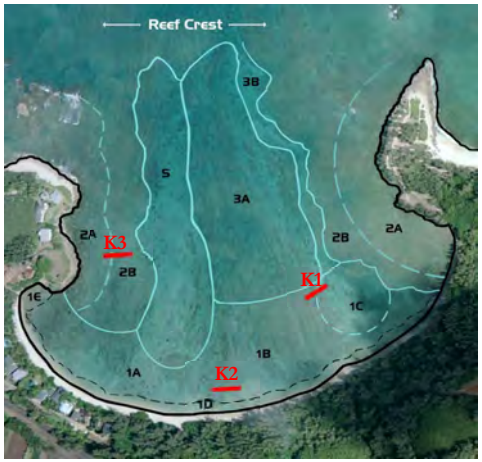


Figure 3-3. Five principal habitat zones in Kawela Bay: 1) inner bay sand, soft sediments, rubble, and scattered corals, 2) shallow hard substrate bench with abundant algae 3) central shallow back-reef with coral and macro-algae, 4) offshore reef crest, and 5) wide sand channel with unique large coral colonies. K1, K2, and K3, in red are the hundred-foot long benthic transect locations.

The bay is a roughly symmetrical horse-shoe shape with shallow shelves beneath the east and west headlands (Figure 3-1 and 3-2). The middle of the bay is relatively shallow, only a couple of feet deep, with narrow finger-and-groove coral structures perpendicular to the shore through the center of the bay. Note that the depths given are relative to the tide at mean-lower-low-water (MLLW) so actual water depth would typically be one or two feet deeper than indicated.

There are channels on both sides of the bay separating the shallow headland shelves from the reef in the center of the bay. However, the channel on the west side of the bay is much wider (~100 ft) and deeper (~6-8 \ft) with a clean coral sand substrate. One important feature is the relatively deep (~6 ft) area on the east side of the bay isolated inside the headland shelf but 100-200 feet off shore. This is the area that, in 1987, held several feet of very fine silt material and prompted the developer (at that time, Asahi Juken) to investigate means to remove the mud and improve water quality in the bay. Subsequent studies suggest that removing the primary source of the mud (Kawela Stream) may be a more prudent approach to water quality improvement. Although thick mud was not evident at this site during the 2011 surveys, this end of the bay remains much more turbid than the western side of the bay.

3.2 Waves and Currents in Kawela Bay

Drouges, small buoys with large under-water surface area, were placed at various areas within the bay and their drift path tracked over several hours during ebb and flood tides. The interpretation of these pathways is shown as general current patterns in the figures below. Both headlands of the bay have relatively shallow ledges where waves break and surge across these platforms is significant.

Currents within the bay are primarily wind and wave driven but with an important overlay of groundwater inflow. In the main western half of the bay, the overall direction of the current seems to be counter-clockwise where the inward flow occurs on the west side of the bay then exits through the center and at the east corner by flowing along the shore and then out to sea through the center and east portion of the bay.

Water circulation in the east portion of the bay is much slower and tends to form a clock-wise gyre with a long residence time. Figure 3-5 show the interpolated current from the field study. Note how this current pattern mirrors the salinity variations shown in Figure 3-7.

Fresh water tends to percolate through the beach in the west end of the bay, rise to the surface, and flow out through the center of the bay where it is joined by flow from a spring near the center of the bay (Figure 3-7).

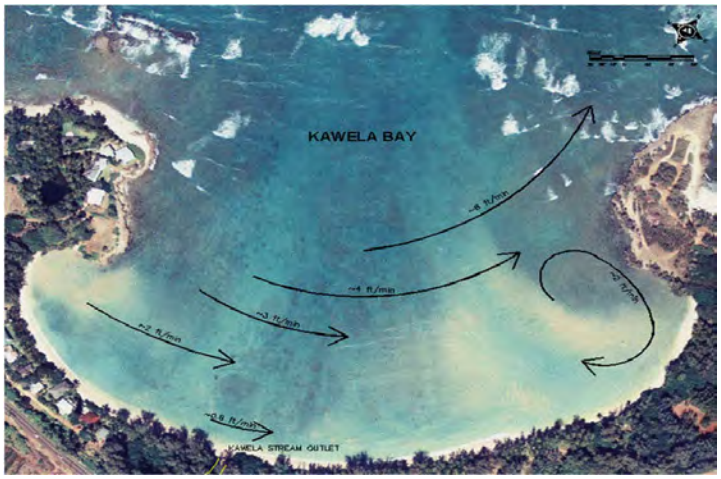


Figure 3-4. Interpolated Current During EBB Tide

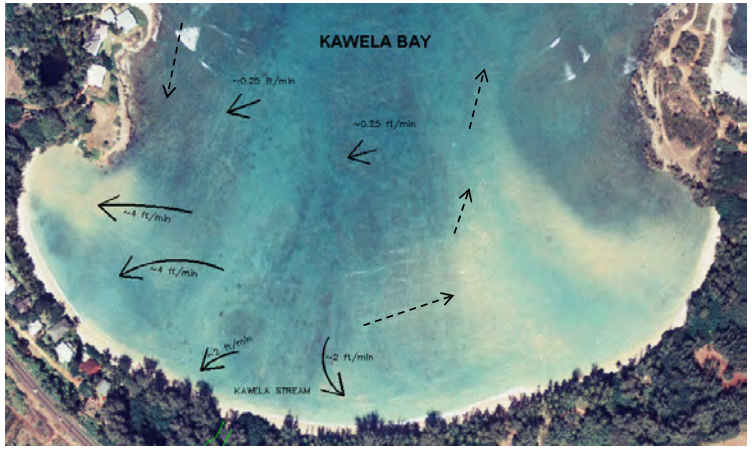


Figure 3-5. Interpolated Current During Flood Tide

3.3 Water Quality in Kawela Bay

Water quality has been examined during three separate long-term studies 1989-1994, 2001-2002, and 2006-2011, with collection points as shown in Figure 3-6. The large scale physical characteristics of the bay such as its bathymetry, current patterns, and salinity profiles are likely stable over a period of decades. However, water quality has the potential to change over much shorter time periods in coastal areas. In 1987 (Oceanit, 1987) a detailed salinity and bathymetry survey of the bay was conducted from which Figure 3-7 is derived. The figure shows a strong groundwater inflow of fresh water from the western portion of the beach. An inflow of approximately 5,000 gallons per minute (Oceanit 1987) of fresh groundwater was estimated to be required to sustain the observed low-salinity plume. This fresh water rises to the surface and is transported out through the center of the bay with the dominant current. Near the center of the bay a fresh water spring adds additional water to this flow. This mid-bay freshwater spring has been confirmed visually and is still active as of 2011. During low tide multiple groundwater freshets may be observed eroding the beach slope as the groundwater flows through the sand beach at the west end of the bay showing the persistence of this groundwater flow. This strong and consistent flow of groundwater into the bay is an important factor in the interpretation of water quality results because the groundwater tends to carry significant quantities of nutrients into the bay.

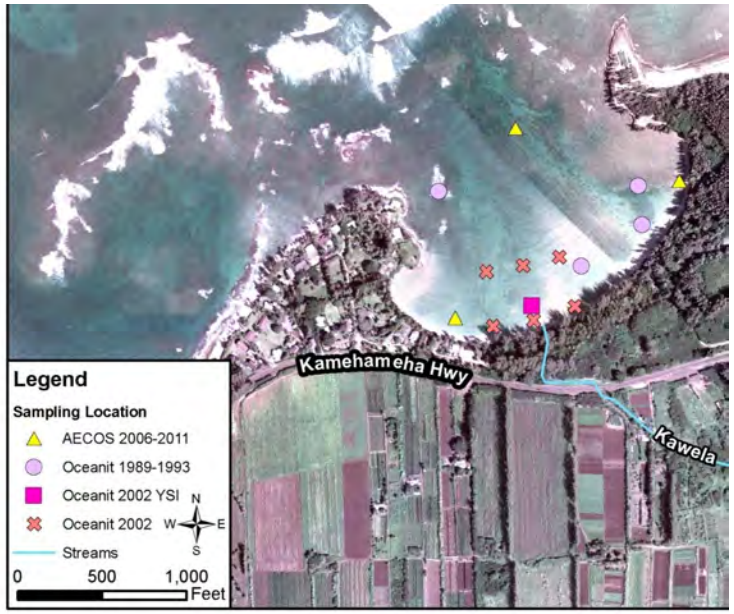


Figure 3-6. Locations of water quality sampling stations in Kawela Bay since 1989.

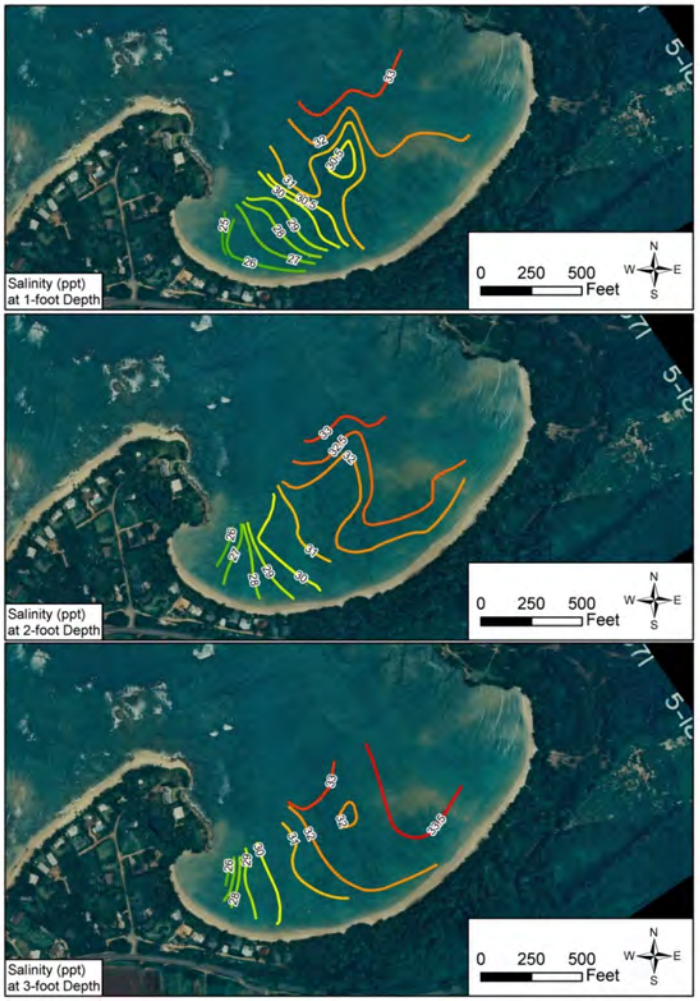


Figure 3-7. Salinity profiles in Kawela Bay at surface (top) two-foot depth (middle) and three-foot depth (bottom) indicate a strong source of fresh water at the West end of the bay as well as from a spring near the center of the bay.

From June 1989 through December 1993 surface and bottom samples were taken from four locations each quarter (Figure 3-6) for a total of 152 samples. Three of the sample sites were in the central and east bay surrounding the area with soft sediments and prevalent high turbidity. The fourth, a control site, was in the west bay at the edge of the sand channel was subject to more open ocean waters. The study concluded that the sediment was from Kawela Stream based upon high content of non-calcareous organic particles, and from observations of the stream outflow.

For the large majority of days the flow of Kawela Stream terminates at the sand beach berm and percolates slowly through the berm to the bay. During the infrequent occasions (~3-4 times per year) when the stream flow is sufficient to break through the beach barrier the entire bay is usually extremely turbid for days. Following these stream flow events the water turbidity in the west end of the bay usually clears within a few days, while the east end of the bay often remains turbid for several weeks to a month. Following a very large storm event in March of 1991 that flooded most of Kahuku, turbidity within the bay ranged from 88 to 4,000 NTU. But even when the Kawela Stream is not flowing to the bay, the water quality of the bay rarely meets State Standards for open coastal waters. Samples taken in the early 1990's and more recently in the past five years show that nitrate plus nitrite concentration in samples are highly correlated with groundwater inflow to the bay. High concentrations of total nitrogen and total phosphorus are correlated with high turbidity either as phytoplankton growth or associated directly with eroded sediments from stream flow events. Much of the water within the bay has N:P ratios (by weight) between 4:1 and 10:1 (Figure 3-10) which is ideal for plankton and algae growth. In the central and western portions of the bay the environment appears to have responded to the combination of high nutrients and high water turnover rates (currents) with abundant growths of macro-algae. In the eastern bay, with much lower currents and long resident time, these nutrients appear to lead to a prevalent turbidity caused by a combination of suspended terrigenous silt and plankton growth.

Figure 3-8. Kawela Stream flowing brown high turbidity water across beach into the bay.

The major flood of March 1991 gave rise to plans for improved drainage along the Kahuku coastline and a need to better understand water quality off of individual stormwater outfall points. During 2001-2002, 11 monthly samples were obtained from three nearshore and three offshore (300 ft) locations directly fronting the Kawela Stream mouth for a total of 66 samples. During this same period a YSI-datasonde water quality meter was affixed just above the bottom in about five feet of water directly off the stream mouth, where it recorded physical water quality data (temperature, pH, depth, salinity, turbidity) at half hour intervals for the entire year. A single month of data from the YSI is displayed as data visualization charts in Figure 3-101. This figure displays the large variance in water quality values during daily and tidal cycles. Averaged data from the monthly samples is plotted against annualized data from both the 1990 and 2010 era surveys in Figures 3-9 and 3-10.

Table 3-1. Summary of Water Quality in Kawela Bay

Kawela Bay Water Quality		Temp. (° C)	Diss. Oxygen (mg/L)	pH	Salinity (ppt)	Turbidity (NTU)	Total Susp. Solids (mg/L)	Ammonia (ug N/L)	Nitrate + Nitrite (ug N/L)	Total Nitrogen (ug N/L)	Total Phosphorus (ug P/L)	Chlorophyll a (ug/L)	Silicates (ug/L)
1989-1994													
Each Value Geo Mean of 19 quarterly samples	K1-1 - surface	25.19			32.19	2.9			17.46	137.8	22.0		
	K1-2 - mid-water	25.11			32.62	5.1			10.44	457.0	31.8		
	K2-1 - surface	25.34			31.76	3.5			17.39	143.8	23.9		
	K2-2 - mid-water	25.23			32.71	14.4			14.32	206.4	55.7		
	K3-1 - surface	25.19			31.61	2.9			22.2	151.6	20.5		
	K3-2 - mid-water	25.13			32.20	5.7			14.62	174.1	27.9		
	K4-1 - surface	25.03			32.23	1.2			13.9	134.3	13.9		
	K4-2 - mid-water	25.00			33.98	1.4			6.77	111.4	14.8		
	K1,K2,K3 Ave	**25.24**			**31.85**	**3.08**			**19.02**	**144.39**	**22.12**		
2002													
Each GM of 33 samples	Near Shore (10 ft)	25.40	7.5		31.50	11.3	18.9		54.2	217.3	35.3	1.90	
	Off Shore (300 ft)	25.30	7.8		33.40	3.1	6.2		27.2	156.4	18.7	0.70	
	Average	**25.35**	**7.7**		**32.45**	**7.2**	**12.6**		**40.7**	**186.9**	**27.0**	**1.30**	
2006-2011													
Each GM of 21 samples	East	25.45	6.49	8.11	31.71	7.4	16.7	1.73	16.45	219.2	25.4	1.28	3232
	West	25.32	6.71	8.09	29.40	5.8	14.8	1.68	102.16	316.0	28.6	1.16	6305
	Offshore Surface	25.24	6.82	8.13	33.88	1.3	6.6	1.51	3.10	156.9	12.7	0.38	626
	Offshore Bottom	25.20	7.06	8.15	34.48	1.2	7.4	1.27	2.62	152.0	12.3	0.41	400
	East, West Ave	**25.38**	**6.60**	**8.10**	**30.55**	**6.6**	**15.8**	**1.70**	**59.31**	**267.6**	**27.0**	**1.22**	**4768**
Open Coast State WQ Std	Wet Season					0.50	20	3.5	5	150	20	0.30	
	Dry Season					0.20	10	2.0	4	110	16	0.15	

* Measured constituents with a geometric mean greater than the State WQ Open Coast Wet season standard are noted in blue

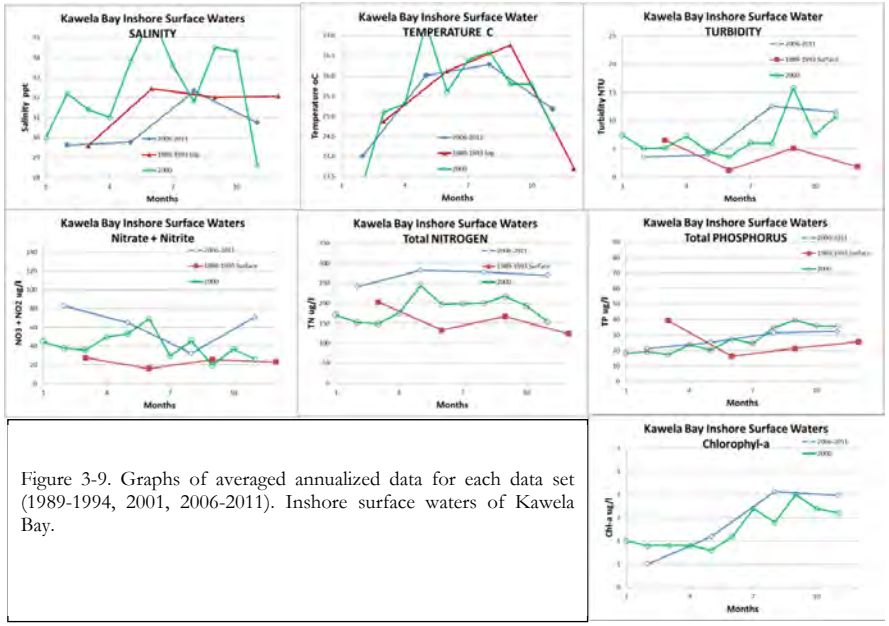


Figure 3-9. Graphs of averaged annualized data for each data set (1989-1994, 2001, 2006-2011). Inshore surface waters of Kawela Bay.

Summary Water Quality Results from Two Surveys, Two Decades Apart

1989-'94 / 2006-'11

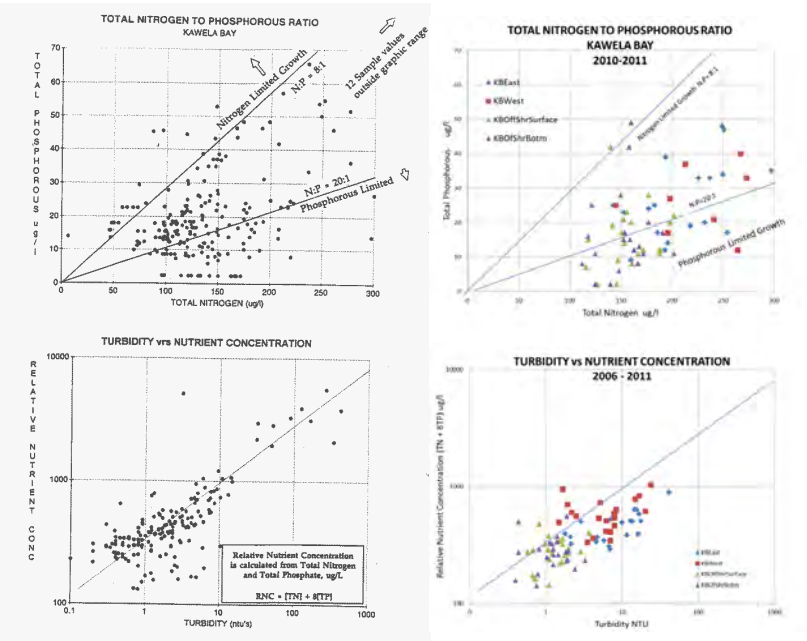


Figure 3-10. Comparison of water quality in Turtle Bay from 1989-1993. (Left) to present 2006-1011 (Right). All lines are in the same locations to ease visual comparison between data-sets. Recent data set appears to be lacking the few very high turbidity events measured previously but shows an overall shift to higher turbidity levels. Although total phosphorous levels are relatively unchanged, the increase in nitrate plus nitrite and total nitrogen appear significant.

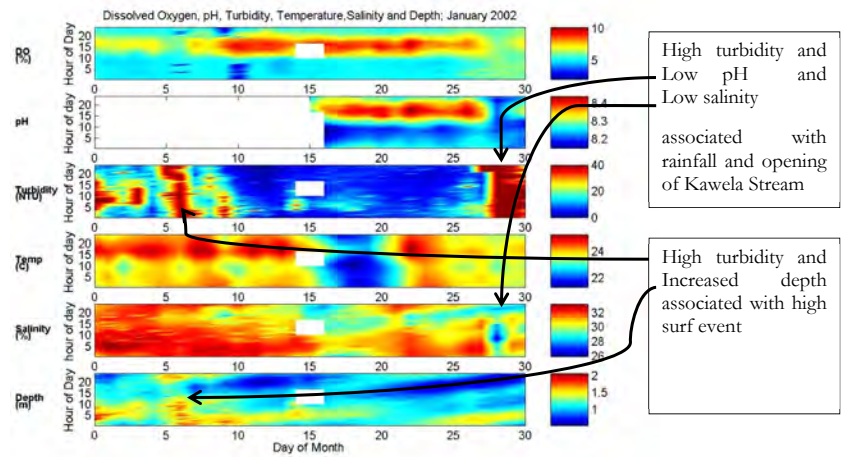


Figure 3-11. One month of hourly water quality data from just off Kawela Stream mouth during January 2002. Days of the month are read across the bottom, with the hour read along the vertical axes. The value of each parameter is expressed as a color according to the scale to the right of each graph. It is important to note the highly variable nature of each parameter over the course of each day as well as over days. Long term "trends" in water quality could be related to a trend in the time of day or fine scale location of samples taken.

The 2002 study concluded that turbidity was more than ten times higher than the State standard for dry open coasts, and that high turbidity events could be associated both with stream openings (Jan 26-30, 2001 in Figure 3-11) and, to a lesser degree, with high surf events (Jan 6, 2001 in Figure 3-10). The closely spaced sample sites off the stream mouth showed that there were differences in water quality between both nearshore/offshore and east/west along the shoreline. Both nitrogen and phosphorus nutrients were in higher concentrations within the groundwater plume near shore on the west side of the bay and exceeded the State standard for dry open coasts. Total phosphorous (TP) was highest during the summer months. The high levels of TP were correlated with high chlorophyll-a levels, particularly when coupled with total nitrogen concentrations at a ratio of about 1:5. As phosphorus is not normally this high in groundwater (it usually becomes adsorbed to sediments) this indicates a relatively close source of phosphorus to the groundwater. These sources could include the adjacent agriculture fields or the adjacent home lots. The study concluded that Kawela Bay was not suited to receive enhanced stormwater discharge due to the low rate of mixing and transport within the bay.

Beginning in 2006 until the present, four water samples (two nearshore, two offshore) have been taken at three locations within the bay (Figure 3-6) on a quarterly basis for a total of 80 samples. Initial comparison of the results from these samples would seem to indicate that the near-shore sites show an increase in the concentration of nitrate plus nitrite, total nitrogen, and possibly total

phosphorus as compared to samples taken in 2002 or during the early 1990's. However, it is also noted that the three datasets show a trend in location of samples taken and this is a more likely source of this variation. During 1989-1994 the three nearshore samples were in the center-west portion of the bay. The 2001 samples were in the center-east portion of the bay, off the stream mouth. The two 2006-2011 sample locations were very close to shore (high groundwater influence) and one was at the west end of the bay within a known groundwater plume. Therefore, the relatively small trends seen in the dataset are consistent with the location of the samples taken within the bay. This is particularly interesting because the 1989 sample effort began not long after the last of the residents had moved away from the east end of the bay and septic systems associated with the homes became unused. If cesspools were delivering a significant load of nutrients through the sand berm one would have expected a decrease in nearshore TP concentrations over time in the east end of the bay. This decrease in phosphorus over time has not been seen. With the exception of a high total nitrogen value, all water quality parameters from the station at the east end of the bay from 2006 to the present are indistinguishable from the samples near this same location taken two decades ago. However, it remains true that the bay receives more nutrients than is likely appropriate according to state standards and this problem is exacerbated by the shallow nature of the bay and it's relative low rate of exchange with ocean waters.

The data indicates that the waters of Kawela Bay do not meet State water quality standards of an open wet coastline. While a large quantity of nutrients are delivered to the bay in groundwater, the majority of sediments and their associated nutrients enter the bay during infrequent flow events of Kawela Stream. Removal of this source of nutrients and sediments to the bay would greatly improve water quality over a period of years. Given the large quantity of fresh groundwater entering the bay, low circulation and mixing within the bay, and inefficient transport to the open ocean, consideration should be given to minimizing storm water flows to this body of water. Given the physical aspects of the bay and high groundwater inflow, it may be more appropriate to use State water quality standards associated with embayments rather than open coastlines.

3.4 Marine Biological Resources

3.4.1 Benthic Surveys: Fish, Coral, and Algae

Benthic habitat and water quality surveys have been conducted along this shoreline by Biengfang and Brock (1981) over a five-year period by Oceanit (1994) and again during the winter and summer of 2011. Benthic survey techniques have changed and improved over the years, particularly with the advent of digital underwater cameras and the ability to use computers to assist with photograph analyses. During the winter and late summer of 2011 three 100-foot transect surveys were conducted, one each in the east bay, central bay 200 feet off shore, and at the edge of the sand channel near the western mouth of the bay (K1, K2, and K3 respectively in Figure 3-3). The first two sites (K1, K2) approximated survey locations used during the early 1990's and the third survey was able to locate underwater markers and therefore duplicates the third transect from the 1990's. At each transect the starting point of each transect is fixed. A diver begins at the starting point and swims along a compass heading moving slowly over the course of the transect making a record of all fish seen within approximately six feet (2m) either side of the transect. The first diver conducting the fish counts is followed by a second unrolling a negatively buoyant cloth measuring tape to a fixed distance of 100-feet (~30m, total area 120m^2). At the end of the survey tape, the route is reversed with photos taken along the length of the tape to document the benthic substrate and biotic cover.

The 2011 surveys were documented using an underwater digital camera mounted on a monopod with a set focal length of 26-inches yielding a photo surface area of just over two square feet (0.20m^2). This short focal length, and resulting small photo area, was necessary due to the often shallow and relatively turbid nature of these nearshore habitats. The monopod was placed on the survey tape at two-foot intervals with the 50$^+$ photos almost adjacent to one another and making a nearly continuous record of the bottom just under 1.3 feet wide and 100 feet long with a total area of 107 ft^2 (10m^2). The photographs were then examined on a computer using a program (Coral Point) to randomly select 10 points from each photo. At each point the substrate was identified and classified (hard substrate, boulder, rock, cobble, rubble, gravel, coarse sand, fine sand, or mud) and the overlaying organism was identified, if possible, to genus. This resulted in the identification of the substrate type and marine organisms present at approximately 500 randomly selected points along each transect. It is uncommon for a substrate to be completely bare, but it is quite common for that cover to consist of a very fine and thin mat of algae too small to identify. Results of the 2011 fish surveys are presented in Table 3-2 with the benthic survey data presented in Table 3-2.

Figure 3-12. The protected waters of Kawela Bay support a broad range of algae and invertebrate species, such as this large nudibranch

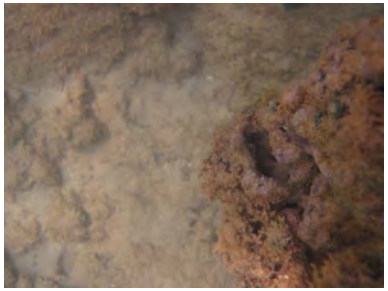
Table 3-3 and representative photographs from each transect is in Figure 3-13.

Table 3-2. Benthic substrate and benthic biota survey results from Kawela Bay, 2011.

	Kaweal Site 1			Kawela Site 2			Kawela Site 3		
	March	Sept	% cover	March	Sept	% cover	March	Sept	
	# Points	# Points	%	# Points	# Points	%	# Points	# Points	%
SUBSTRATE (only)	18	na	3.5	70	77	14.6	104	166	26.0
CORAL	9	na	1.8	0	2	0.2	9	9	1.7
OTHER INVERTEBRATES	0	na	0.0	0	0	0.0	0	1	0.1
CORALLINE ALGAE	34	na	6.7	13	6	1.9	45	18	6.1
TURF ALGAE	449	na	88.0	423	368	78.3	361	275	61.2
NATIVE ALGAE	0	na	0.0	0	4	0.4	13	3	1.5
INVASIVE ALGAE	0	na	0.0	0	40	4.0	0	24	2.3
CYANOBACTERIA	0	na	0.0	0	1	0.1	0	0	0.0
UNKNOWN	0	na	0.0	0	0	0.0	0	0	0.0
TAPE, QUADRAT, SHADOW	0	na	0.0	4	2	0.6	8	4	1.2
TOTAL POINTS	510		100.0	510	500	100.0	540	500	100.0
	Kaweal Site 1			Kawela Site 2			Kawela Site 3		
	March	Sept	% cover	March	Sept	% cover	March	Sept	% Cover
	# Points		%						
BENTHIC SUBSTRATE									
Benthos (BENTH, HARD)	229		45.0	191	129	31.8	395	316	68.6
Boulder (BOULD)(ROCK)	1		0.2	13	8	2.1	1	1	0.2
Cobble (COB)	24		4.7	54	45	9.8	22	1	2.2
Rubble (RUB)	210		41.3	139	192	32.9	44	15	5.7
Gravel (GRAVEL)	8		1.6	36	19	5.5	5	2	0.7
Coarse Sand (CSAND)	11		2.2	46	48	9.3	72	162	22.6
Fine Sand (FSAND)	19		3.7	30	57	8.6	0	0	0.0
Mud (MUD)	7		1.4	0	0	0.0	0	0	0.0
Substrate Total	509		100.0	509	498	100.0	539	497	100.0

Table 3-3. Results of fish surveys from three transects in Kawela Bay, 2011

				Kawela Bay				
			K1		K2		K3	Total
		March	Sept	March	Sept	March	Sept	Fish
Surgeon Fish	Acanthurus leucopareius							
	Acanthurus nigrofuscus	2		2				4
	Acanthurus triostegus	8		3	3			14
	Acanthurus xanthopterus			2				2
Butterflyfish	Chaetodon auriga	2		1				3
Goat fish	Mulloidicthys flavolineatus							
Box fish	Canthigaster jactator	1				1	1	3
	Canthigaster amboinensis					1		1
	Ostracion meleagris					1		1
Wrasses	Coris flavowittata							
	Coris venusta				12	1		13
	Labroides phthirophagus				1			1
	Stethojulis balteata							
	Thalassoma duperrey	3		3	3	6		15
	Thalassoma purpureum							
	Thalassoma trilobatum							
Damselfish	Plectroglyphidodon imparipennis					1		1
	Plectroglyphidodon johnstonianus							
	Abudefduf abdominalis				2			2
	Stegastes marginatus	2				2		4
Triggerfish	Rhinecanthus rectangulus					1		1
	Total Species Count	6	0	5	5	8	1	14
	Total Number Fish	18	0	11	21	14	1	65

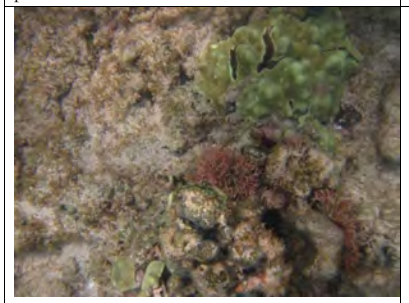


1. Kawela Bay East Transect quadrant photo

1.Kawela Bay East transect detail photo

2.Kawela Bay Center Nearshore quadrant photo

2.Kawela Bay Center Nearshore detail photo



3.Kawela Bay West quadrant photo

3.Kawela Bay West detail photo

Figure 3-13. Representative photographs from three transects within Kawela Bay

There are five major habitat types within Kawela Bay covering a total of about 50 acres (Figure 3-3). The bay is protected from constant ocean trade wind swells by a fringing reef at the center of the bay and by raised headlands and adjacent shallow limestone benches to the east and west. Waves larger than about three-feet break well off shore maintaining the body of the bay in a relatively quiescent condition. The bay supports a highly diverse growth of corals, fish, sea turtles and macro-algae.

The inner bay (biotype 1) fronts the beach shoreline and is protected from constant ocean swells and currents by the headlands and shallow central reef. Biotype 1A (Figure 3-3) is primarily sand or hard bottom with low relief at depths from three to six feet in the west side of the bay. This biotype typically has high water clarity but often with a well-defined fresh water lens at the surface. Biotype 1B is shallower generally two to four feet and consists of the inner portion of the finger-and-groove central reef. Finger-and-grooves are formed on a reef in response to wave action and scouring by sand. Sand channels tend to form in line with the wave direction, and corals grow on either side of the channel, protected from scouring by elevation. In this habitat the finger-and-groove formations are indistinct with lower relief and greater quantity of rubble and sand. Small coral colonies within this zone are more numerous on the west side of the zone away from the typically turbid water common on the east side of the bay. Biotype 1C consists of an isolated low point in the bathymetry with depths of up to about eight feet. This area accumulates soft sediments and is often very turbid. The narrow (20 to 40 foot wide) steep sand beach (Biotype 1D) extends the entire length of the bay shoreline, with the toe of the sand beach terminating at a depth of two to three feet where it meets the inner rubble zone of Biotype 1A and 1B.

Figure 3-14. Corals in the east bay often show signs of siltation stress

The shallow shelves fronting both headlands (Biotype 2) are divided into a very shallow (2A) and slightly deeper (2B) habitats. The benthic substrate in 2A presents itself as a very flat but pitted calcareous substrate supporting a dense growth and broad variety of macro-algae and occasional sea urchins. This substrate is usually swept with waves and may be exposed, or nearly so, during low tides. Slightly deeper the habitat (2B) expresses greater irregularity with the presence of sand patches in depressions, coral rock boulders scattered across the surface, and occasional coral colonies. This slightly deeper habitat appears to be a favorite for grazing by green sea turtles. The bench along the eastern headland has an abrupt edge dropping several feet into a channel. Along the western headland the depth of the bench increases gradually to the edge of the sand channel and supports a variety of coral growth in a surge habitat.

The center of the bay is characterized as a coral reef habitat with high cover of several varieties of corals dominated by lobe coral (*Porites lobata*) but with at least seven other species prevalent (*P. lutea, P. compressa, P. duerdeni, Pavona duerdeni, Montipora flabellate, Pocillopora meandrina*). The inner shallower portion of Biotype 3 displays classic "finger and groove" coral and sand channel formations that extend into Biotype 1 near shore.

There is no distinct reef crest, the inner portion of the biotype displaying a depth of two to three feet and then gradually increasing to a depth of four to six feet at the outer edge where the finger and groves become deeper and more prominent. The west side of this biotype (3B) may either be termed a major groove or a minor channel, strewn with boulder sized lobe coral colonies up to the abrupt ledge forming the outer limits of the shallow benches of Biotype 2B. As the water increases in depth outside the bay, the reef takes on the characteristics of a deeper and wider surge channels that eventually grade into deep patch reefs of Biotype 4.

Biotype 5 is somewhat unique in that it consists of a relatively wide and deep sand channel with about a dozen immense free standing lobe coral colonies of *Porites lutea* (ex. *P. evermanni*). These colonies range from about three-feet to 12-feet in diameter.

3.4.2 Human Activities at Kawela Bay

As part of the sea turtle surveys (Section 2.5), observers were asked to note beach and ocean activities in Kawela Bay. This process was initially instituted to merely keep the observer "observant" by decreasing the monotony of the long observation periods, but it has more than proven a unique perspective to the change in beach and ocean recreational activities over time. Log sheets from individual observations taken from 1989-1993 were re-analyzed in 2011 and data regarding human activities were distributed into two either Beach Activities (playing/walking, shore-fishing) or Water Activities (swimming, boating/surfing). This information was compared to similar data accumulated during the surveys conducted in 2011.

Human activity within the bay has seen marked changes as compared to activities observed in the early 1990's. Table 3-4 displays the average total number of people during a single day observed engaging in a variety of activities in the water or on the beach at Kawela Bay. Because of the way the observations are made, these estimates are likely slightly high. For instance, one person walking on the beach for one hour will be counted twice, once in each consecutive 25-minute observation period. This yields a high estimate of total population although it may be balanced somewhat by those people who accessed the beach during the day sometime between the three 2 ½ hour sample periods. During the early 1990's the total average daily number of people either in the water or on the beach was about 22, whereas in 2011 there were about 60 people per day at the bay.

The highest number of people observed during any single 25 minute observation period was 21 on the beach and five in the water, during a Saturday afternoon in September of 2011. All categories of beach and water use except for boating and scuba diving have seen increases. The most significant increase, kayak use, appears related to the regular daily kayak guided tour that is sponsored through the Turtle Bay Resort.

Table 3-3. People counts at Kawela Bay

	1990-1993	2011
Average Daily Total People at Kawela Bay	**22.0**	**60.1**
Beach Activities (total)	**17.1**	**42.6**
· Playing, walking on beach	13.3	38.2
· Shorefishing	3.8	4.4
Water Activities (total)	**4.9**	**17.5**
Swimming	**2.2**	**5.6**
· Snorkelers	0.6	1.9
· Swimming/Playing in Water	1.3	3.7
· Divers	0.3	0.0
Boating/Surfing	**2.7**	**11.9**
Surfing	**1.4**	**7.4**
· Standup	0.1	3.1
· Surfing	0.6	3.9
· Boogie Boards	0.2	0.4
· Wind Surfers	0.5	0.0
Kayaking	**0.4**	**18.4**
· Kayak	0.4	18.1
· Kayak fishing	0.0	0.3
Boating	**0.9**	**0.1**
· Canoe	0.5	0.0
. Boat fishing	0.0	0.0
· Boating	0.5	0.1

Table 3-4. Water Related Activities at Kawela Bay, Five Days in September 2011

Date	Seen From	Morning	Noon	Evening
9/19/11	Zone 2	1 pole fisherman	1 throw net	2 throw nets
	Zone 5	1 pole fisherman,7 kayaks getting stage	1 throw net, 1 snorkler	2 throw nets
	Zone 4	1 pole fisherman, 6 kayaks	none	1 sailboat
	Zone 3	6 kayaks	two pole fishermen	none
	Zone 1	1 pole fisherman, 6 kayaks	1 standup paddler, 2 swimmers, 2 polefisherman	1 sailboat (same as in zone 4), 2 pole fishermen
9/21/11	Zone 2	none	4 surfers	2 swimmers
	Zone 5	none, two people on beach staging kaya	2 surfers	4 surfers
	Zone 4	none,two people on beach staging 7 kay	2 surfers	3 surfers, 2 polefishermen w/ 3 poles
	Zone 3	7 kayaks	none	3 surfers, 2 polefisherman
	Zone 1	7 kayaks	none	4 surfers (in zone for duration of obsr)
9/22/11	Zone 2	none	7 kayaks	1 swimmer
	Zone 5	none	7 kayaks	none
	Zone 4	none,two people on beach stageing kay	7 kayaks	1 surfer, 1 standup paddler
	Zone 3	1 surfer, 8 kayaks	2 pole fisherman	1 surfer, 1 stand up paddler
	Zone 1	1 surfer, 8 kayaks	none	1 surfer, 2 standup paddlers
9/23/11	Zone 2	none	7 kayaks (in zone 10:48-10:57)	none
	Zone 5	none	7 kayaks (in zone 11:16 -11:24)	4 snorklers
	Zone 4	none	7 kayaks	3 swimmers, 1 standup paddler, 2 surfers
	Zone 3	8 kayaks	none	1 standup paddler, 2 surfers
	Zone 1	1 standup paddler, 8 kayaks	1 boogie borader	1 standup paddler (in zone 6:12 till end)
9/24/2011 Saturday	Zone 2	2 standup paddlers, 1 surfer	6 kayaks (in zone 10:45 till 10:57)	2 surfers
	Zone 5	1 standup paddler, 1 surfertwo people c	2 stand up paddlers, 1 jetski, 7 kayaks, 1 surfter	1 standup paddler
	Zone 4	none	1 surfer, 2 stand up paddlers	5 swimmers
	Zone 3	8 kayaks	1 standup paddler	none
	Zone 1	10 kayaks, 3 surfers, 2 standup paddlers	none	none

4. TURTLE BAY

4.1 General Physical Description

Turtle Bay beach is a half-mile long crescent of white sand perched on top of a beach-rock shoreline. Kuilima Point at the east end of the beach blocks most of the trade-wind generated swells from the beach, although these swells do wrap around the peninsula to create a popular surf break in the lee of the Turtle Bay Resort. The active reef crest is well off shore from the beach (~2000 feet) with a significant back-reef lagoon between the beach and reef.

Turtle Bay's unique bathymetry has a dramatic impact on water flow and water quality in the bay. As mentioned earlier (Section 2) during prehistoric times the ocean was as much as 60 feet (17 meters) higher than present, during which time much of the flat coastal plain was formed and upon which the project site now rests. But during times of lower sea levels (by as much as 200-feet!) the coastline was much farther out to sea, and coastal streams formed channels across the broad plateau. A remnant of the prehistoric Kuilima Stream bed snakes through the reef from the west end of Turtle Bay in a deep 350-foot wide channel and meets the shoreline about a third of the way along the beach towards the main hotel (Figure 4-1). This channel is a dominant factor in the hydrology and ecology of Turtle Bay as described below under currents and waves.

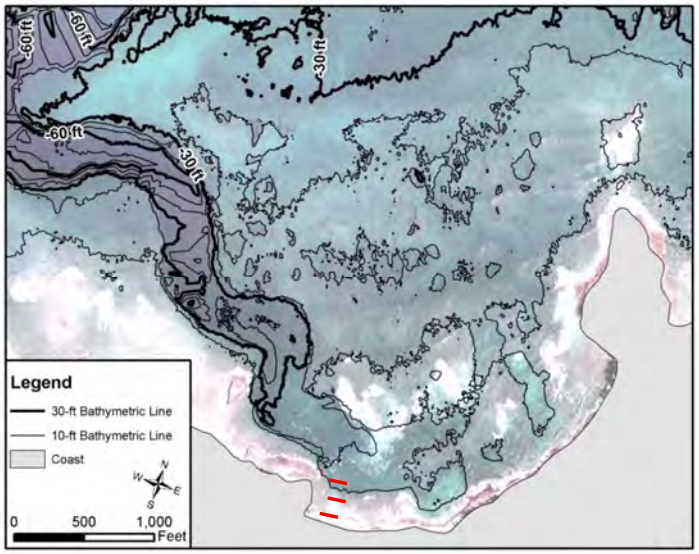


Figure 4-1. Turtle Bay Bathymetry showing submerged ancient stream bed that controls hydrology within the bay. Red lines mark locations of 100-foot long survey transects W1, W2, and W3

Because the sand beach is perched on top of a lithified beach-rock shoreline, the toe of the beach sand is either above or, at most, slightly below water line. Along the eastern portion of the bay closest to the main resort buildings, the nearshore displays the characteristics of a shallow back-reef substrate. The bathymetry is relatively flat consisting of coral rubble substrate at a depth of two to six feet consolidated by a cover of algae and invertebrate growth. Small depressions or ridges filled with coarse sand and rubble and interspersed with small coral rocks thrown back from the reef face by past storms. Occasional small corals, more prevalent further from shore, grow on raised outcroppings above the action of the scouring sand. Small fish, primarily damsals, wrasses, and occasional box-fish and trigger fish are associated with the scattered cover provided by ridges, small corals and coral boulders. The nearshore along the western half of the beach provides a significantly different appearance. Here the prehistoric stream channel is roughly parallel to the shore forming a 350-foot wide relatively deep (6-12 foot) lagoon. At the extreme west end, a narrow (200-foot) apron of hard substrate remains between the shore and the edge of the channel, but this apron is highly rugose and includes scattered boulders presenting a complex substrate. Our three benthic transects were located over this nearshore apron. Closer to the center of the beach the old stream channel crosses the shoreline. The substrate on the bottom of this submerged stream bed consists of sand and rubble with boulder debris particularly nearer the shoreline. This more irregular substrate in the nearshore with ample groundwater intrusion provides excellent habitat for the abundant growth of a wide variety of algae along the shoreline at the west end of the beach. The algae proximity to deeper water, and enhanced cover also supports a greater variety of fishes in the nearshore as compared to the east end of the beach. While the edges of the submerged stream bed provide enhanced substrate, the rubble and sand bottom of the bed provide very limited habitat.

Two storm water drainages, the West and the West Main, outfall into Turtle Bay, neither of which receives significant flows from mountain streams or inland valleys. The West Drain consists of two 48-inch culverts placed in a concrete headwall at a cut through the beach-rock shoreline about mid-way along the beach. The West Drain receives flows from the golf course and the general resort premises only during heavy rainfall events. During light to moderate rainfall events the golf course and resort grounds are typically infiltrated with the large majority of rainfall. The West Main Drain is located at the extreme west end of the perched sandy beach against the base of the rocky headland and consists of two, forty-eight-inch drains ending at a concrete headwall at the top of the beach with a short channel cut through the beach-rock shoreline to the ocean. During summer sand from the adjacent perched beach often completely covers these outlets (Figure 4-2) and requires physical sand removal prior to the arrival of winter storms to allow flow to the ocean. The normally dry stream bed follows upstream around the west edge of the golf course and then parallels the Kamehameha Highway in a broad swale. The swale receives flow partially from the golf course, but primarily through a two-foot wide culvert beneath the highway (Figure 4-2) fed by the lower slopes of the Koʻolau mountains. The total drainage area of both the Kuilima and the West Main Drains is about half a square mile (80 acres).

About 600 feet from the beach the far side of the old stream channel is visible as an abrupt vertical ledge rising to within about five feet of the surface. In the lagoon this ledge varies from almost zero-feet to well over 10 feet in height. As one follows the channel seaward, the near vertical face of the old stream bed wall approaches 20 feet in height above a uniform sand and rubble bottom. The reef crest at a depth of three to five feet is another 1000 feet beyond the edge of the channel.

Figure 4-2. West Main Drain Outlet (above) to Turtle Bay is typically buried in sand when not actively flowing. The small channel under Kamehameha Highway (right) limits flow to the West Main Drain from mauka of the highway.

White water from the waves breaking over the reef crest dissipates where it crosses into the lagoon channel. No surveys have been conducted over this section of the reef because it is far from the stream and storm drain outfall points. However, qualitative observations show this reef to be typical of other reefs along this windward shoreline consisting of a relatively flat pavement substrate covered with algae mat intermixed with sand and rubble patches and occasional coral heads on raised substrate. With the exception of the ancient stream bed channel the crest of the reef is continuous across the width of the bay and of relatively uniform width and depth.

4.2 Waves and Currents

Direct north swells and trade-wind swells that wrap around the Kuilima peninsula approach the shoreline as three-four foot waves through a minor channel at the east end of the bay. Larger swells from the north-west tend to break over the shallow reef crest and dissipate as white-water moving over the back-reef and into the lagoon. Currents within the bay are primarily driven by the pulsing of the white-water over the reef and, to a lesser degree, by wind direction. The overall direction of the current seems to be counter-clockwise where the inward flow occurs on the east side of the bay then exits at the east corner by flowing along the shore then by cutting diagonally across the bay.

Figure 4-3 shows the interpolated current from the field study during ebb and flood tides. Both show the current in a counter-clockwise orientation. Under conditions of normal trade-wind swells with surf across the shallow reef into the deeper nearshore back-reef lagoon, there is a dominant outward current to the ocean through the channel at the southwest end of the beach immediately off the outfall of the West Main Drain.

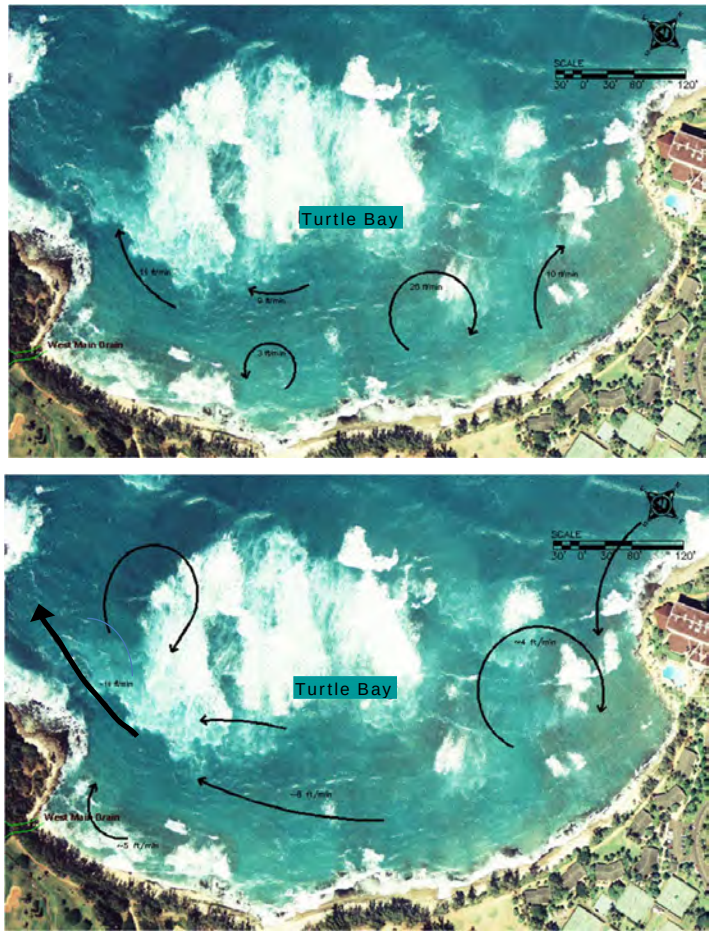


Figure 4-3.Water current circulation in Turtle Bay during rising tide (top) and falling tide (bottom) showing wave pumping over shallow fringing reef into deeper nearshore lagoon with the majority of outflow occurring through the deep channel through the reef at the south-west end of the bay.

4.3 Water Quality

Water quality has been monitored in Turtle Bay during three time periods, semi-annually from 1989-1994, monthly for one year during 2001-2002, and quarterly from 2006 to the present. The location of these samples is shown in Figure 4-4.

Table 4-1 displays the geometric mean value for each water quality constituent collected at each of the sample sites within Turtle Bay, and then averaged for the whole-bay during each of the three survey periods for each constituent. The graphics in Figure 4-5 present the same three data sets, but with the geometric means expressed by month, to show any seasonal trends in the data. The graphs are all of the same scale as those of Figure 3-8 for Kawela Bay and Figure 5-4 for Kuilima Bay to allow for ease of comparison between bays. Figure 4-6 displays one month of hourly data from the 2002 survey as a data visualization graph for physical water quality constituents only. A standard XY plot of this same one-month data set is presented in Appendix B for comparison.

Turbidity values are rarely below the State Water Quality Standard for Wet Open Coasts (0.5 ntu). Turbidity values are typically higher in nearshore (~2ntu) than from offshore sample sites (~1ntu). As can be seen from Figure 4-6 there is a great deal of variability in turbidity from day to day and even from hour to hour during a given day. Turbidity appears to be correlated with water outflow events from the West Main Drain, with high wave events, and with summer low wave periods (and presumably low circulation) causing high chlorophyll-a levels associated with plankton blooms.

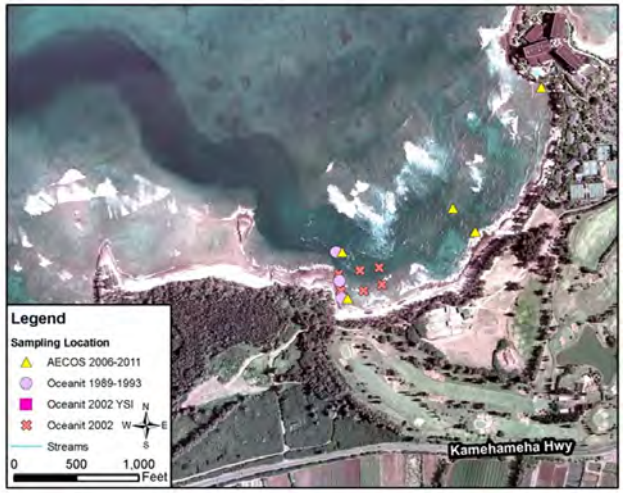


Figure 4-4. Location of water quality samples taken during 1989-1994, 2002, and 2006-present

Table 4-1. Summary of Water Quality from three surveys over 22 years at Kawela Bay

Turtle Bay Water Quality		Temp.	Diss. Oxygen	pH	Salinity	Turbidity (lab)	Total Susp. Solids	Ammonia	Nitrate + Nitrite	Total Nitrogen	Total Phosphorus	Chlorophyl a	Silicates
		(°C)	(mg/L)		(ppt)	(NTU)	(mg/L)	(ug N/L)	(ug N/L)	(ug N/L)	(ug P/L)	(ug/L)	(ug/L)
1989-1994													
	W1-1 surface	24.5	6.2		31.8	1.5			16.7	181	19.5		
	W1-2 - mid-water	24.6	6.2		32.7	1.8			20.5	186	16.2		
Each Value	W2-1 - surface	24.4	6.4		34.2	0.8			8.3	113	12.0		
Geo Mean of	W2-2 - mid-water	24.3	6.4		34.4	0.7			4.7	104	11.0		
10 semi-annual samples													
	Average	**24.47**	**6.29**		**33.26**	**1.19**			**12.53**	**146**	**14.7**		
2002	West Turtle Bay												
Each GM of	Near Shore (10 ft)	25.12	7.5	8.08	33.63	2.4	7.8		4.1	154	15.9	0.93	
33 samples	Off Shore (300 ft)	25.11	7.5	8.17	35.43	1.7	5.0		2.8	124	11.7	0.47	
	Average	**25.11**	**7.5**	**8.1**	**34.53**	**2.0**	**6.4**		**3.4**	**139**	**13.8**	**0.70**	
2006-2011	East nearshore	26.06	7.2	8.3	33.95	2.3	10.9	2.0	20.9	208	17.9	1.31	967
	Cntr nearshore	25.77	6.8	8.2	34.20	1.5	8.6	1.7	6.2	176	16.7	0.86	559
Each GM of	Cntr 300 ft offshore	25.53	6.7	8.2	34.49	1.1	6.6	1.4	7.3	162	11.4	0.42	451
21 samples	West nearshore	25.49	7.0	8.2	33.02	1.5	8.7	1.7	34.2	208	21.4	1.02	1525
	West 300 ft offshor	25.28	6.7	8.2	34.40	1.1	6.7	1.4	6.5	163	10.5	0.43	495
	Average	**25.62**	**6.88**	**8.23**	**34.01**	**1.50**	**8.32**	**1.64**	**15.02**	**183.37**	**15.59**	**0.81**	**799.50**
Open Coast	Wet Season					0.50	20	3.5	5	150	20	0.30	
State WQ Std	Dry Season					0.20	10	2.0	4	110	16	0.15	

* Measured constituents with a geometric mean greater than the State WQ Open Coast Wet season standard are noted in blue

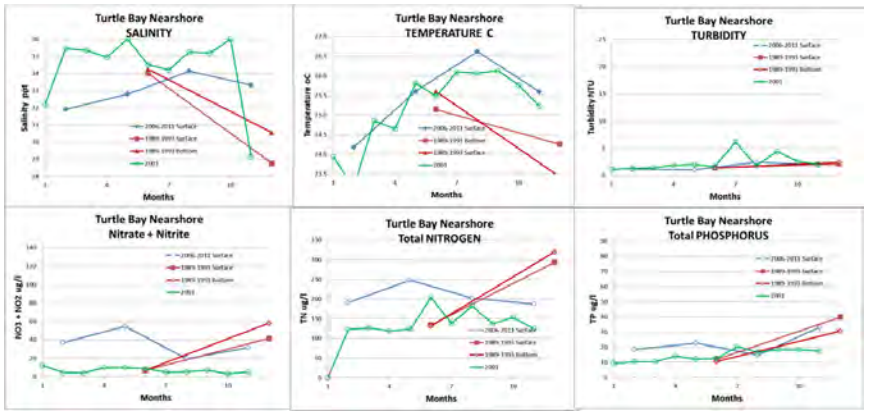
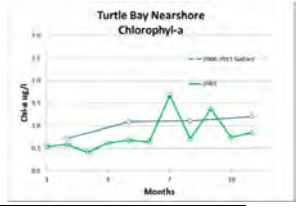


Figure 4-5. Graphic display of annualized averaged data from three studies conducted in Turtle Bay since 1989.



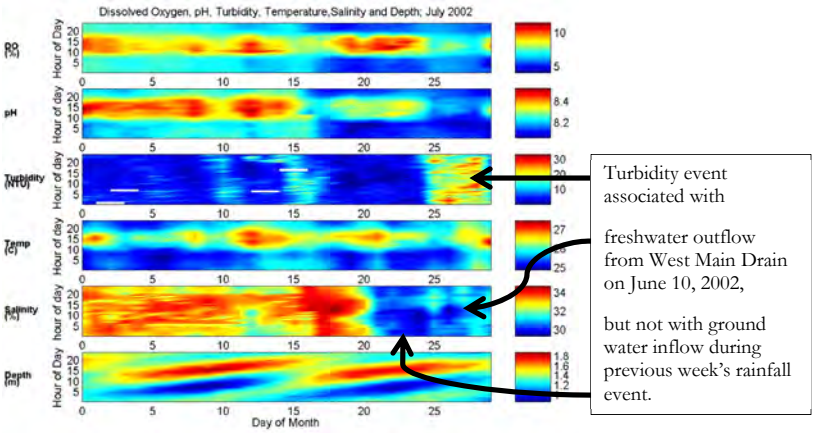


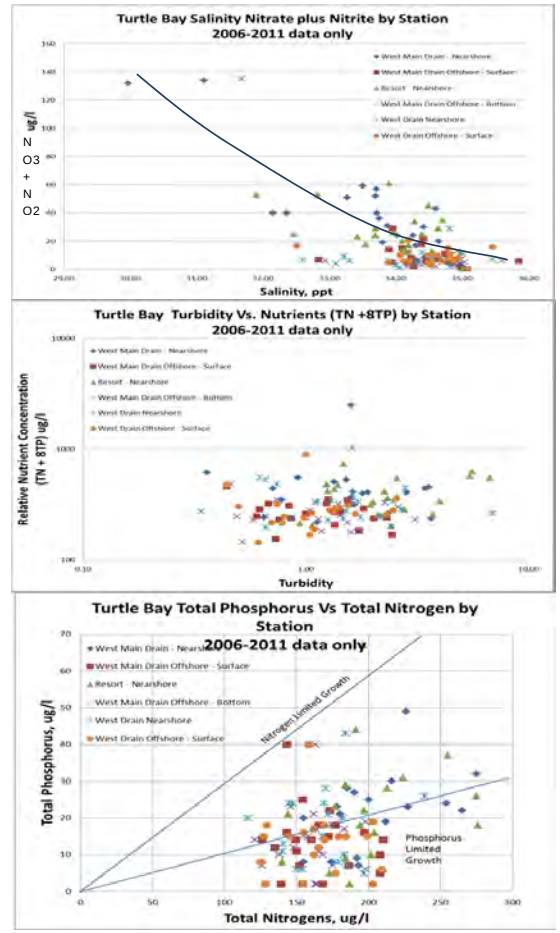
Figure 4-6. Data visualization graphic from Turtle bay June, 2002

Although turbidity levels are higher than state standards, it is unrealistic to assume that this standard is achievable in shallow nearshore areas subject to the turbulence of waves and currents. The State previously used a geometric mean of 20 mg/l for Total Suspended Solids as a water quality constituent along near shore open coasts. All of the sample geometric means are well within this standard. There does not appear to be any long term trend in turbidity levels within Turtle Bay.

Total nitrogen, and nitrate plus nitrite levels typically exceed the State Water Quality standards, particularly at the very nearshore sample stations. The higher nitrogen concentrations in nearshore samples show that these constituents are likely carried to the shore in groundwater. Because of the strong relationship between nitrogen concentration and ground water input (Figure 4-7) the two most practical ways to lower nitrogen in nearshore waters would be to either lower the nitrogen in the ground water or to increase the rate of mixing and offshore transport of nearshore waters.

Total phosphorous concentration is likely a more important variable than nitrogen concentrations in nearshore aquatic environments, because it is typically the limiting nutrient for plankton or plant growth. In contrast to Kawela Bay where TP concentrations were generally above State Water Quality Standards, in Turtle Bay these concentrations are, with one exception, generally lower than the State Water Quality Standard. Therefore in Turtle Bay the growth of algae and phytoplankton is generally phosphorous limited and there is not a strong correlation between turbidity (caused by plankton growth) and total nutrient concentration (Figure 4-7). Water quality within Turtle Bay appears to be strongly influenced by the rapid exchange of water with the open ocean as it is pumped in across the reef by wave action and exits through the drowned stream bed. Nutrient levels within the bay can reach very high concentrations during storm water outflow events through the West Main Drain, but due to the high exchange rate these high concentration do not persist and water quality rapidly improves. There is no apparent long term trend in water quality within the bay.

Figure 4-7. Top: Relation between Salinity and nitrate plus nitrite in Turtle Bay. Middle: Relationship between total nutrients (TN+8TP) and turbidity, and Bottom: TN Vs TP in Turtle Bay



2006-2011 data only. Compare to Figure 3-10

4.4 Marine Biological Resources

4.4.1.1 Benthic Surveys: Fish, Coral, and Algae

Benthic marine surveys were conducted in the nearshore waters in Turtle Bay off the West Main Drain during March and September 2011. The surveys were conducted along 100-foot transects parallel to shore approximately 50-feet, 100-feet, and 150 feet off the shoreline at the extreme west end of the bay. The nearshore survey is over a heavily scoured rough hard substrate in the surge zone just below the beach in about 4 feet of water. The survey 100 feet offshore is still over a hard beach-rock substrate but slightly deeper with slightly less surge, more gravel, and greater vertical relief. Both transects display abundant macro algae, calcareous algae, and occasional small corals. The third survey, at 150 feet from shore is deeper (six to ten feet) and lies just inshore of the edge of the submerged prehistoric stream bed. Substrate is highly irregular along this outer transect with large cracks and caves in solid substrate and provides a myriad of niches in which fish and invertebrates find refuge. This transect displayed both the highest total fish count (35) and the greatest number of fish species seen (eight).

Table 4-2. Benthic survey results from three transects within Kawela Bay, 2011

	1			2			3		
	Turtle Bay Nearshore			Turtle Bay MidShore			Turtle Bay Channel		
	March	Sept	% cover	March	Sept	% cover	March	Sept	
RESULTS SUMMARY CHART	# Points	# Points	%	# Points	# Points	%	# Points	# Points	%
SUBSTRATE (only)	58	151	20.7	31	136	16.7	1	496	49.7
CORAL	0	1	0.1	0	0	0.0	5	0	0.5
OTHER INVERTEBRATES	0	0	0.0	0	0	0.0	0	0	0.0
CORALLINE ALGAE	27	54	8.0	56	9	6.5	88	0	8.8
TURF ALGAE	406	115	51.6	387	280	66.7	399	0	39.9
NATIVE ALGAE	14	21	3.5	11	70	8.1	4	0	0.4
INVASIVE ALGAE	0	1	0.1	0	1	0.1	0	0	0.0
CYANOBACTERIA	0	155	15.3	0	0	0.0	0	0	0.0
UNKNOWN	0	0	0.0	3	0	0.3	0	0	0.0
TAPE, QUADRAT, SHADOW	5	2	0.7	12	4	1.6	4	4	0.8
TOTAL POINTS	510	500	100	500	500	100	501	500	100
	1			2			3		
	Turtle Bay Nearshore			Turtle Bay MidShore			Turtle Bay Channel		
	March	Sept	% cover	March	Sept	% cover	March	Sept	% Cover
CATEGORIES			%						
BENTHIC SUBSTRATE									
Benthos (BENTH, HARD)	258	187	45.8	390	287	68.9	405	437	83.9
Boulder (BOULD)(ROCK)	0	0	0.0	0	0	0.0	0	2	0.2
Cobble (COB)	2	8	1.0	0	4	0.4	21	17	3.8
Rubble (RUB)	1	6	0.7	9	25	3.5	74	26	10.0
Gravel (GRAVEL)	0	3	0.3	6	6	1.2	4	4	0.8
Coarse Sand (CSAND)	6	8	1.4	2	165	17.0	0	8	0.8
Fine Sand (FSAND)	212	280	50.7	89	0	9.1	1	5	0.6
Mud (MUD)	0	0	0.0	0	0	0.0	0	0	0.0
Substrate Total	479	492	100.0	496	487	100.0	505	499	100.0

Table 4-3. Fish transect results from two surveys of three transects in Turtle Bay, 2011

		Turtle Bay						
			W1		W2		W2	Total
		March	Sept	March	Sept	March	Sept	Fish
Surgeon Fish	Acanthurus leucopareius						2	2
	Acanthurus nigrofuscus						2	2
	Acanthurus triostegus		3		3		8	14
	Acanthurus xanthopterus							
Butterflyfish	Chaetodon auriga							
Goat fish	Mulloidicthys flavolineatus							
Box fish	Canthigaster jactator					1		1
	Canthigaster amboinensis							
	Ostracion meleagris							
Wrasses	Coris flavowittata						1	1
	Coris venusta	9	3	3	2	6	3	26
	Labroides phthirophagus							
	Stethojulis balteata						2	2
	Thalassoma duperrey	4	3	9	5	17	14	52
	Thalassoma purpureum	2		2		1	1	6
	Thalassoma trilobatum	1				1		2
Damselfish	Plectroglyphidodon imparipennis		5	3	2	7	8	25
	Plectroglyphidodon johnstonianus						1	1
	Abudefduf abdominalis						1	1
	Stegastes marginatus			1		1	3	5
Triggerfish	Rhinecanthus rectangulus	4	1	2		1	2	10
	Total Species Count	5	5	6	4	8	13	15
	Total Number Fish	20	15	20	12	35	48	150

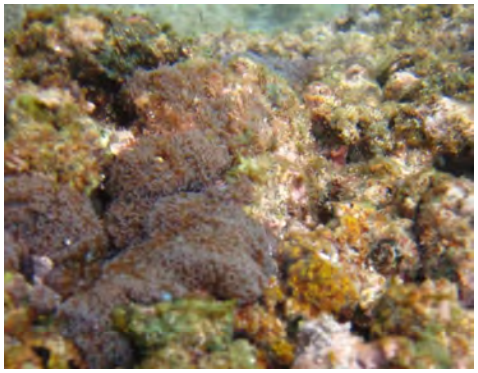
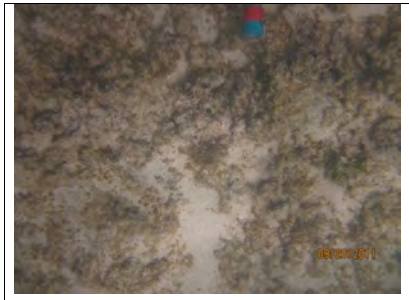
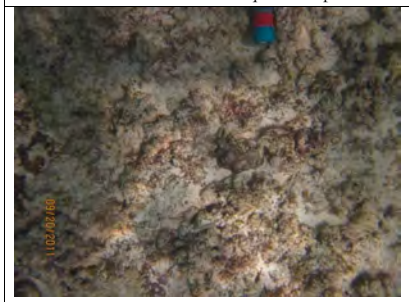


Figure 4-8. Complex benthic communities are common over nearshore lagoon reef flat



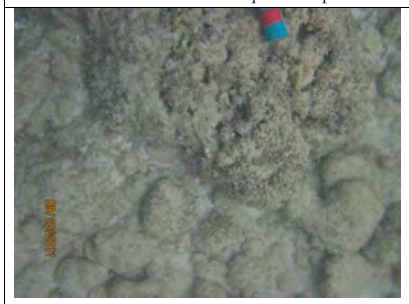
West Main Drain Nearshore quadrant photo

West Main Drain Nearshore detail photo



West Main Drain Mid-shore quadrant photo

West Main Drain Mid-shore detail photo



West Main Drain Offshore quadrant photo

West Main Drain Offshore detail photo

Figure 4-9. Representative photos from three transects in Turtle Bay in shallow water off the West Main Drain Outlet

5. KUILIMA BAY

5.1 General Physical Description

Of the three embayments along the project coastline, Kuilima Bay is the most exposed to the open ocean. The shoreline is dominated by reef-rock supporting a perched beach from Kuilima Cove to Kahuku Point. Although the long beach makes this shore popular for beach walking, the rough shoreline and exposure to open ocean waves makes access to the water challenging. Midway along the beach near the center of the bay, a 20-foot wide channel has been excavated through the beach rock shore to allow for the passage of stormwater from ʻŌʻio Stream, but this depression is often filled with sand from the perched beach to either side. The shoreline is a vertical beach-rock face dropping to a sand and rubble bottom in six to eight feet of water. The sand bottom extends about 200 feet from shore where its depth gradually increases to about 12 feet. Beyond this a hard bottom substrate with scattered corals and reef rubble gradually shallows to a depth of six to eight feet over an indistinct reef crest about 500 feet off shore. The reef crest is discontinuous near the center of the bay with passes deeper than 10-feet extending from nearshore to offshore areas. This deep reef crest allows a significant quantity of wave energy to impact the shoreline, much more than either Turtle Bay or Kawela Bay. The 30-foot depth contour is reached about 2000 feet off shore across multiple hard bottom reef areas.

The coral reef off of this section of coast does not form a contiguous barrier against the open ocean swells, and is physically closer to the shore than at either Turtle Bay or Kawela Bay. Because of the relative discontinuity of the reef, there is a greater diversity of habitat in the nearshore reef. NOAA coral reef habitat maps for this shoreline (Figure 2-10) categorize this reef as "Spur and groove" formation dominated by "turf" cover. However this greatly oversimplifies the character of the reef. The bay receives outflow from the ʻŌʻio Stream near the center of Kaihalulu Beach less than a mile East of the Turtle Bay Kuilima Resort. The stream outlet is often termed the "East Main Drain." Total Stream length is approximately four miles up to the top of the Koʻolau Mountains at an elevation of 1200 to 1600 feet. The total direct watershed area is approximately 2.56 square miles. During periods of heavy rainfall and runoff the ʻŌʻio Stream also receives overflow runoff from the Punahoʻolapa Wetland and the Hoʻolapa Stream.

The alignment of ʻŌʻio Stream has been changed several times according to historical maps of the area. Kahuku Plantation maps from the 1890's (State register 1460 Map 3 and Map 4) show this stream ending not far from the foot of the mountains at the "Old Government Road," with no outlet to the ocean. In maps from 1932 (State Topo Survey Map No. 4754) much of the land is designated as "sugar plantation" and the stream mouth is shown out-letting into the small cove just east of Kuilima Point and present location of the Turtle Bay Hotel. During the 1940's when aviation landing strips were constructed across the site, the mouth of the stream again becomes unclear, but by 1952, USGS maps show the stream again out-letting (as Kuilima Stream) at Kuilima Point, with another un-named stream skirting the west end of the Kahuku Airfield and entering the ocean at the present site of the ʻŌʻio Stream. The present straightened alignment appears to have been constructed as part of the golf course construction in the 1960's. Once the stream crosses under the Kamehameha Highway onto the Turtle Bay Shoreline plateau, the elevation is very low and waters from adjacent watersheds may co-mingle under heavy flow events. The stream courses along a relatively straight path from the Kamehameha Highway through the grounds of the Turtle Bay Golf course, through a primarily grassed, and typically dry, swale. Under heavy rainfall storm-flow conditions adjacent fairways may be flooded and flow direction is dependent upon which stream mouth (ʻŌʻio Bakahan to the east) is open to the ocean. The mouth of the ʻŌʻio stream is confined by a golf course road bridge constructed over three 3-foot diameter drainage pipes leading to the beach.

Beach sand that accumulates at the ocean end of these outlets must be mechanically cleared to allow the passage of storm waters.

Others (R.M. Towill, Aug. 1998) have determined that a 100-year flood would produce a peak storm flow in ʻŌʻio Stream of approximately 5,600 cubic feet per second (cfs). The present three 3-foot diameter pipes can handle only about 2000 csf. The City has proposed improvements to the ʻŌʻio stream channel to contain the storm flow including the construction of a 70-foot Kamehameha Highway bridge, and a 100-foot wide approximately nine foot deep grassed swale across the golf course. Conceptual plans have not yet been developed to modify the outlet structure making it capable of handling the 8000 cfs flow anticipated from ʻŌʻio Stream and other sources during a 100-year storm event.

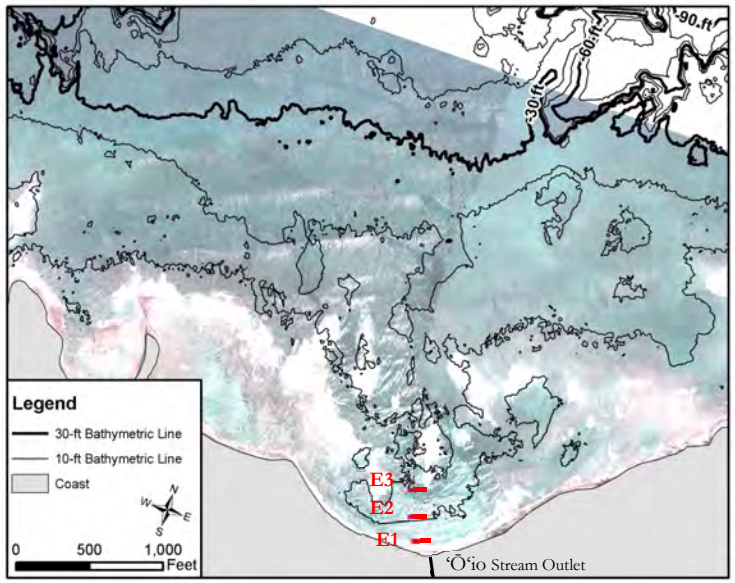


Figure 5-1. Bathymetry of Kuilima Bay showing location of ʻŌʻio Stream and transect locations

5.2 Waves and Currents

Of the three bays along the project coastline, the East Main Drain within Kuilima Bay presents the most open shoreline to the ocean waves and currents. The reef directly off of the East Main Drain is not as well formed, as wide, or as shallow as the reef off of Turtle Bay and subsequently allows much more wave energy to pass to the shore. Nearshore currents, both during rising and falling tides, were long shore from east to west, directly towards the main Turtle Bay Hotel facility (Figure 5-2). This is consistent with visual observations during outflow events where the plume of muddy water stays relatively close to shore and moves towards the west.

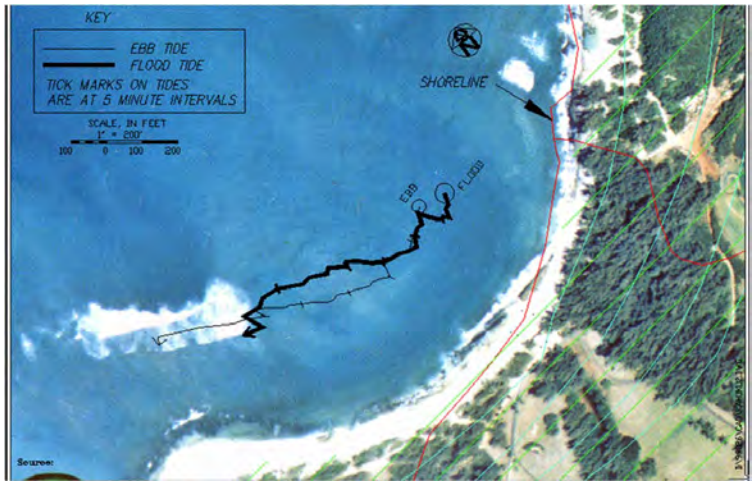


Figure 5-2. Nearshore currents in Kuilima Bay are along shore towards Kuilima Point

5.3 Water Quality

Water quality has been monitored in Kuilima Bay during three time periods, semi-annually from 1989-1994, monthly for one year during 2001-2002, and quarterly from 2006 to the present. The location of these sample sites is shown in Figure 5-3.

Table 5-1 displays the geometric mean value for each water quality constituent collected at each of the sample sites within Kuilima Bay for each survey period, and then the whole-bay average during each survey period for each constituent. The graphics in Figure 5-4 present these same three data sets, but with the geometric means expressed by month, to show any seasonal trends in the data. The graphs are all of the same scale as those of Figure 3-8 for Kawela Bay and Figure 4-5 for Turtle Bay to allow for ease of comparison between bays. Figure 5-5 displays one month of hourly data from the 2001 survey as a data visualization graph for physical water quality constituents only.

Nitrate plus nitrite levels in the ocean waters off the ʻŌʻio stream outlet are generally low, consistent with Oceanic or open dry coastline concentrations indicating low groundwater input at this site. The concentrations measured range from 0.5 ug/l. in May and June to 6.5 ug/l. in July 2001 at station E5. Total Nitrogen levels are not exceptionally low, being more on the level with nutrient concentrations typical of Wet Open Coastlines and Estuaries (according to State Standards). There are many potential sources of nitrogen in groundwater including animal feces, fertilizers, cesspool systems, and decayed plant material. The nearshore marine environment also adds to these sources with fish and invertebrate wastes and decaying plankton or benthic algae. Nitrate plus nitrite concentrations impacting this site are not as high as in the other two bays. Groundwater inflow at this location does not appear as significant as either Kawela or Turtle Bays and in combination with high nearshore turbulence, does not allow concentrations of these nutrients to build to significant elevations.

Total nitrogen levels are lower than both Kawela Bay and Turtle Bay, but still slightly above State Water Quality Standards for Wet Open Coast. There does appear to be a long-term trend toward increasing total nitrogen in the water during the past 22 years, but the source of this increase is unknown.

Total phosphorous (TP) levels are well below State Water Quality Standards and show no long term trends over the past 22 years. The monthly sampling conducted in 2001 appears to show a slight trend of increasing TP levels during summer months, but the concentrations typically stay below the 20 ug/l state standard except for individual very nearshore samples. The slight increase in summer TP concentrations during 2001 is correlated with both an increase in turbidity and an increase in chlorophyll-a concentrations.

A meter near the shore just west of the East Main Drain outlets into Kuilima Bay recorded physical water quality data on an hourly basis for one year in 2001. One month of this data is shown in Figure 5-5 as data interpretive graphic with colors representing measured values. Examination of the graphic shows a turbidity event beginning on January 12 with a storm and large wave event followed an outflow from the drain to the ocean. The period of turbid water lasted five days with significant outflow from the stream occurring over a period of three days until water subsided and the ocean closed the stream outlet with sand from adjacent beaches.

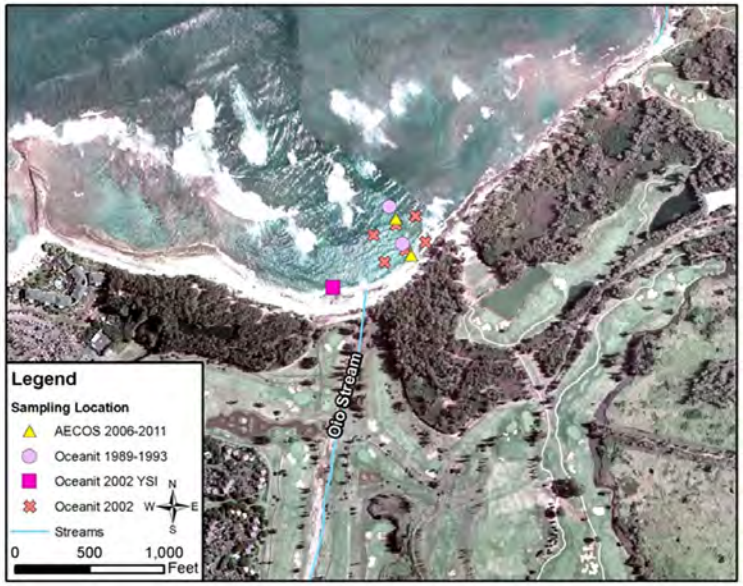


Figure 5-3. Location of water quality samples during three survey periods in Kuilima Bay

Table 5-1. Summary of water quality from three surveys over 22 years at Kuilima Bay

Kuilima Bay		Temp. (° C)	Diss. Oxygen (mg/L)	pH	Salinity (ppt)	Turbidity (lab) (NTU)	Total Susp. Solids (mg/L)	Ammonia (ug N/L)	Nitrate + Nitrite (ug N/L)	Total Nitrogen (ug N/L)	Total Phosphorus (ug P/L)	Chlorophyll a (ug/L)	Silicates (ug/L)
1989-1994													
	E1-1 surface	24.81	6.0		34.09	1.4			3.06	123.09	12.2		
	E1-2 - mid-water	24.71	6.3		34.43	1.0			1.99	102.36	12.1		
Each Value	E2-1 - surface	24.71	6.5		34.29	0.7			2.11	98.34	9.9		
Geo Mean of	E2-2 - mid-water	24.62	6.4		34.45	0.7			2.7	97.18	12.1		
10 semi-annual samples													
	Average	**24.71**	**6.30**		**34.32**	**0.91**			**2.46**	**105.24**	**11.59**		
2002													
Each GM of	Near Shore (10 ft)	25.12	7.5	8.08	33.63	2.4	7.76		4.06	154.0	15.92	0.93	
33 samples	Off Shore (300 ft)	25.11	7.5	8.17	35.43	1.7	5.05		2.84	123.5	11.72	0.47	
	Average	**25.11**	**7.5**	**8.1**	**34.53**	**2.0**	**6.4**		**3.4**	**138.7**	**13.8**	**0.70**	
2006-2011													
Each GM of	Nearshr Surface	25.94	6.48	8.20	34.44	1.7	9.5	1.61	2.10	172.6	13.2	0.66	415
21 samples	Offshore Surface	25.65	6.61	8.17	34.47	1.3	7.3	1.39	3.51	156.6	10.6	0.38	356
	Offshore Bottom	25.58	6.87	8.18	34.42	1.3	8.0	1.21	3.34	165.1	11.9	0.43	323
	Surface Only	**25.80**	**6.55**	**8.19**	**34.45**	**1.50**	**8.39**	**1.50**	**2.80**	**164.58**	**11.94**	**0.52**	**385.77**
Open Coast	Wet Season					0.50	20	3.5	5	150	20	0.30	
State WQStd	Dry Season					0.20	10	2.0	4	110	16	0.15	

* Measured constituents with a geometric mean greater than the State WQ Open Coast Wet season standard are noted in blue

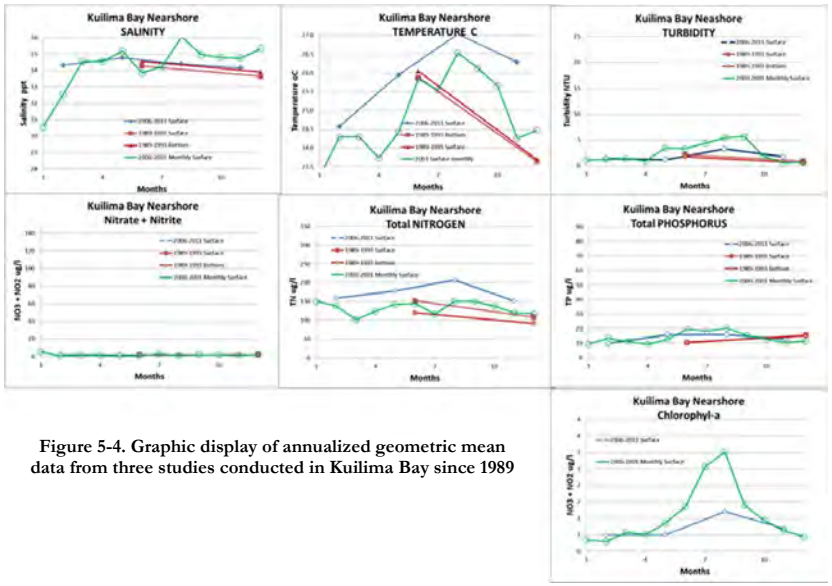


Figure 5-4. Graphic display of annualized geometric mean data from three studies conducted in Kuilima Bay since 1989

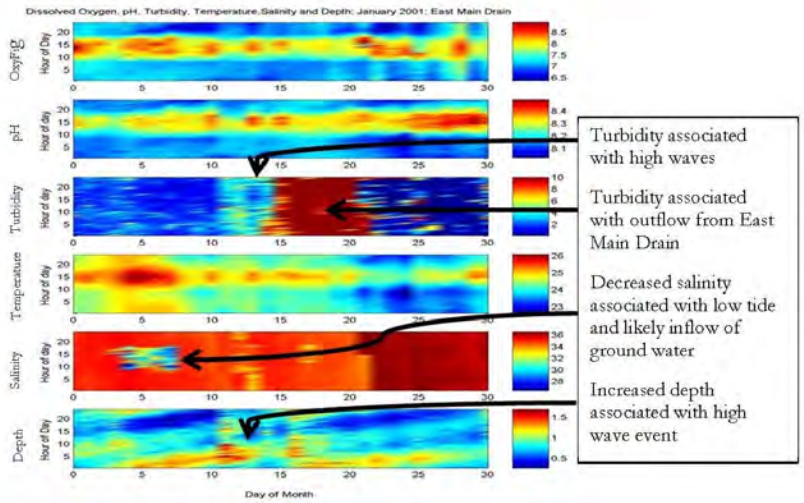


Figure 5-5. Water quality interpretive graphic from Kuilima Bay, January 2001

Examination of Figure 5-5 is critical as it shows how daily and sometimes hourly changes in water quality can be significant factors. With the possible exception of a slight increase in total nitrogen concentrations, there do not appear to be any significant changes in water quality during the 22-year period of measurement at this site. The concentration of total nitrogen in Kuilima Bay is lower than in either Turtle Bay or Kawela Bay.

5.4 Marine Biological Resources

5.4.1 Benthic Surveys: Fish, Coral, and Algae

The nearshore benthic habitat changes with distance from the abrupt shoreline out to the reef crest. The intertidal zone consists of the beach-rock surface. Where the surface has been protected by sand it forms a ledge sloping towards the sea with vertical broken edges and cracks exposed to the ocean. The cracks and biological borings of the exposed surface support the growth of intertidal mollusks and, deeper, boring echinoderms. Where the cracks are too narrow for fish to graze they commonly support a growth of bright green Ulva seaweed, which is often considered to be an indicator of fresh water intrusion. At the bottom of the bench and extending 100 to 200 feet from shore is a relatively flat seascape six to 12 feet deep with at least 50 percent cover of fine to coarse sand and rubble with exposed hard substrate covered with a fine algae turf. Further from shore the fine sand is replaced by coarse sand and the depth begins to decrease with increasing incidence of raised shelves and reef rubble supporting more algae and an occasional small coral. The most prevalent algae was *Halameda sp, Acanthophora sp.* and *Martensia sp.* Farther than 300 feet from the beach, the back side of the reef is approached, with the water generally shallowing, and the surface

relief beginning to show more complexity, more reef rubble, occasional reef boulders and a greater predominance of coralline and fleshy algae and more common corals on the uplifted surfaces. The crest of the reef, at about 450 to 500 feet offshore, displays a complex highly variable reef top within two to six feet of the surface without obvious finger and groove formations but irregular 10-foot-deep channels between reef patches. The most visibly prevalent corals are lobe coral (*Porites. lobata*) and cauliflower corals (*Pocillopora meandrina*).

Benthic surveys were conducted over 100-foot long transects laid parallel to shore 25 feet, 100 feet and 150 feet off shore. A continuous string of 50 photographs was taken along one side of the transect line and the results tabulated by percent benthic substrate type, and then by percent of biological cover over the substrate (Table 5-2). These surveys are in good agreement with those conducted in 1989-1994 and again in 2002 by Oceanit and characterize these nearshore areas as being relatively low relief, highly mobile sand and gravel sediments, little habitat for fish (except at the shoreline), and low percent cover of either coral or fleshy algae.

The characteristics of the benthic habit improves markedly as one moves away from the shore to the inner extent of the active reef about 300 to 400 feet off shore. The reef is highly irregular with a profusion of sand patches, ledges, and uplifted reef sections supporting a healthy growth of corals.

Figure 5-6. Much of the benthic substrate immediately off the East Main Drain in Kuilima Bay is dominated by sand and rubble with little vertical substrate

	1			2			3		
	Kuilima Bay Nearshore			Kuilima Bay Midshore			Kuilima Bay Offshore		
	March	Sept	% cover	March	Sept	% cover	March	Sept	
RESULTS SUMMARY CHART	# Points	# Points	%	# Points	# Points	%	# Points	# Points	%
SUBSTRATE (only)	47	254	30.1	156	136	28.9	175	127	30.2
CORAL	0	0	0.0	1	0	0.1	0	0	0.0
OTHER INVERTEBRATES	0	0	0.0	0	0	0.0	0	0	0.0
CORALLINE ALGAE	19	4	2.3	10	9	1.9	24	12	3.6
TURF ALGAE	402	210	61.2	308	280	58.3	280	277	55.7
NATIVE ALGAE	25	30	5.5	29	70	9.8	12	82	9.4
INVASIVE ALGAE	0	0	0.0	0	1	0.1	0	0	0.0
CYANOBACTERIA	0	0	0.0	0	0	0.0	0	0	0.0
UNKNOWN	0	0	0.0	0	0	0.0	0	0	0.0
TAPE, QUADRAT, SHADOW	7	2	0.9	5	4	0.9	9	2	1.1
TOTAL POINTS	500	500	100	509	500	100	500	500	100
	Kuilima Bay Nearshore			Kuilima Bay Midshore			Kuilima Bay Offshore		
	March	Sept	% cover	March	Sept	% cover	March	Sept	% Cover
CATEGORIES			%						
BENTHIC SUBSTRATE									
Benthos (BENTH, HARD)	274	187	47.0	78	287	37.0	285	355	63.0
Boulder (BOULD)(ROCK)	28	0	2.9	3	0	0.3	0	0	2.8
Cobble (COB)	14	8	2.2	1	4	0.5	4	4	1.8
Rubble (RUB)	19	6	2.5	2	25	2.7	15	8	2.7
Gravel (GRAVEL)	7	3	1.0	1	6	0.7	3	7	1.4
Coarse Sand (CSAND)	147	8	15.8	415	165	58.8	193	122	26.9
Fine Sand (FSAND)	0	280	28.5	0	0	0.0	3	0	0.0
Mud (MUD)	0	0	0.0	0	0	0.0	0	0	0.0
Substrate Total	489	492	100.0	500	487	100.0	503	496	98.6

Table 5-2. Benthic survey results from two surveys over three transects within Kuilima Bay, 2011

		Kuilima Bay						
			E1		E2		E3	Total
		March	Sept	March	Sept	March	Sept	Fish
Surgeon Fish	Acanthurus leucopareius							
	Acanthurus nigrofuscus							
	Acanthurus triostegus				5			5
	Acanthurus xanthopterus							
Butterflyfish	Chaetodon auriga							
Goat fish	Mulloidicthys flavolineatus							
Box fish	Canthigaster jactator	1	1				1	3
	Canthigaster amboinensis							
	Ostracion meleagris							
Wrasses	Coris flavowittata							
	Coris venusta	4	2	1	5	3	2	17
	Labroides phthirophagus							
	Stethojulis balteata							
	Thalassoma duperrey	1			1			2
	Thalassoma purpureum							
	Thalassoma trilobatum				1			1
Damselfish	Plectroglyphidodon imparipennis	1				1		2
	Plectroglyphidodon johnstonianus							
	Abudefduf abdominalis							
	Stegastes marginatus							
Triggerfish	Rhinecanthus rectangulus	1						1
	Total Species Count	5	2	1	4	2	2	7
	Total Number Fish	8	3	1	12	4	3	31

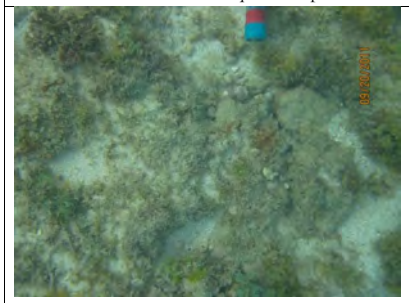
Table 5-3. Fish transect results from two surveys of three transects in Kawela Bay, 2011

KUILIMA BAY Nearshore quadrant photo

KUILIMA BAY Nearshore close up detail

KUILIMA BAY Midshore quadrant photo

KUILIMA BAY Midshore close up detail



KUILIMA BAY Offshore quadrant photo

KUILIMA BAY Offshore close up detail

Figure 5-7. Representative photos from three transects in Kuilima Bay in shallow water

6. IMPACT ANALYSIS FROM PROPOSED DEVELOPMENT COMPONENTS AND RECOMMENDATIONS FOR MITIGATION

This analysis accounts only impacts from the proposed development to coastal living marine resources (fish, coral, invertebrates, turtles, seals), coastal water quality, and coastal currents and waves. It is accurate to the extent that we understand the elements proposed in the development and the coastal ecosystem disclosed through the studies of various researchers as cited. Potential nearshore impact to the marine ecosystem from any shore-side development includes:

- short-term construction impacts (primarily sediment from runoff or dewatering)
- nutrient enrichment or pollution of nearshore waters from
  - agriculture, horticulture, hotel grounds, or golf course fertilization
  - R2 water (treated sewage) golf course irrigation
  - commercial herbicide application
- changes in ground water or surface water flow patterns
- impacts related to improved shoreline access and higher human population
  - unintentional takes of ESA species (primarily sea turtles and monk seals) that frequent the coastline
  - increased fishing pressure
  - increased potential for ESA/fishing gear entanglement
  - lights that disorient juvenile turtles

The first stage of avoiding adverse impacts is to recognize where these potential impacts may lie, and to then design to avoid, minimize, or mitigate for unavoidable impacts. The baseline survey serves as both a point of reference to gage any future impacts and as a source of information for project designers to incorporate all possible means to avoid, minimize or mitigate adverse impacts.

Because the site is riddled with sub-surface caves, any dewatering that needs to occur as part of any construction activity should carefully control effluent water and not direct it to unlined dug pits where it will likely find a direct route to the shoreline.

Along the Kuilima shoreline, there are three primary surface outfalls to the nearshore waters and several focused points of groundwater input. Balancing the flow between these outfall points as discussed in the North Shore flood assessment reports will be key to minimizing adverse impacts to nearshore ecosystems. Results from our analyses indicate that storm runoff may presently be over-allocated to Kawela Bay, and significantly under allocated to the West Main Drain in Turtle Bay. Engineering to modify these flows could have a significant positive impact upon the nearshore environment. Specifically, restoring the Kawela Stream to its original alignment outfalling to the West Main Drain would have a new, large positive impact on Kawela Bay with minimal adverse impact in Turtle Bay.

Improving access to the shoreline will lead to a greater probability of interactions between people and sea turtles or monk seals, both of which are on the Federal endangered species list. Any human interaction that causes an endangered species to alter its behavior may be considered as a "take" by Federal agencies. While this may seem extreme, NOAA recognizes that minimal interaction with turtles and seals is not likely to result in permanent harm (at least not for the seals or turtles) and is

primarily concerned with overt interactions and conflicts with fishing gear. Probably the best way to mitigate this impact is through a public education program that advises beach goers of their stewardship responsibility towards these creatures. Federal wildlife managers have expressed concern that lighting from the expanded Turtle Bay Development may disorient juvenile turtles (and fledgling seabirds). Consideration should be given to a development-wide lighting design that minimizes light impact towards the beaches and ocean.

Improving access to the shoreline will likely lead to an increase in fishing pressure and an equal increase in illegal or destructive fishing practices. In addition to providing educational material about stewardship, the Turtle Bay Development management should work closely with State agencies charged with fisheries management and with concerned fishermen from this ahupuaʻa to investigate the initiation of marine protected area status for the coastline to include closed, rotational, or restricted fishing areas, seasons, or other methods of stewardship.

The potential for increased ground water nutrient input should be addressed through appropriate vegetation management planning (integrated fertilizer and pest management plans), and may also include extension activities directed at farm operators located up-slope of the development. Development of a nutrient budget and tracking of fertilizer applications over time are keystones to good long-term management. Controlling sediment influx from winter storms through upslope detention (desilting) basins and appropriate vegetation of bare exposed slopes could greatly reduce the adverse impact of these winter storms to the nearshore ecosystem.

The other potential large source of nutrients to groundwater, and thereafter to nearshore coastal waters is human sewage. The Turtle Bay Development operates a sewage treatment plant with lagoon treatment and effluent recycled as R2-water for irrigation of the golf course. A review of the operation of this plant is beyond the scope of this report, but is under study by others as part of the resort expansion plan. At the new shoreline park in Kawela Bay, special consideration should be given to public restroom facilities as any groundwater generated by this system will enter the bay at a point with minimal circulation, dilution, or offshore transport. Shoreline residential lots both east and west of the development treat sewage either with individual cesspool or septic systems. In 2005 all large capacity cesspools were required by the EPA to be upgraded and the State no longer gave permission to construct individual home cesspools. But individual residential cesspools are still in use in many coastal areas and these likely contribute to nearshore nutrient enrichment. In areas where coastal circulation is limited (i.e. Kawela Bay) the number and type of individual waste treatment systems should be enumerated and consideration should be given to mechanisms whereby individual residential cesspool or septic systems could be upgraded thereby reducing adverse impact to a common resource.

7. SUMMARY

There are a variety of ways in which coastal developments could adversely impact public marine resources if appropriate measures are not taken to avoid or mitigate these impacts. The goal of this report has been to describe the variety and quality of the marine resources in the nearshore area along the project coastline, understand how these resources may have changed over time and uncover potential threats to these resources from the present and planed development.

Living marine resources along the very nearshore area of the Kuilima coast appear relatively unchanged or improved over the past 22 years. The benthic surveys were restricted to very nearshore waters, less than about three-hundred feet from shore, and were not intended to characterize the quality of the offshore coral reef system nor the health of recreational fisheries. The status of recreational and commercial fisheries is challenged around the entire state and is beyond the scope of this survey. The intent of the surveys was to characterize benthic resources adjacent to storm water and stream outfalls as these locations are the most sensitive to potential impacts from land based pollution. The study was divided between the three principle bays along the shoreline Kawela Bay, Turtle Bay, and Kuilima Bay.

Kawela Bay encompasses a large (~80 acre) relatively shallow bay consisting primarily of a back-reef lagoon with minimal wave impact or influence from coastal currents. While large corals are present in deeper sand channels on both sides of the bay, the majority of the fixed benthic substrate is shallow and is dominated by a wide variety of macro algae. It is likely that the macro-algae grows well within the bay because of decreased impact from large waves, the relatively high concentration of nutrients (particularly phosphorus) in the bay, and the shallow extent of the bay. Analyses of the benthic surveys showed Kawela Bay to have the highest near-shore coral counts (1.25 percent cover) and a moderate number of fish. Both fish and coral counts could be artificially low, however, because of very poor visibility along one of the transects located in the eastern highly turbid portion of the bay. The east near-shore portion of the bay is challenged by low circulation and the presence of large quantities of very fine silt making it very difficult for corals to grow. Inflow from Kawela Stream during large storm events has a long-lasting and adverse impact on water quality in the bay. Removal of this stream flow from this bay and restoration of its flow to Turtle Bay would likely have a large positive impact on Kawela Bay's ecosystem.

Turtle Bay is unique in that the shoreline along the western half of the bay is separated from the fringing reef by a deep (to 10 foot) lagoon. This lagoon exits the western portion of the bay in a 400-foot wide channel through the solid fringing reef and functions to channel wave-induced flow from over the reef back to the open ocean. While this natural rip-tide can pose a serious hazard to swimmers, it also functions to keep nearshore water quality high. The benthic transects in the nearshore area off the West Main Drain at the extreme west end of Turtle Bay produced the most diverse habitat with modest coral cover (0.2 percent) and highest fish counts. The channel through the reef, however, is uniform rubble and sand offering minimal habitat and an excellent pathway through the reef for runoff.

In Kuilima Bay the sand beach rests on top of a lithified limestone beach-rock bench, often with an abrupt drop-off at the shoreline into three- to eight-feet of water. The street ʻŌʻio stream enters the bay through a man-made breach in the beach-rock shoreline. The nearshore area within about 300 feet from the mouth of the ʻŌʻio stream is habitat limited and often impacted by coral sand sediments, but the offshore reef is very diverse and offers a variety of habitats for coral and fish. The offshore reef is neither broad nor shallow along this shoreline and this allows significant wave energy to strike the shoreline. A persistent long-shore current from east to west produces good water exchange along this shore. Within 300 feet from the mouth of the ʻŌʻio the coral cover was the lowest (0.03 percent) of the three bays and the substrate had the least complexity to offer cover for fish and invertebrates. Not surprisingly fish counts in nearshore Kuilima Bay were the lowest of the three bays (Table 7-1).

	Kawela Bay		Turtle Bay		Kuilima Bay	
	# Fish	# Sp.	# Fish	# Sp.	# Fish	# Sp.
Surgeon Fish	20	3	18	3	5	1
Butterflyfish	3	1	0	0	0	0
Goat fish	0	0	0	0	0	0
Box fish	5	3	1	1	3	1
Wrasses	29	3	89	6	20	3
Damselfish	7	3	32	4	2	1
Triggerfish	1	1	10	1	1	1
Totals	65	14	150	15	31	7

Table 7-1 Differences in Fish Counts between Bays along project shoreline.

A large potential impact to the marine resources along this shore will be the planned increase in human presence. In Kawela Bay the average number of people at the bay at any given time increased from seven people in the early 1990's to about 20 people in 2011. These numbers are expected to increase all along the coast with the increased density of development and improved public access. Resource managers have expressed concern that unfettered access to this shoreline may cause ecological harm through increased fishing and harvest as well as from unintentional damage due to trampling of shallow water habitats or impacts to endangered species. This later concern is more specific to Kawela Bay where a public beach park will likely result in a dramatic increase in beach use, and the shallow water habitat is susceptible to impact from walking. Any beach park at this location should incorporate educational signage to encourage stewardship from beach users.

Surveys of turtles (only in Kawela Bay) showed a 50 percent increase in population since the early 1990's. Analyses of NOAA turtle stranding data from this shoreline indicate that the turtles are larger as compared to two decades ago. Similarly the turtle survey data and NOAA database indicate that there has been an increase in the number of Hawaiian monk seals along this shoreline since 1985.

While increases in these large marine animals is a good thing, because they are both on the Federal Endangered Species List, it is important that the developer create public education programs to ensure that visitors and residents treat these species with due respect.

Water quality along the project shoreline has been monitored since 1989. There do not appear to be any significant long-term changes in water quality off the project shoreline. A graphical summary comparing water quality trends in all three bays between the three sampling periods over the past two decades is presented in Figure 7-2. For ease of comparison each water quality parameter is expressed as a percentage of a given standard. Apparent increases seen within Kawela Bay (turbidity, TN, NO3+NO2) are consistent with changes in sampling sites over the years (See Section 3.3).

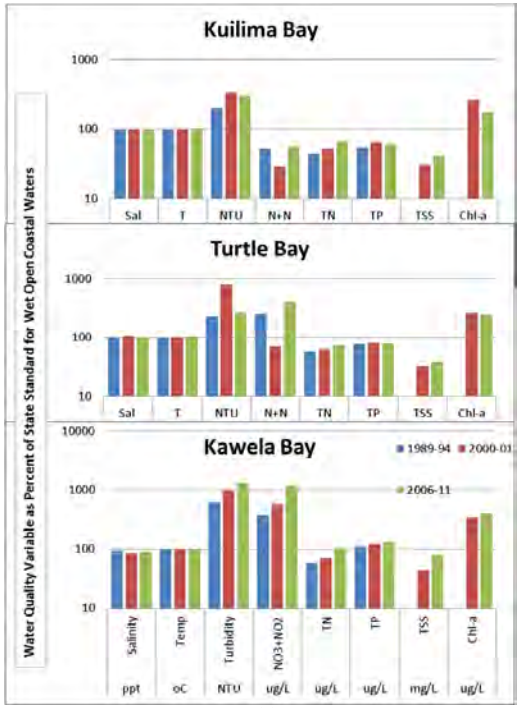


Figure 7-1. Summary of nearshore water quality off Turtle Bay Resort development site comparing data taken during three major sampling events (1989-1994 / 2000-2001 / 2006-2011). Variables are expressed as percent of State Water Quality Standard for Wet Open Coastal waters. Standard values for Salinity (34 ppt), Temperature (25° C) and TSS (20 mg/L) are not State Standards.

Water quality has been found to vary predictably with daily cycles, season, wave height, and the inflow from storm runoff through the four runoff outfall locations. During and shortly after runoff events State water quality standards for turbidity, total nitrogen, and total phosphorus are typically exceeded in the nearshore water of each bay. During prolonged periods when there is no stream outflow the waters of both Turtle Bay and Kuilima Bay are usually within State water quality standards, but the waters of Kawela Bay typically do not meet these standards. In Kawela Bay total nitrogen and total phosphorus did not meet state standards. These nutrients likely inflow with the large flux of groundwater and become concentrated due to the high residence time of water in the bay. Turbidity in Kawela Bay usually does not meet State standards, particularly in the eastern portion of the bay. Turbidity is likely the result of both sediment input from Kawela Stream and phytoplankton growth associated with the inflow of nutrient rich ground water. Nitrogen is commonly high in groundwater inflow, but the high concentration of phosphorus is unusual. Potential sources of the high groundwater phosphorus concentration include septic waste systems from adjacent homes, and fertilizers from up-slope agriculture.

With one possible exception, the proposed development does not include any physical modifications to the shoreline (sea walls, dredging, filling, boating facilities) that would directly impact nearshore marine resources or greatly alter their use. The one possible exception is the potential for altering the location, drainage area, or runoff characteristics of the four drainage outlets entering the three bays across the project coastline. This report has identified the influx of nutrients and sediments into the nearshore as an existing problem causing frequent violation of State water quality standards. The problem is a function of site geology and efforts of prior land managers (golf course, military, plantation) to control floodwaters by channelizing and re-routing natural stream flows to the ocean. An ideal drainage would provide floodwaters an opportunity to drop heavy sediments, and then discharge into the ocean at a location that maximizes mixing and offshore transport while minimizing sediment and nutrient transport over shallow benthic substrates and coral reefs. Drainage characteristics of the three principle outlet points (considering the Kuilima and West Main Drain outlets as one) are summarized in Table 7-2 below.

Table 7-2. Drainage Characteristics

	Kawela Stream Kawela Bay	West Main Drain Turtle Bay	East Main Drain Kuilima Bay
Distance to 10-foot depth contour	1800 ft	200 ft	100 ft
Distance to 30-foot depth contour	3000 ft	1000 ft	2500 ft
Ocean currents to disperse inflow	Minimal	Strong, off shore	Strong, long shore
Wave energy to mix inflow	None	Moderate	Strong
Adverse impact to coral reefs	High	Low	Moderate
Residence time in nearshore areas	Very Long	Very short	Short
Present Drainage Area	1.4 sq. mi	0.4 sq mi	4.8 sq. mi.

Under present conditions, the drainage outlet with least likely adverse impact on nearshore marine resources, West Main Drain, receives runoff from the smallest drainage area. A review of historical information suggests that the natural outlet for Kawela Stream is near the West Main Drain. Watershed restoration to reduce sediment and nutrient loads in the three principal stream outlets could have very positive impacts to water quality along this shoreline. Consideration of re-routing the upland flow from Kawela Valley to the West Main Drain would greatly improve water quality in Kawela Bay while likely having little or no adverse impact to the nearshore ecosystem within Turtle Bay at the West Main Drain.

8. CITATIONS

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APPENDIX A

Summary Data on Observed "People Activities" Obtained During Turtle Surveys

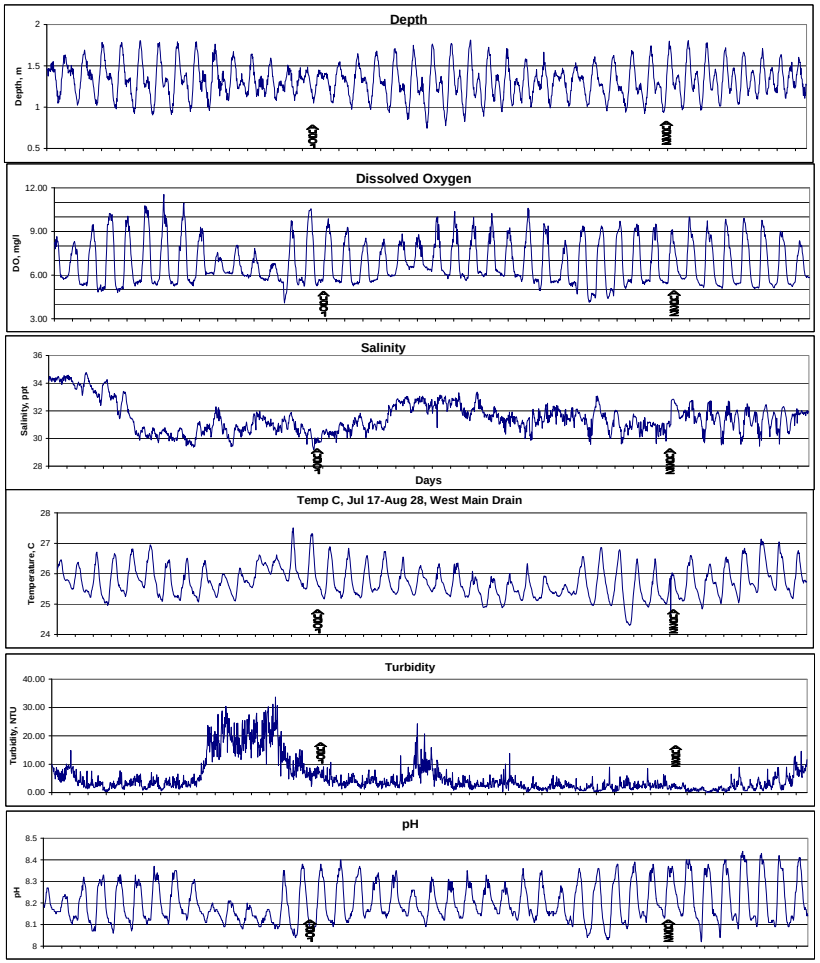
	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Average All	Winter	Summer
	1990	1991				1992				1993				1990-1993	2011	2011
Average Daily Total People at Kawela Bay	**25.4**	**20.0**	**18.8**	**24.5**	**32.8**	**23.4**	**11.8**	**13.3**	**14.0**	**33.8**	**25.3**	**24.3**	**18.2**	**22.0**	59.6	60.6
Beach Activities (total)	20.0	14.3	12.6	17.3	27.0	19.6	8.6	11.3	13.2	25.8	17.0	18.8	16.4	17.1	39.8	45.4
• Playing, walking on beach	17.0	9.7	10.4	9.5	22.3	15.8	6.2	8.8	9.6	19.6	14.7	13.8	15.4	13.3	35.2	41.2
• Shorefishing	3.0	4.7	2.2	7.8	4.8	3.8	2.4	2.5	3.6	6.2	2.3	5.0	1.0	3.8	4.6	4.2
Water Activities (total)	5.4	5.7	6.2	7.3	5.8	3.8	3.2	2.0	0.8	8.0	8.3	5.5	1.8	4.9	19.8	15.2
Swimming	2.0	1.7	1.8	1.8	1.8	2.2	2.0	0.8	0.2	5.6	4.3	4.0	0.6	2.2	8.0	3.2
• Snorkelers	0.0	0.0	0.0	0.0	0.0	0.4	1.4	0.5	0.0	2.8	1.0	1.5	0.0	0.6	2.8	1
• Swimming/Playing in Water	0.8	0.3	1.8	1.8	1.8	1.0	0.6	0.3	0.2	2.8	3.3	2.5	0.0	1.3	5.2	2.2
• Divers	1.2	1.3	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.3	0.0	0
Boating/Surfing	3.4	4.0	4.4	5.5	4.0	1.6	1.2	1.3	0.6	2.4	4.0	1.5	1.2	2.7	11.8	12.0
Surfing	1.0	2.7	2.2	3.0	3.0	1.2	0.2	1.3	0.6	0.6	0.3	1.0	0.6	1.4	3.6	11.2
• Standup	0.0	1.0	0.2	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	2.2	4
• Surfing	0.2	0.0	0.8	2.3	0.5	0.2	0.0	0.5	0.6	0.6	0.0	1.0	0.6	0.6	0.8	7
• Boogie Boards	0.0	0.0	0.0	0.8	1.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.2	0.6	0.2
• Wind Surfers	0.8	1.7	1.2	0.0	1.3	1.0	0.2	0.8	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0
Kayaking	0.0	0.0	1.4	0.0	0.3	0.0	0.2	0.0	0.0	0.0	2.7	0.3	0.6	0.4	8.2	28.6
• Kayak	0.0	0.0	1.4	0.0	0.3	0.0	0.2	0.0	0.0	0.0	2.7	0.3	0.6	0.4	7.6	28.6
• Kayak fishing	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0
Boating	2.4	1.3	0.8	2.5	0.8	0.4	0.8	0.0	0.0	1.8	1.0	0.3	0.0	0.9	0.0	0.2
• Canoe	2.4	0.0	0.0	0.0	0.5	0.4	0.8	0.0	0.0	1.8	0.0	0.0	0.0	0.5	0.0	0
• Boat fishing	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
• Boat	0.0	1.3	0.8	2.5	0.3	0.0	0.0	0.0	0.0	0.0	1.0	0.3	0.0	0.5	0.0	0.2

APPENDIX B

Example Plot of In-situ Water Quality Data

Off of West Main Drain for one Month, 2002

Compare to Figure 4-6 in main report



YSI DataSonde Water Quality Data from Shallow Water in Turtle Bay off the West Main Drain, Kahuku, O'ahu. From July 17 to August 28, 2002. Compare to Data Visualization Graph – Figure 4-6.

APPENDIX C

Water Quality Summary Data

Monthly Average Water Quality at Turtle Bay, West Main Drain Stream Mouth

Month	Day	Turbidity In-Situ	Turbidity Lab	TSS	N+N	TN	TP	Chl_a	Temp	DO	pH	Sal
Jan	16	54.4	1.08	3.1	12.2	123	9.2	0.54	23.9	7.2	7.81	32.2
Feb	21	25.2	1.28	5.2	4.4	127	10.5	0.59	23.2	7.0	8.58	35.5
Mar	15	3.8	1.43	2.9	4.1	119	10.5	0.41	24.9	5.0	8.22	35.4
Apr	30	4.0	1.90	4.7	9.8	123	14.2	0.63	24.6	7.6	8.25	34.9
May	24	4.3	2.01	9.3	9.8	204	12.2	0.69	25.8	8.9	8.22	36.6
Jun	30	5.6	1.63	4.1	8.8	138	12.7	0.65	25.5	4.8	8.29	34.5
Jul	17	20.9	6.19	22.2	4.8	182	20.3	1.68	26.1	7.1	7.80	34.2
Aug	20	1.8	1.82	6.7	5.2	138	16.7	0.71	26.1	10.8	7.81	35.2
Sep	30	53.5	4.41	10.6	7.0	153	18.3	1.37	26.1	8.6	8.06	38.0
Oct	31	34.8	2.59	16.1	3.0	125	18.3	0.75	25.8	7.1	8.04	36.0
Nov	21	69.8	2.05	7.2	5.3	136	17.5	0.85	25.2	7.6	8.15	29.1
Year Averag		**25.3**	**2.4**	**8.4**	**6.8**	**142.6**	**14.6**	**0.81**	**25.2**	**7.4**	**8.1**	**34.7**
GeoMean												
All 6 Sites		**3.9**	**2.0**	**6.3**	**3.4**	**137.9**	**13.7**	**0.66**	**25.1**	**7.5**	**8.1**	**34.6**
Nearshore		**18.4**	**2.4**	**7.8**	**4.1**	**154.0**	**15.9**	**0.93**	**25.1**	**7.5**	**8.1**	**33.6**
Offshore		**0.9**	**1.7**	**5.0**	**2.8**	**123.5**	**11.7**	**0.47**	**25.1**	**7.5**	**8.2**	**35.4**
Storm Averages												
		332.5	**332.5**	**180.2**	**1859.3**	**2974.3**	**529.8**	**0.58**	**22.7**	**6.1**	**7.6**	**14.8**

Salinity at Turtle Bay, West Main Drain Stream Outlet (*ppt)

Month	Station K1	Station K2	Station K3	Station K4	Station K5	Station K6	/——Averages——\ All	Nr Shore	Off Shore
			Year 2002						
Jan	30.69	32.83	30.85	32.78	32.98	32.92	32.2	31.5	32.9
Feb	34.73	35.54	35.52	35.60	35.75	35.66	35.5	35.3	35.7
Mar	35.01	35.47	35.45	35.24	35.57	35.39	35.4	35.3	35.4
Apr	34.38	34.92	35.20	34.75	35.21	35.23	34.9	34.8	35.1
May		36.56	36.11	36.63	36.78	36.89	36.6	36.3	36.8
Jun			33.96	34.74	34.86	34.45	34.5	34.0	34.7
Jul	34.18	34.45	32.80	34.65	34.62	34.51	34.2	33.8	34.6
Aug	34.99	35.19	34.87	35.42	35.49	35.53	35.2	35.0	35.5
Sep	37.42	38.09		38.21	38.14	38.12	38.0	37.8	38.2
Oct	35.39	35.74	36.07	36.32	36.32	36.28	36.0	35.7	36.3
Nov	31.98	25.10	19.10	35.44	34.08		29.1	25.4	34.8
Average	36.38853	37.1187	37.03615	37.44278	37.44538	37.47	**34.7**	**34.1**	**35.4**
Geometric Mean							**34.6**	**33.6**	**35.4**
Standard Deviation							**2.3**	**3.3**	**1.4**

* ppt= parts per thousand

In-Situ Turbidity at Turtle Bay, West Main Drain Stream Outlet *

Month	Station K1	Station K2	Station K3	Station K4	Station K5	Station K6	/——Averages——\ All	Nr Shore	Off Shore
			Year 2002						
Jan	52.90	194.70	73.93	1.85	0.78	1.98	54.4	107.2	1.5
Feb	14.41	6.93	125.81	2.13	0.44	1.34	25.2	49.1	1.3
Mar	8.76	10.98	2.78	0.10	0.10	0.10	3.8	7.5	0.1
Apr	6.60	8.06	1.19	3.01	0.67	4.46	4.0	5.3	2.7
May		14.04	7.16	0.10	0.10	0.10	4.3	10.6	0.1
Jun	2.89	4.81	19.48	0.59	0.96	5.01	5.6	9.1	2.2
Jul	17.53	12.03	81.40	3.57	3.58	7.27	20.9	37.0	4.8
Aug	1.68	1.58	2.98	0.64	1.90	2.12	1.8	2.1	1.6
Sep	49.72	9.60	261.21	0.10	0.10	0.10	53.5	106.8	0.1
Oct	91.05	38.46	70.94	4.70	1.39	2.01	34.8	66.8	2.7
Nov	53.17	206.50	145.69	2.37	1.11	9.83	69.8	135.1	4.4
Average							25.3	48.8	2.0
Geometric Mean							**3.9**	**18.4**	**0.9**
Standard Deviation							24.5	48.5	1.6

* Turbidity = NTU Units

Suspended Solids (mg/l) at Turtle Bay, West Main Drain Stream Outlet

Month	Station K1	Station K2	Station K3	Station K4	Station K5	Station K6	/---------Averages---------\ All	Nr Shore	Off Shore
			Year 2002						
Jan	4	2.9	2.8	3.2	2.3	3.2	3.1	3.2	2.9
Feb	6.8	6.2	4.8	5.4	3.9	4.3	5.2	5.9	4.5
Mar	2.9	3.2	3	3.4	2.5	2.3	2.9	3.0	2.7
Apr	5	4.4	6.7	4.6	3.5	4	4.7	5.4	4.0
May	11.1	11.8	10.9	9.7	8.3	4.0	9.3	11.3	7.3
Jun	7.1	5.5	6.4	1.9	2.1	1.7	4.1	6.3	1.9
Jul	27.2	20.3	35.3	18.7	14.3	17.2	22.2	27.6	16.7
Aug	5.5	6.8	12	2.6	4.8	8.6	6.7	8.1	5.3
Sep	16.5	11	10.6	5.2	9.9	10.3	10.6	12.7	8.5
Oct	8.5	6.3	60	10	5.8	6	16.1	24.9	7.3
Nov	9.3	6.6	7.4	6.6	7.8	5.7	7.2	7.8	6.7
Average							8.4	10.6	6.2
Geometric Mean							**6.3**	**7.8**	**5.0**
Standard Deviation							6.0	8.3	4.1

Nitrate plus Nitrite at Turtle Bay, West Main Drain Stream Outlet

Month	Station K1	Station K2	Station K3	Station K4	Station K5	Station K6	/---------Averages---------\ All	Nr Shore	Off Shore
			Year 2002						
Jan	44	6	5	10	4	4	12.2	18.3	6.0
Feb	24	0.5	0.5	0.5	0.5	0.5	4.4	8.3	0.5
Mar	10	2	0.5	8	2	2	4.1	4.2	4.0
Apr	36	4	5	5	4	5	9.8	15.0	4.7
May	47	1	1	3	2	5	9.8	16.3	3.3
Jun	40	2	2	5	2	2	8.8	14.7	3.0
Jul	14	2	2	3	3	5	4.8	6.0	3.7
Aug	21	1	1	4	2	2	5.2	7.7	2.7
Sep	18	1	2	6	7	8	7.0	7.0	7.0
Oct	6	3	3	2	2	2	3.0	4.0	2.0
Nov	20	3	2	2	2	3	5.3	8.3	2.3
Average							6.8	10.0	3.6
Geometric Mean							**3.4**	**4.1**	**2.8**
Standard Deviation							3.0	5.1	1.8

Total Nitrogen(mg/l) at Turtle Bay, West Main Drain Stream Outlet

Month	Station K1	Station K2	Station K3	Station K4	Station K5	Station K6	/---------Averages---------\ All	Nr Shore	Off Shore
			Year 2002						
Jan	217	108	90	113	106	103	122.8	138.3	107.3
Feb	151	119	136	115	103	137	126.8	135.3	118.3
Mar	183	121	106	114	92	99	119.2	136.7	101.7
Apr	151	126	156	106	99	102	123.3	144.3	102.3
May	329	181	188	174	161	190	203.8	232.7	175.0
Jun	167	143	149	117	108	145	138.2	153.0	123.3
Jul	187	179	201	176	167	184	182.3	189.0	175.7
Aug	177	120	162	122	115	129	137.5	153.0	122.0
Sep	210	167	131	139	137	136	153.3	169.3	137.3
Oct	176	146	113	104	103	107	124.8	145.0	104.7
Nov	179	161	121	115	117	125	136.3	153.7	119.0
Average							142.6	159.1	126.1
Geometric Mean							**137.9**	**154.0**	**123.5**
Standard Deviation							27.2	29.0	26.6

Total Phosphorous (mg/l) at Turtle Bay, West Main Drain Stream Outlet

Month	Station K1	Station K2	Station K3	Station K4	Station K5	Station K6	/---------Averages---------\ All	Nr Shore	Off Shore
			Year 2002						
Jan	8	7	8	10	11	11	9.2	7.7	10.7
Feb	13	11	10	10	10	9	10.5	11.3	9.7
Mar	9	9	18	10	9	8	10.5	12.0	9.0
Apr	14	13	28	10	10	10	14.2	18.3	10.0
May	18	14	11	11	9	10	12.2	14.3	10.0
Jun	20	14	15	10	7	10	12.7	16.3	9.0
Jul	23	22	31	15	15	16	20.3	25.3	15.3
Aug	19	17	24	14	11	15	16.7	20.0	13.3
Sep	23	21	18	16	17	15	18.3	20.7	16.0
Oct	23	27	17	17	13	13	18.3	22.3	14.3
Nov	22	20	17	16	14	16	17.5	19.7	15.3
Average							14.6	17.1	12.1
Geometric Mean							**13.7**	**15.9**	**11.7**
Standard Deviation							3.8	5.3	2.8

Chlorophyl-a (mg/l) at Turtle Bay, West Main Drain Stream Outlet

Month	Station K1	Station K2	Station K3	Station K4	Station K5	Station K6	/---------Averages---------\ All	Nr Shore	Off Shore
			Year 2002						
Jan	1.39	0.35	0.31	0.61	0.24	0.34	0.5	0.7	0.4
Feb	1.4	0.66	0.49	0.57	0.16	0.23	0.6	0.9	0.3
Mar	0.86	0.48	0.31	0.38	0.19	0.26	0.4	0.6	0.3
Apr	1.18	0.58	0.69	0.5	0.42	0.38	0.6	0.8	0.4
May	1.59	0.78	0.68	0.46	0.32	0.29	0.7	1.0	0.4
Jun	1.27	0.74	0.59	0.5	0.46	0.32	0.6	0.9	0.4
Jul	1.76	1.46	2.87	0.79	1.23	1.97	1.7	2.0	1.3
Aug	1.24	0.7	1.02	0.34	0.42	0.52	0.7	1.0	0.4
Sep	2.15	1.92	1.41	0.98	0.87	0.9	1.4	1.8	0.9
Oct	1.38	0.72	0.85	0.42	0.59	0.53	0.7	1.0	0.5
Nov	1.27	1.33	0.75	0.78	0.49	0.49	0.9	1.1	0.6
Average							0.8	1.1	0.5
Geometric Mean							**0.7**	**0.9**	**0.5**
Standard Deviation							0.4	0.5	0.3

Temperature (C) at Turtle Bay, West Main Drain Stream Outlet

Month	Station K1	Station K2	Station K3	Station K4	Station K5	Station K6	/---------Averages---------\ All	Nr Shore	Off Shore
			Year 2002						
Jan	23.72	23.97	23.95	24.02	24.00	23.99	23.9	23.9	24.0
Feb	23.44	22.88	23.36	23.36	23.33	23.32	23.2	23.2	23.3
Mar	25.04	24.67	24.55	24.83	24.59	24.79	24.9	24.8	24.7
Apr	24.72	24.58	24.75	24.67	24.36	24.30	24.6	24.7	24.4
May		25.81	25.72	26.05	26.06	25.43	25.8	25.8	25.8
Jun	25.42	25.54	25.56	25.36	25.40	25.24	25.5	25.5	25.3
Jul	26.17	26.03	26.09	25.89	25.94	26.06	26.1	26.1	26.0
Aug	26.25	25.88	25.43	25.31	25.59	25.59	26.1	25.9	25.5
Sep	26.10	26.16	25.63	26.20	26.17	26.13	26.1	26.0	26.2
Oct	25.67	25.85	25.80	25.88	25.90	25.86	25.8	25.8	25.9
Nov	25.28	25.18	25.15	25.14	25.29	25.09	25.2	25.2	25.2
Average							25.2	25.2	25.1
Geometric Mean							**25.1**	**25.1**	**25.1**
Standard Deviation							1.0	1.0	1.0

pH (pH units) at Turtle Bay, West Main Drain Stream Outlet

Month	Station K1	Station K2	Station K3	Station K4	Station K5	Station K6	/--------Averages--------\ All	Nr Shore	Off Shore
			Year 2002						
Jan	7.48	7.67	7.79	8.03	7.98	7.93	7.8	7.6	8.0
Feb	8.59	8.57	8.22	8.51	8.46	8.44	8.6	8.5	8.5
Mar	8.22	8.22	8.25	8.38	8.30	8.28	8.2	8.2	8.3
Apr	8.27	8.24	8.24	8.24	8.15	8.12	8.3	8.2	8.2
May		8.22	8.24	8.19	8.24	8.22	8.2	8.2	8.2
Jun	8.31	8.27	8.26	8.26	8.27	8.21	8.3	8.3	8.2
Jul	7.78	7.81	7.84	7.95	7.95	7.90	7.8	7.8	7.9
Aug	7.84	7.78	7.78	7.98	7.97	7.87	7.8	7.8	7.9
Sep	8.06	8.05	8.01	8.10	8.08	8.07	8.1	8.0	8.1
Oct	7.98	8.10	8.11	8.14	8.14	8.12	8.0	8.1	8.1
Nov	8.04	8.26	8.33	8.41	8.38	8.28	8.2	8.2	8.4
Average							8.1	8.1	8.2
Geometric Mean							**8.1**	**8.1**	**8.2**
Standard Deviation							0.3	0.3	0.2

Dissolved Oxygen (mg/l) at Turtle Bay, West Main Drain Stream Outlet

Month	Station K1	Station K2	Station K3	Station K4	Station K5	Station K6	/--------Averages--------\ All	Nr Shore	Off Shore
			Year 2002						
Jan	7.23	7.03	7.04	7.27	7.19	7.30	7.2	7.1	7.3
Feb	7.10	6.88	7.45	7.18	7.22	7.22	7.0	7.1	7.2
Mar	5.23	4.78	4.60	4.50	4.29	4.55	5.0	4.9	4.5
Apr	7.78	7.47	7.12	8.36	8.49	8.58	7.6	7.5	8.5
May		8.92	9.19	8.47	8.51	8.12	8.9	9.1	8.4
Jun	8.37	7.36	7.40	8.10	7.45	7.23	4.8	7.7	7.6
Jul	7.22	7.06	7.11	6.57	6.80	6.96	7.1	7.1	6.8
Aug	11.21	10.41	10.43	11.97	12.50	11.73	10.8	10.7	12.1
Sep	8.84	8.37	9.59	7.28	7.44	7.61	8.6	8.9	7.4
Oct	7.14	6.96	6.65	6.66	6.72	6.63	7.1	6.9	6.7
Nov	7.44	7.69	7.89	7.52	7.56	8.27	7.6	7.7	7.8
Average							7.4	7.7	7.6
Geometric Mean							**7.5**	**7.5**	**7.5**
Standard Deviation							1.8	1.6	1.9

Turbidity at Kuilima Bay East Main Drain Site (NTU)

Month	Station E1	Station E2	Station E3	Station E4	Station E5	Station E6	Average		
				Year 2000					
March	-	1.19	-	-	1.70	-	**1.45**		
April	0.86	1.12	0.94	0.61	0.96	0.89	**0.90**		
May	3.62	5.08	4.02	2.92	2.68	2.38	**3.45**		
June	3.64	5.36	5.26	2.44	1.83	1.42	**3.33**		
July	-	-	-	-	-	-	**--**		
August	7.80	4.02	5.18	5.36	6.10	4.03	**5.42**		
September	6.39	6.20	6.26	6.22	4.94	4.12	**5.69**		
October	1.52	2.03	2.24	2.45	1.46	1.46	**1.86**		
November	0.66	0.61	0.44	0.47	0.47	0.57	**0.54**		
December	0.50	0.69	1.45	0.44	0.60	0.44	**0.69**		
				Year 2001					
January	1.41	0.97	1.35	0.68	0.89	1.37	**1.11**	Nearshore	Offshore
February	0.82	0.97	2.43	0.96	0.75	1.35	**1.21**	E1-3	E4-6
Geometric Mean	**1.78**	**1.82**	**2.23**	**1.47**	**1.46**	**1.42**	**1.675**	**2.15**	**1.60**

State Standard Wet = 50% Geo Mean[1,2] .5 NTU;
Open Coast = 10% Not to Exceed[1,2] 1.5 NTU.

Total Suspended Solids at Kuilima Bay East Main Drain Site (mg/l)

Month	Station E1	Station E2	Station E3	Station E4	Station E5	Station E6	Average		
				Year 2000					
March	-	4.00	-	-	2.00	-	**3.00**		
April	3.00	2.90	3.20	2.30	1.90	2.40	**2.62**		
May	11.50	13.80	10.00	7.10	6.30	6.90	**9.27**		
June	7.30	12.00	22.30	5.10	6.10	5.30	**9.68**		
July	2.92	7.71	38.10	3.03	1.88	0.85	**9.08**		
August	28.80	7.79	8.00	6.58	4.66	6.13	**10.33**		
September	11.14	10.77	15.74	10.51	9.12	11.19	**11.41**		
October	4.27	8.04	4.46	3.29	3.21	6.19	**4.91**		
November	4.91	4.27	3.00	5.88	5.84	5.58	**4.91**		
December	6.01	6.87	9.62	8.62	10.88	6.46	**8.08**		
				Year 2001					
January	3.88	3.84	5.54	4.91	4.11	5.58	**4.64**	Nearshore	Offshore
February	8.11	9.67	7.78	10.78	12.56	7.44	**9.39**	E1-3	E4-6
Geometric Mean	**6.54**	**6.86**	**8.60**	**5.55**	**4.72**	**4.99**	**6.066**	**7.55**	**4.73**

Nitrate + Nitrite at Kuilima Bay East Main Drain Site (ug N/L)

Month	Station E1	Station E2	Station E3	Station E4	Station E5	Station E6	Average		
				Year 2000					
March	-	1.00	-	-	2.00	-	**1.50**		
April	0.50	0.50	2.00	1.00	1.00	2.00	**1.17**		
May	0.50	1.00	0.50	0.50	1.00	0.50	**0.67**		
June	0.50	0.50	1.00	0.50	2.00	1.00	**0.92**		
July	1.85	2.22	3.35	3.71	4.46	2.93	**3.09**		
August	2.51	0.46	0.51	0.56	1.49	2.12	**1.27**		
September	4.72	1.58	1.23	1.69	1.74	1.86	**2.14**		
October	1.54	1.66	2.19	2.30	2.41	3.05	**2.19**		
November	1.00	1.00	1.00	1.00	1.00	3.00	**1.33**		
December	2.00	2.00	4.00	2.00	3.00	2.00	**2.50**		
				Year 2001					
January	3.00	4.00	9.00	5.00	5.00	7.00	**5.50**	Nearshore	Offshore
February	0.50	0.50	1.00	0.50	0.50	1.00	**0.67**	E1-3	E4-6
Geometric Mean	**1.26**	**1.09**	**1.59**	**1.23**	**1.75**	**1.94**	**1.444**	**1.21**	**1.57**

State Standard Wet = 50% Geo Mean[1,2] 5 ug/l;
Open Coast = 10% Not to Exceed[1,2] 14 ug/l.

Total Nitrogen at Kuilima Bay East Main Drain (ug N/L)

Month	Station E1	Station E2	Station E3	Station E4	Station E5	Station E6	Average		
Year 2000									
March	-	106.00	-	-	97.00	-	**101.50**		
April	163.00	125.00	122.00	109.00	110.00	113.00	**123.67**		
May	154.00	147.00	148.00	135.00	131.00	138.00	**142.17**		
June	169.00	131.00	188.00	132.00	126.00	115.00	**143.50**		
July	119.57	128.51	141.19	102.64	102.64	102.64	**116.20**		
August	166.11	149.76	155.35	152.62	127.65	146.30	**149.63**		
September	174.20	145.10	136.20	164.90	154.60	125.50	**150.08**		
October	220.80	116.60	121.00	132.40	112.20	118.70	**136.95**		
November	136.00	127.00	107.00	120.00	120.00	107.00	**119.50**		
December	128.00	117.00	126.00	102.00	126.00	103.00	**117.00**		
Year 2001									
January	195.00	140.00	146.00	126.00	110.00	179.00	**149.33**	Nearshore	Offshore
February	157.00	134.00	139.00	132.00	125.00	139.00	**137.67**	E1-3	E4-6
Geometric Mean	**159.73**	**129.94**	**137.63**	**126.71**	**119.31**	**124.36**	**132.097**	**139.65**	**121.19**

State Standard Wet = 50% Geo Mean[1,2] 150 ug/l;
Open Coast = 10% Not to Exceed[2,3] 250 ug/l.

Total Phosphorous at Kuilima Bay East Main Drain Site (ug P/L)

Month	Station E1	Station E2	Station E3	Station E4	Station E5	Station E6	Average		
Year 2000									
March	-	12.00	-	-	10.00	-	**11.00**		
April	8.00	8.00	8.00	10.00	10.00	10.00	**9.00**		
May	13.00	15.00	15.00	10.00	10.00	12.00	**12.50**		
June	20.00	20.00	21.00	30.00	14.00	12.00	**19.50**		
July	16.52	24.61	31.16	11.51	12.09	12.47	**18.06**		
August	26.19	24.28	24.66	14.44	17.93	13.74	**20.21**		
September	17.67	16.71	15.74	14.69	14.10	12.86	**15.30**		
October	12.42	12.31	13.60	12.27	11.88	11.68	**12.36**		
November	13.00	12.00	10.00	9.00	9.00	9.00	**10.33**		
December	8.00	13.00	16.00	13.00	10.00	8.00	**11.33**		
Year 2001									
January	9.00	9.00	11.00	9.00	8.00	9.00	**9.17**	Nearshore	Offshore
February	16.00	13.00	13.00	14.00	13.00	11.00	**13.33**	E1-3	E4-6
Geometric Mean	**13.61**	**14.15**	**15.13**	**12.65**	**11.39**	**10.92**	**12.882**	**14.93**	**11.89**

State Standard Wet = 50% Geo Mean[1,2] 20 ug/l;
Open Coast = 10% Not to Exceed[2,3] 40 ug/l.

Chlorophyll-a at Kuilima Bay East Main Drain Site (ug/l)

Month	Station E1	Station E2	Station E3	Station E4	Station E5	Station E6	Average		
Year 2000									
March	-	0.81	-	-	0.33	-	**0.57**		
April	0.97	0.54	0.54	0.32	0.36	0.32	**0.51**		
May	1.08	1.26	1.05	0.73	0.60	0.46	**0.86**		
June	1.38	1.87	3.07	0.90	0.47	0.49	**1.36**		
July	4.63	4.39	14.00	1.23	1.30	1.30	**4.48**		
August	5.24	4.87	3.24	1.56	2.19	1.03	**3.02**		
September	1.39	1.30	1.42	1.47	-	-	**1.40**		
October	1.15	0.83	1.24	0.60	0.70	1.14	**0.94**		
November	0.68	0.75	1.04	0.41	0.43	0.42	**0.62**		
December	0.47	-	0.64	0.37	0.32	0.40	**0.44**		
Year 2001									
January	0.35	0.54	0.38	0.28	0.25	0.26	**0.34**	Nearshore	Offshore
February	0.32	0.33	0.32	0.27	0.27	0.26	**0.30**	E1-3	E4-6
Geometric Mean	**1.07**	**1.11**	**1.25**	**0.61**	**0.51**	**0.51**	**0.790**	**1.46**	**0.64**

State Standard Wet = 50% Geo Mean[1,2] 0.3 ug/l;
Open Coast = 10% Not to Exceed[2,3] 0.9 ug/l.

Salinity at Kuilima Bay East Main Drain Site (ppt)

Month	Station E1	Station E2	Station E3	Station E4	Station E5	Station E6	Average		
Year 2000									
March	-	34.61	-	-	34.54	-	**34.58**		
April	34.70	34.71	34.56	34.70	34.00	34.61	**34.55**		
May	35.19	35.19	35.19	35.19	35.19	35.19	**35.19**		
June	33.82	33.71	33.75	34.01	33.84	33.95	**33.85**		
July	33.46	34.79	34.64	34.29	34.12	34.18	**34.25**		
August	35.94	35.85	36.13	36.23	36.19	35.98	**36.05**		
September	34.42	34.27	35.21	35.28	35.28	35.28	**34.96**		
October	34.03	33.42	35.36	35.34	35.31	35.32	**34.80**		
November	34.98	32.56	35.18	35.34	35.31	35.19	**34.76**		
December	35.16	35.13	35.38	35.45	35.48	35.45	**35.34**		
Year 2001									
January	21.25	21.48	35.05	35.30	35.26	35.13	**30.58**	Nearshore	Offshore
February	34.68	20.75	34.84	35.03	35.02	34.91	**32.54**	E1-3	E4-6
Geometric Mean	**33.13**	**31.72**	**35.02**	**35.10**	**34.96**	**35.01**	**34.11**	**34.68**	**35.00**

State Standard = None

Water Quality During Storm Outflow Events in Kuilima Bay off the East Main Drain.

Turbidity at E. Main Drain Site (NTU)

Storm Event	Station E1	Station E2	Station E3	Station E4	Station E5	Station E6	Stream	Geometric Mean	Average
Nov. 27, '01	-	158.17	-	-	9.11	-	-	37.96	83.64
Jan. 30, '02	-	-	-	14.80	-	-	146.00	14.80	14.80
May 6, '02	404.00	-	-	-	-	-	59.20	404.00	404.00
Geometric Mean	**404.00**	**158.17**		**14.80**	**9.11**		**92.97**	**61.00**	**79.38**

State Standard Wet = 50% Geo Mean[1,2] .5 NTU; Open Coast = 10% Not to Exceed[2] 1.5 NTU.

Total Suspended Solids at E. Main Drain Site (mg/l)

Storm Event	Station E1	Station E2	Station E3	Station E4	Station E5	Station E6	Stream	Geometric Mean	Average
Nov. 27, '01	-	211.60	-	-	11.44	-	-	49.20	111.52
Jan. 30, '02	-	-	-	15.70	-	-	66.00	15.70	15.70
May 6, '02	266.70	-	-	-	-	-	77.50	266.70	266.70
Geometric Mean	**266.70**	**211.60**	**-**	**15.70**	**11.44**	**-**	**71.52**	**59.06**	**77.58**

Nitrate + Nitrite at E. Main Drain Site (ug/L)

Storm Event	Station E1	Station E2	Station E3	Station E4	Station E5	Station E6	Stream	Geometric Mean	Average
Nov. 27, '01	-	13.00	-	-	9.00	-	-	10.8	11.0
Jan. 30, '02	-	-	-	73.00	-	-	296.00	73.0	73.0
May 6, '02	89.00	-	-	-	-	-	13.00	89.0	89.0
Geometric Mean	**89.00**	**13.00**	**-**	**73.00**	**9.00**	**-**	**62.03**	**41.27**	**41.50**

State Standard Wet = 50% Geo Mean[1,2] 5 ug/l; Open Coast = 10% Not to Exceed[2] 14 ug/l.

Total Nitrogen at E. Main Drain Site (ug/L)

Storm Event	Station E1	Station E2	Station E3	Station E4	Station E5	Station E6	Stream	Geometric Mean	Average
Nov. 27, '01	-	83.00	-	-	72.00	-	-	77	78
Jan. 30, '02	-	-	-	303.00	-	-	960.00	303	303
May 6, '02	1050.00	-	-	-	-	-	411.00	1050	1050
Geometric Mean	**1050.00**	**83.00**	**-**	**303.00**	**72.00**	**-**	**628.14**	**290.81**	**291.06**

State Standard Wet = 50% Geo Mean[1,2] 150 ug/l; Open Coast = 10% Not to Exceed[2] 250 ug/l.

Total Phosphorous at E. Main Drain Site (ug/L)

Storm Event	Station E1	Station E2	Station E3	Station E4	Station E5	Station E6	Stream	Geometric Mean	Average
Nov. 27, '01	-	137.00	-	-	55.00	-	-	86.8	96.0
Jan. 30, '02	-	-	-	86.00	-	-	525.00	86.0	86.0
May 6, '02	417.00	-	-	-	-	-	70.00	417.0	417.0
Geometric Mean	**417.00**	**137.00**	**-**	**86.00**	**55.00**	**-**	**191.70**	**146.01**	**151.00**

State Standard Wet = 50% Geo Mean[1,2] 20 ug/l; Open Coast = 10% Not to Exceed[2] 40 ug/l.

Chlorophyll-a at E. Main Drain Site (ug/l)

Storm Event	Station E1	Station E2	Station E3	Station E4	Station E5	Station E6	Stream	Geometric Mean	Average
Nov. 27, '01	-	4.50	-	-	0.99	-	-	2.11	2.75
Jan. 30, '02	-	-	-	0.85	-	-	0.66	0.85	0.85
May 6, '02	-	-	-	-	-	-	-	-	-
Geometric Mean	**#NUM!**	**4.50**	**-**	**0.85**	**0.99**	**-**	**0.66**	**1.34**	**1.53**

State Standard Wet = 50% Geo Mean[1,2] 0.3 ug/l; Open Coast = 10% Not to Exceed[2] 0.9 ug/l.

APPENDIX D:

Ground Water Flow Calculations

Groundwater Discharge Calculations -								
	Distribution of groundwater between shallow coastal caprock and deep basal discharge.							
Estimating Caprock Annual Water Budget for Kahuku at Turtle Bay								
We will use Giambelluca (1986) estimates of water budget for the PH area to estimate proportional recharge, ET, groundwater recharge								
Assume	1000 mm rainfall area, "Natural" land use so			61 mm runoff, 800 mm ET, 139 mm recharge				
Mean Annual Rainfall	40	in	or	3.33	ft		feet coastline:	19000
Caprock study area	2.296	sq miles	or	64,008,806	sq ft		miles of coastline	3.60
Recharge	6.1%	%						
ET	80.0%	%						
Runoff	13.9%	%						
Total Rainfall	1,608,754,668	gal						
Annual recharge	98,134,035	gal						
Annual ET	1,287,003,734	gal						
Annual Runoff	223,616,899	gal						
Total Rainfall	4.408	mgd	or	1.22	mgd/mile			
Recharge mgd	0.269	mgd		0.07	mgd/mile			
ET mgd	3.526	mgd						
Runoff mgd	0.613	mgd		0.17	mgd/mile			
Assume that 20% of the Basal GW flow discharges into the caprock								
So 20% x 3.3 mgd =	0.66	mgd per mile						
	16.7	cubic feet per day per linear foot of coast.						
Total GW flow through caprock		**0.735**	**mgd/mile**					
This groundwater discharges into the ocean.								

Draft Supplemental Environmental Impact Statement for

TURTLE BAY RESORT EXPANSION

Portions of Ahupuaʻa O ʻŌpana-Kawela, Ahupuaʻa O Hanakaʻoe, and Ahupuaʻa O Kahuku, Koʻolau Loa District, Island of Oʻahu

Volume Four of Four

PREPARED FOR TURTLE BAY RESORT, LLC by LEE SICHTER LLC • NOVEMBER 2012

APPENDIX F:

FLORA AND FAUNA IMPACT ASSESSMENT

F

Biological Surveys Conducted in Support of a Supplemental Environmental Impact Statement For the Turtle Bay Resort, Kahuku District, Island of O'ahu

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February 7, 2012

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Introduction

Turtle Bay Resort, LLC (TBR) is preparing a Supplemental Environmental Impact Statement (SEIS) updating their original EIS, which was prepared in 1985. The SEIS will cover all of the lands included in the original EIS plus the following three additional areas:

• Approximately 11 acres immediately south of Turtle Bay Hotel and immediately east of Ocean Villas. These lands are owned by TBR but were excluded from the 1985 EIS,
• A former *kuleana* of approximately 4 acres on the eastern boundary of the Turtle Bay Lands classified as State Agricultural District (TMK 5-6-003:033). (This parcel, now owned by TBR, was excluded from the 1985 EIS),
• Approximately 11 acres east of the Turtle Bay Lands. These lands constitute the Marconi Road ROW Lands and are currently owned by Cottonwood Development LLC, Marconi Point LLC, and the Estate of James Campbell.

This report describes the methods used and the results of the botanical, avian and mammalian surveys conducted on the subject property as part of the environmental disclosure process associated with the proposed project.

The primary purpose of the surveys was to determine if there are any botanical, avian or mammalian species currently listed, or proposed for listing under either federal or State of Hawai'i endangered species statutes within or adjacent to the study area. The federal and State of Hawai'i listed species status follows species identified in the following referenced documents, (Department of Land and Natural Resources (DLNR) 1998; U. S. Fish & Wildlife Service (USFWS) 2005a, 2005b, 2011). Fieldwork was conducted on March 23 and 24, 2011 and then repeated on September 19 and 20, 2011. Turtle Bay Resort, LLC will use the information in this report to evaluate the extent to which its proposed resort expansion plans may impact any endangered species (either current or proposed for listing) identified on the SEIS lands.

Hawaiian and scientific names are italicized in the text. A glossary of technical terms and acronyms used in the document, which may be unfamiliar to the reader, are included at the end of the narrative text.

General Site Description

The approximately 842 acres of land included in the SEIS lands are owned by Turtle Bay Resort, LLC (with the exception of the Marconi Road ROW Lands discussed above), and located *makai* of Kamehameha Highway, extending from the highway to the ocean, and laterally between Marconi Road (formerly known as the Kahuku Airport Road) on the east and the mid-point of Kawela Bay on the west (Figure 1). We did not survey the existing Turtle Bay Hotel grounds for avian or mammalian resources, though the botanist did make a cursory walkthrough of the grounds. We also did not survey the adjacent Ocean Villas, or Kuilima Estates, essentially the areas demarcated on Figure 1 in white.

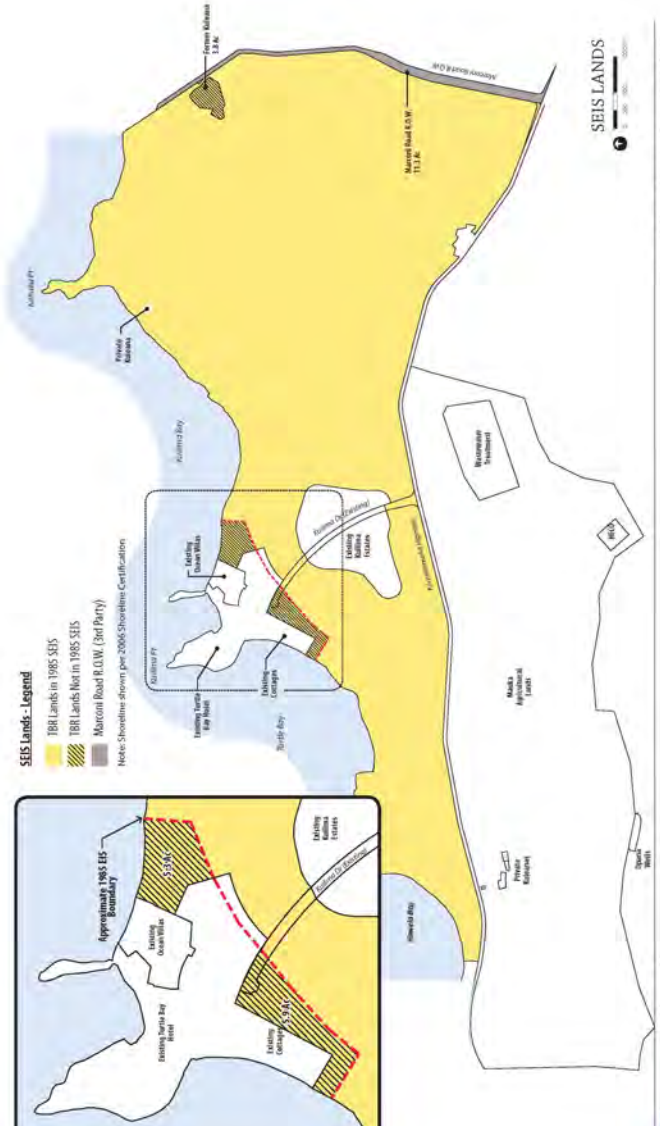

Figure 1- Turtle Bay SEIS Lands

The lands are located within three *ahpuaa'a*. From west to east these are *na ahupua'a O 'Ōpana Kawela, Hanaka'oe* and *Kahuku*. TBR lands extend inland from the shoreline between 150 meters at Kawela Bay and 2000 meters at the southern terminus along Marconi Road.

The SEIS Lands can be generally characterized as a disturbed area that has been subjected to development and redevelopment since the late 1700s. The first written descriptions of the area date back to 1779 when Captain Charles Clerke and Lieutenant James King of the HMS Resolution described the area of Kahuku Point as fine and fertile and occupied by a large village (Cook and King, 1784). Subsequent to the decline of the Hawaiian population in the area, the SEIS Lands were converted to a sheep and cattle ranch.

Records indicate that in 1873, Kahuku Ranch included all of the SEIS Lands; and scattered remains of the ranch have been found in the vicinity of Punaho`olapa Marsh. By the 1880s the land was transformed from cattle ranching to sugar cane cultivation (Figure 2). In 1889, construction of the O'ahu Railway and Land Company's railroad linking Kahuku to other parts of O`ahu began The rail line was officially opened in 1899 and its right-of-way crossed the SEIS Lands, passing through Punaho`olapa Marsh.

The coastal plains around Kahuku Point were again dramatically transformed during the course of World War II. Land modification activities included the construction of concrete bunkers, asphalt runways, and large soil/sand revetments along with barracks and numerous other buildings. After the war, beach cottages were constructed along the shoreline, especially in the area of Kawela Bay and Kawela Point. The portions of the SEIS lands cultivated in cane eventually turned fallow with the closure of the Oahu Sugar Company.

In the early 1970s, the Kuilima Resort opened and the SEIS Lands were transformed once again with the development of the original Kulima Resort Hotel, residential condominiums, an 18-hole golf course and a wastewater treatment plant (Figure 2).

In the late-1980s, the residential cottages along Kawela Point and the eastern half of Kawela Bay were demolished, structural fill was brought in, and construction of the foundations for a new multi-story hotel structure began. The structure was never completed, but underground utilities and concrete piles remain today. During this period the 18-hole Palmer Golf Course was built and the Fazio Golf Course was reduced to 9-holes. Punaho'olapa Marsh was enhanced by the construction of a moat around much of its perimeter. The original wastewater treatment plant was decommissioned after a more modern facility was constructed *mauka* of Kamehameha Highway. Around 2002 the Fazio Golf Course was expanded back to an 18-hole golf course.

The present-day vegetation of the site can be characterized as either developed landscape plantings (all hotel/resort grounds and appurtenances, and golf courses) or naturalized, non-native scrub and forest on previously disturbed lands. Areas of wetland vegetation are also extensive. Forming coastal strand and dune vegetation zones occur along most coastal

portions of the site. For the most part, the dune vegetation is also dominated by non-native, naturalized species and merges inland with either inland scrub/forest or landscaping. In contrast, the most seaward part of the coastal strand, and an area of active dunes at the east end of the SEIS lands, support a native strand vegetation.

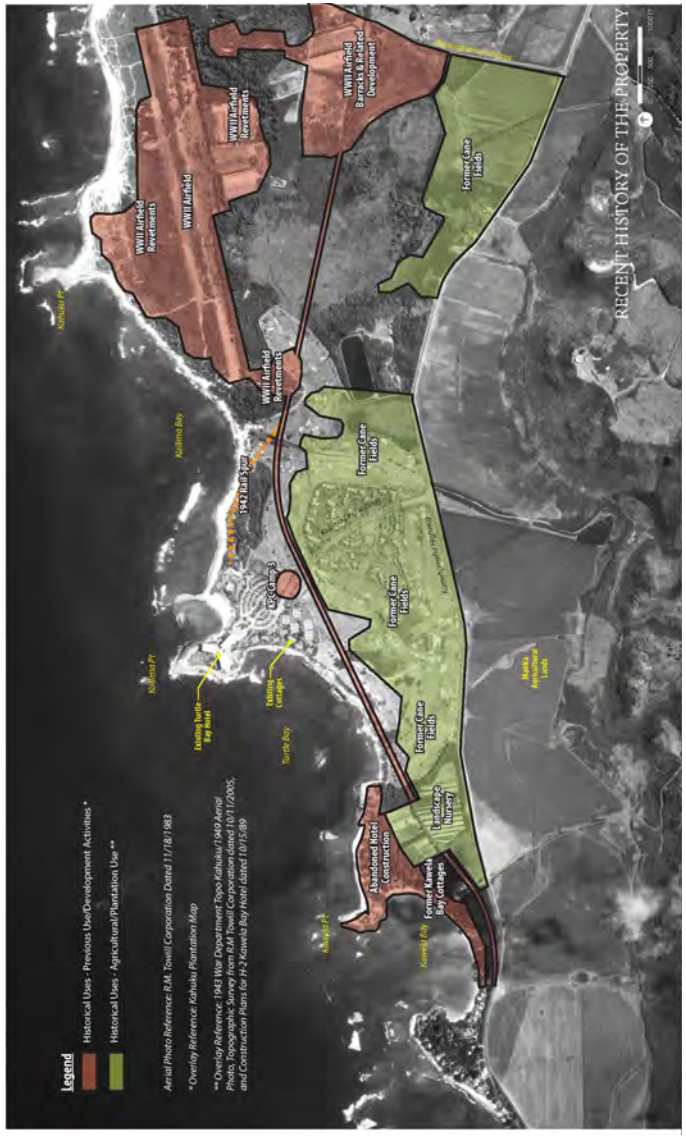

Figure 2- Turtle Bay Recent History of the Property

Methods

Plant names mostly follow *Manual of the Flowering Plants of Hawai'i* (Wagner *et al*., 1990, 1999) for native and naturalized flowering plants, Palmer (2003) for ferns, and *A Tropical Garden Flora* (Staples and Herbst, 2005) for crop and ornamental plants. Some plant species names have been updated following more recently published literature. The avian phylogenetic order and nomenclature used in this report follows the *AOU Check-List of North American Birds* (American Ornithologists' Union, 1998), and the 42nd through the 52nd supplements to the Check-List (American Ornithologists' Union, 2000; Banks et al., 2002, 2003, 2004, 2005, 2006, 2007, 2008; Chesser *et al*., 2009, 2010, 2011). Mammal scientific names follow (Tomich, 1986). Place names follow (Pukui *et al.*, 1974).

Botanical Survey Methods

The botanical survey was undertaken twice: a wet season survey on March 23-24, 2011 and a dry season survey on September 19-20, 2011. The two surveys were conducted independent of each other, which is to say the second survey was conducted without reference to any notes (or species list) generated by the first survey. The surveys both utilized a pedestrian (walking) transect methodology to cover the project area. Guided by a real-time, GPS tracking record, the botanist attempted to cover all parts of the site and to visit all areas representing various vegetation types and environments supporting plants. As the walking survey progressed, a list of all higher plants (ferns, conifers, and flowering plants) encountered was recorded in field notes, along with a sense of the relative abundance of each species overall or within various vegetation types.

This approach is vastly superior to using more rigorous quantitative transects when the primary purpose is to characterize the flora and discover the presence of normally rare, listed species or native species having resource value. In essence, by recording all plants encountered, the resulting flora (plant species) listing provides information useful to characterize the nature of botanical resources present, including species that now or perhaps in the future may be of interest or concern from a variety of perspectives, such as native plant protection, listed species, occurrence of invasive species, etc. Completeness of the listing is partly dependent upon the actual proportion of the land covered. It is neither reasonable nor necessary to cover 100 percent of an area by traversing continuously until every possible location is viewed. Utilizing ever-changing view planes and the fact that species occur in populations of individuals that form a repeating mosaic within environment types enables the botanist to direct the survey track into all areas of the site that hold promise of yielding species not encountered earlier in a survey; and this process is repeated until no new species are being added to the field notes. Thus, very rare species represented by one or just a few individuals in area as large as the SEIS lands could be missed. But certainly the vast majority of species present will be "discovered."

One result of conducting two "independent" field visits is to provide a cross check on the completeness of the surveys, although in this case, conducting one survey (March 2011) near the end of the wet season and the other (September 2011) near the end of the dry

season was more for the purpose of demonstrating that seasonal factors were covered. Much of the site consists of vegetation that is highly tolerant of extended dry conditions, so plants not seen due to the season would be annual species surviving as seeds in the soil. Finding native shrubs or trees would not be dependent upon the season, as these species are persistent and recognizable in both the wet and dry periods.

Avian Survey Methods

Point Counts

Twenty avian count stations were sited within the project site. Stations were roughly equidistant from each other. A single eight-minute avian point count was made at each count station. The same methodology was repeated during the fall survey. Field observations were made with the aid of Leica 10 X 42 binoculars and by listening for vocalizations. The point counts were conducted between 6:30 am and 11:00 am. Time not spent counting the point count stations was used to search the rest of the SEIS lands for species and habitats not detected during the point counts.

Time Dependant Waterbird Counts

Fifteen minute, time dependant waterbird counts were made at all of the water features located within the golf courses, and a set of thirty minute time dependant waterbird counts were made around and within Punahoʻolapa Marsh.

Mammalian Survey Methods

With the exception of the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*), or *ʻōpeʻapeʻa* as it is known locally, all terrestrial mammals currently found on the Island of Oʻahu are alien species, and most are ubiquitous. The survey of mammals was limited to visual and auditory detection, coupled with visual observation of scat, tracks, and other animal sign. A running tally was kept of all terrestrial vertebrate mammalian species detected within the project area during the time spent on the site.

Results

Botanical Surveys, Flora

"Flora" is the diversity of plant species living in the survey area. A plant checklist (Table 1) was compiled from field observations, with entries arranged alphabetically under plant family names (standard practice). Included in the list are scientific name, common name, and status (whether native or non-native) for each species observed during the survey. Species status given in **bold** indicates a plant of particular interest to the Hawaiian Islands flora (indigenous, endemic, or Polynesian introduction). Qualitative estimates of plant abundance were recorded for each species on each survey date, and within the vegetation type indicated in the "notes" column. Abundance values are coded in the table as explained in the Legend to Table 1. For some species, a two-level system of abundance is used; with a letter-number code indicating a species having a somewhat clustered distribution. For example, a species infrequently encountered but numerous where found would have an abundance rating of "R" indicating a plant encountered only one to three times during the entire survey of the site, but an "R2" to indicate several to many individuals present where encountered. An "R3" would be a plant similarly seldom encountered (i.e., rare), but locally abundant in one or more of the locations where encountered. A species marked "O3" would be one seen with some regularity, usually occurring in patches of numerous individuals (as opposed to "C" for a species seen with regularity throughout the vegetation zone). As with any system attempting to ascribe abundance, the task becomes increasingly difficult where spread across a large area of constantly varying terrain.

A total of 226 species of vascular plants was identified from the survey area. This total number is certainly high, although the SEIS lands represent a large area with a variety of different environments. Forty-five or one-fifth (20 percent) of the tabulated species are ornamentals (**Orn**), meaning landscape plants that have not become naturalized in Hawaiʻi. A much higher percentage are actually serving landscape purposes at Turtle Bay Resort, since many naturalized species are also used for landscaping; once a plant introduced for landscaping escapes into the wild or naturalizes, it's status changes to naturalized (**Nat**). Eighty-two of the species (36 percent) in Table 1 were recorded in the "landscape" vegetation type (note <4>); that is, were observed either around the develop resort buildings and appurtenances or around the golf courses. Given the nature of this vegetation type, these species are either weeds or plants serving an ornamental function.

Twenty-six of the species (11.5 percent) are Hawaiian natives, indicated under the status column as either indigenous (**Ind**) or endemic (**End**). Another 8 species (3.5 percent) are early Polynesian introductions (**Pol**), technically not native, but so-called "canoe plants" that have been in the Islands for several thousand years. A majority (18 of 26 species or 8 percent of total species) of the indigenous and endemic species occur in the wetland and coastal strand vegetation, which is why these two environments are botanically the most sensitive in the SEIS lands. Only four native species were recorded within the developed lands or landscape vegetation areas. Another five Polynesian introductions—typically

thought of as Hawaiian native plants due to their association with native peoples and long presence in the Islands—are found in the landscaped areas surveyed.

Of course, percentages based upon total species recorded can be misleading without considering a sense of abundance. In this regard, plants such as *hala* (*Pananus tectorius*), *naupaka* (*Scaevola taccada*), and *niu* (coconut or *Cocos nucifera*) are prominent species in the landscaping, within the resort. The same is true for the wetland and the most seaward part of the strand vegetation, where natives tend to dominate (see below).

Comparison between wet and dry season surveys can be made, although interpreting these results is tricky. It is not entirely the case that the differences between the two species lists represents plants present in one season and not present in the other. A total of 45 species were recorded in March ("wet season") and not later observed in September ("dry season"). For the September listing, 33 species had not been previously observed on the SEIS lands in March. The higher number in March appears to be mostly ruderal species that might be expected to be more prominent under wetter conditions. All but seven of the 45 species were recorded either within the landscaped or disturbed areas (notes <3> and <4>) of the property. Two of the seven are forest vines seen only once each in the March survey; one an indigenous species: *kāʻeʻe* (*Mucuna gigantea*). Three other native, indigenous species were missed in September: *pāʻū-o-Hiʻiaka* (*Jacquemontia ovalifolia*), recorded as rare in a disturbed area previously; *moa* (*Psilotum nudum*) recorded from a single plant seen in the landscaping in March; and *ʻuhaloa* (*Waltheria indica*), a ruderal species that should have been seen, was uncommon in March.

Only thirteen of the 33 species recorded in September but not in March were from environments other than landscaped areas or highly disturbed areas. These were mostly weedy or non-characteristic species in the strand or wetland environments (notes <1> and <2>). Two indigenous species recorded in September were missed (or not present) in the previous, March survey. One, *pōhinahina* (*Vitex rotundifolia*) was only seen as a landscape bedding plant in September. The other, the sedge *ʻahuʻawa* (*Mariscus javanicus*), is a wetland plant noted as rare in September; and *ʻuhaloa* (*Waltheria indica*) should have been seen, although was uncommon in March.

Because the Turtle Bay Hotel grounds were included in both surveys only in passing—species encountered were recorded, but no attempt was made to be thorough around the buildings—differences in the species list are to be expected from this area: 17 species of ornamentals were recorded in only one or the other survey, 22 percent of the recorded once species. Clearly, these are plants that are not present or absent due to the season, but missed as a result of the route taken by the botanist around the grounds.

With but a few exceptions, the plants missed in one survey or the other, were recorded as (mostly) rare or uncommon when seen. The exceptions include a couple of grasses and

weedy species associated with mowed lawns. Grasses can be missed if not in flower at the time of the survey. Nephthytis (*Syngonium* sp.), elephant grass (*Pennisetum purpureum*), pitted beardgrass (*Bothriochloa pertusa*), narrow-leaved carpetgrass (*Axonopus fisifolius*) and prostrate indigo (*Indigofera hendecaphyla*) were each recorded as present in numbers greater than rare or uncommon in one survey, but still missed in the other survey.

Table 1 - Checklist of Plants Found in SEIS Lands at the Turtle Bay Resort, O'ahu, Hawai'I

FAMILY		STATUS	ABUNDANCE		NOTES
Species	**Common name**		**Wet Season**	**Dry Season**	
PTERIDOPHYTES ~ FERNS & FERN ALLIES					
NEPHROLEPIDACEAE					
Nephrolepis multiflora (Roxb.) F.M. Jarrett ex C.V. Morton	sword fern	Nat	U	---	<4>
POLYPODIACEAE					
Phymatosorus grossus (Langsd. & Fisch.) Brownlie	*laua'e*	Nat	R, R3	U2, U2	<4, 5>
PSILOTACEAE					
Psilotum nudum (L.) P. Beauv.	*moa*	**Ind**	R	---	<4>
THELYPTERIDACEAE					
Cyclosorus interruptus (Wild.) H. Itō	*neke*	Nat	O3	O3	<2>
GYMNOSPERMS					
ARAUCARIACEAE					
Araucaria columnaris (G. Forster) J.D. Hoiok..	Cook Island pine	Nat	U3	U3	<1>
FLOWERING PLANTS					
DICOTYLEDONS					
ACANTHACEAE					
Aphilandra squarrosa C. Nees	zebra plant	Orn	R	R	<4>
Asystasia gangetica (L.) T. Anderson	Chinese violet	Nat	R, U, C	R,U,O	<1, 4, 5>
Barlaria repens C. Nees	pink –ruellia	Nat	R1	--	<3>
Pseuderanthemum carruthersii var. *carruthersii* (Seemann) Guill.	---	Orn	R	R	<4>
AIZOACEAE					
Sesuvium portulacastrum (L.) L.	*'akulikuli*	**Ind**	O2, U	O,	<1, 3>
Tetragonia tetragonioides (Pall.) Kuntze	New Zealand spinach	Nat	U, U	O3, R	<1, 5>
AMARANTHACEAE					
Alternanthera pungens Kunth	khaki weed	Nat	R	U	
Ameranthus spinosus L.	spiny amaranth	Nat	R	R	<1>
Amaranthus viridis L.	slender amaranth	Nat	U	U	<3>
ANACARDIACEAE					
Schinus terebinthifolius Raddi	Christmas berry	Nat	O	O	<5>

Table 1 (continued).

FAMILY		STATUS	ABUNDANCE		NOTES
Species	**Common name**		**Wet Season**	**Dry Season**	
APIACEAE					
Centella asiatica (L.) Urb.	Asiatic pennywort	Nat	--	R	<2>
Ciclospermum leptophyllum (Pers.) Sprague	fir-leaved celery	Nat	R	--	<3>
Hydrocotyle sibthorpioides Lam.	pennywort	Nat	R	--	<4>
APOCYNACEAE					
Nerium oleander L.	oleander	Orn	U	U	<4>
Plumeria obtusa L.	Singapore plumeria	Orn	R	R	<4>
Plumeria rubra L.	frangipani	Orn	U	O	<4>
Thevetia peruviana (Pers.) K. Schum.	be-still tree	Nat	R3	U	<4>
ARALIACEAE					
Schefflera actinophyla (Endl.) Harms	octopus tree	Nat	U	U	<4>
Polyscias guilfoylei (W. Bull.) L.H. Bailey	panax	Orn	U	U	<5>
ASTERACEAE (COMPOSITAE)					
Ageratina riparia (Regel) R. King & H. Robinson	*Hāmākua pāumakani*	Nat	R	--	<3>
Bidens alba (L.) DC	beggartick	Nat	C3, C, O2	C1, C, U	<1, 3, 4>
Calyptocarpus vialis Less.	---	Nat	U2, U2	O, O	<3, 4>
Conyza bonariensis (L.) Cronq.	hairy horseweed	Nat	R	C	<3>
Cyanthillium cinereum (L.) H. Rob.	little ironweed	Nat	--	R	<3>
Eclipta prostrata (L.) L.	false daisy	Nat	R, --	--, U3	<4, 5>
Emilia fosbergii Nicolson	Flora's paintbrush	Nat	U	R	<3>
Pluchea carolinensis (Jacq.) G. Don	sourbush	Nat	C	O	<5>
Pluchea indica (L.) Less.	Indian fleabane	Nat	O, O, C	U, C, U	<2, 3, 5>
Pluchea x fosbergii Cooperr. & Galang	pluchea hybrid	Nat	O	R	<2>
Sonchus oleraceus L.	sow thistle	Nat	O, O3	--, R	<1, 3>
Sphagneticola trilobata (L.) Pruski	wedelia	Nat	C1, U, U	--, --, O	<1, 2, 3>
Verbesina encelioides (Cav.) Benth. & Hook.	golden crown-beard	Nat	U3	C	<1>
Xanthium strumarium L.	kīkānia, cocklebur	Nat	--	R	<3>
Youngia japonica (L.) DC	Oriental hawksbeard	Nat	R	--	<4>
BALSAMINACEAE					
Impatiens walleriana J. D. Hook.	busy lizzy	Nat	--	R	<4>
BIGNONIACEAE					
Spathodea campanulata P. Beauv.	African tulip tree	Nat	R	--	<4>

Table 1 (continued).

FAMILY		STATUS	ABUNDANCE		NOTES
Species	**Common name**		**Wet Season**	**Dry Season**	
Tabebuia heterophylla (A.P. de Candolle) Britton	pink tecoma	Orn	R	R	<4>
BALSAMINACEAE					
Impatiens walleriana J. D. Hook.	busy lizzy	Nat	--	R	<4>
BIGNONIACEAE					
Spathodea campanulata P. Beauv.	African tulip tree	Nat	R	--	<4>
Tabebuia heterophylla (A.P. de Candolle) Britton	pink tecoma	Orn	R	R	<4>
BORAGINACEAE					
Cordia subcordata Lam.	*kou*	**Ind**	R	R	<4>
Heliotropium anomalum Hook. & Arnott	*hinahina*	**Ind**	O	O	<1>
Tournefortia argentea L. fil.	tree heliotrope	Nat	C	C	<1>
BRASSICACEAE					
Lepidium virginicum L.	common pepperwort	Nat	--	U	<1>
CACTACEAE					
Hylocereus undatus (Haw.) Britt. & Rose	night-blooming cereus	Nat	R	R2	<5>
CAPRIFOLIACEAE					
Lonicera japonica Thunb.	Japanese honeysuckle	Orn	R	---	<4>
CARICACEAE					
Carica papaya L.	papaya	Nat	R	R	<5>
CARYOPHYLLACEAE					
Spergularia marina (L.) Griseb.	saltmarsh sand spurry	Nat	R	--	<3>
CASUARINACEAE					
Casuarina equisetifolia L.	common ironwood	Nat	AA, U, A	AA, U, C	<1, 2, 5>
CHENOPODIACEAE					
Chenopodium murale L.	*'aheahea*	Nat	U2, R	U, --	<1, 3>
CLUSIACEAE					
Calophyllum inophyllum L.	*kamani*	**Pol**	R	R	<5>
Clusia rosea Jacq.	autograph tree	Nat	R	R	<4>
COMBRETACEAE					
Conocarpus erectus L.	button mangrove	Orn	R	R	<4>
Terminalia catappa L.	tropical almond; false *kamani*	Nat	U	O	<1>
CONVOLVULACEAE					
Ipomoea alba L.	moon flower, *koali pehu*	Nat	R	--	<5>
Ipomoea obscura	---	Nat	U	U	<3>

Table 1 (continued).

FAMILY		STATUS	ABUNDANCE		NOTES
Species	**Common name**		**Wet Season**	**Dry Season**	
CONVOLVULACEAE (continued)					
Ipomoea pes-caprae (L.) R. Br.	*pōhuehue*	Nat	U	O	<1>
Ipomoea triloba L.	little bell	Nat	R	U	<3>
Jacquemontia ovalifolia (Choisy) H. Hallier	*pā'ū-o-Hi'iaka*	**Ind**	R	---	<3>
CUCURBITACEAE					
Coccinia grandis (L.) Voigt	ivy or scarlet-fruited gourd	Nat	O, O	R, --	<1, 4>
Momordica charantia L.	wild bitter melon	Nat	--	R	<3>
EUPHORBIACEAE					
Acalypha hispida N.L. Burm.	chenille plant	Orn	--	R	<4>
Aleurites moluccana (L.) Wild.	*kukui*	**Pol**	R	R	<4>
Codiaeum variegatum (L.) Blume	croton	Orn	R	R	<4>
Euphorbia albomarginata Torr. & A. Grey	rattlesnake weed	Nat	R	U	<3>
Euphorbia degneri (Sherff) Croizat & Degener	*'akoko*	**End**	O2	O1	<1>
Euphorbia hirta L.	garden spurge	Nat	U	O	<1>
Euphorbia hypericifolia L.	graceful spurge	Nat	U	O	<3>
Macaranga tanarius (L.) Müll. Arg.	---	Nat	C	U	<5>
Manihot esculenta Crantz	cassava	Orn	R	---	<4>
Phyllanthus debilis Klein ex Willd.	niruri	Nat	U	O	<3>
Ricinus communis L.	castor bean	Nat	U	U	<3>
FABACEAE					
Albizia saman F. Muell.	monkeypod	Nat	R	R	<4>
Alysicarpus vaginalis (L.) DC	alyce clover	Nat	U	U1	<4>
Canavalia cathartica Thouars	*maunaloa*	Nat	R	U	<5>
Crotalaria incana L.	fuzzy rattlebod	Nat	--	U	<3>
Desmanthus pernambucanus (L.) Theilung	virgate mimosa	Nat	O3	U	<3>
Erythrina variegata L.	Indian coral tree	Nat	R	R	<4>
Indigofera hendecaphyla Jacq.	prostrate indigo	Nat	--	O	
Indigofera suffruticosa Mill.	indigo	Nat	R	R	<3>
Leucaena leucocephala (Lam.) deWit	koa haole	Nat	U, AA	O, AA	<1, 5>
Macroptilium atropurpureum (DC) Urb.	---	Nat	R	---	<3>
Macroptilium lathyroides (L.) Urb.	cow pea	Nat	R	U	<3>
Medicago polymorpha L.	bur clover	Nat	R	--	<1>
Melilotis indica (L.) All.	yellow sweet clover	Nat	R	R	<3>

Table 1 (continued).

FAMILY		STATUS	ABUNDANCE		NOTES
Species	**Common name**		**Wet Season**	**Dry Season**	
FABACEAE (Continued)					
Mimosa pudica L.	sensitive plant	Nat	U	U	<3>
Mucuna gigantea (Willd.) DC	sea bean, *kāʻeʻe*	**Ind**	R	---	<5>
Neonotonia wightii (Wight & Arnott) Lackey	glycine vine	Nat	U3, O	U2,	<3, 5>
Prosopis pallida (Humb. & Bonpl. ex Willd.) Kunth	*kiawe*	Nat	R	U	<4>
Senna surattensis (N.L. Burm.) H. Irwin & Barneby	scrambled egg plant, *kolomona*	Nat	R	---	<1>
Sesbania grandiflora (L.) Poir.	sesban; *ʻohai keʻokeʻo*	Orn	---	R	<4>
Vigna marina (J. Burm.) Merr.	beach pea	**Ind**	U	U1	<1>
GOODINACEAE					
Scaevola taccada (J. Gaertn.) Roxb.	*naupaka kahakai*	**Ind**	C	C	<1>
LAMIACEAE					
Leonotis nepetifolia (L.) R. Br.	lion's ear	Nat	U	O	<3>
LOGANIACEAE					
Fagraea berteroana Benth.	*pua kenikeni*	Orn	R	--	<4>
MALVACEAE					
Abutilon grandifolium (Willd.) Sweet	hairy abutilon	Nat	R	--	<5>
Hibiscus rosa-sinensis L.	Chinese hibiscus	Orn	U	U	<4>
Hibiscus tiliaceus L.	*hau*	**Ind**	U1	---	<5>
Hibiscus tiliaceus var. cf. *purpurascens*	*hau* cultivar	Orn	R	R	<4>
Malva parviflora L.	cheeseweed	Nat	R1	--	<3>
Malvastrum coromandelianum (L.) Garcke	false mallow	Nat	R, U	--, --	<1, 3>
Sida ciliaris L.	---	Nat	U	O	
Sida rhombifolia L.	Cuba jute	Nat	R	---	<3>
Sida spinosa L.	prickly sida	Nat	R	R	<3>
Thespesia populnea (L.) Sol. ex Corrêa	milo	Ind	U, O3	O, O	<1, 5>
MORACEAE					
Ficus elastica Horn.	India rubber tree	Orn	R	R	<5>
Ficus macrophylla Pers.	Moreton Bay fig	Orn	R	R	<4>
Ficus microcarpa L.	Chinese banyan	Nat	R	U	<4>
MORINGACEAE					
Moringa oleifera Lam.	horseradish tree	Orn	R	R	<4>

Table 1 (continued).

FAMILY		STATUS	ABUNDANCE		NOTES
Species	**Common name**		**Wet Season**	**Dry Season**	
MYRSINACEAE					
Ardisia elliptica Thunb.	shoe-button ardisia	Nat	R	R1	<5>
MYRTACEAE					
Psidium guajava L.	common guava	Nat	--	R	<5>
Syzigium cumini (L.) Skeels	Java plum	Nat	U	U	<5>
NYCTAGINACEAE					
Boerhavia coccinea Mill.	false *alena*	Nat	U	O	<3>
Boerhavia repens L.	*alena*	**Ind**	C	O	<1>
Bougainvillea spectabilis Wild.	bougainvillea	Orn	U	U	<4>
Mirabilis jalapa L.	marvel of Peru, four-o'clock	Nat	--	R	<5>
ONAGRACEAE					
Ludwigia octovalvus (Jacq.) Raven	primrose willowl	**Pol**	--	R	<2>
OXALIDACEAE					
Oxalis corniculata L.	yellow wood sorrel	**Ind**	O, U	U, --	<1, 5>
Oxalis debilis var. *corymbosa* (A.P. de Candolle) Lour.	pink wood sorrel	Orn	R	--	<4>
PASSIFLORACEAE					
Passiflora foetida L.	love-in-a-mist	Nat	--	U	<1>
Passiflora suberosa L.	wild passionfruit	Nat	O, R, U	U, --, U3	<1, 3, 5>
PHYTOLACCACEAE					
Rivina humilis L.	coral berry	Nat	O3	R	<5>
PITTOSPORACEAE					
Pittosporum sp.	---	Orn	R	--	<4>
PLANTAGINACEAE					
Plantago lanceolata L.	nrw-lvd plantain	Nat	U2	O	<1>
Plantago major L.	common plantain	Nat	O	O	<3>
POLYGONACEAE					
Antigonon leptopus Hook. & Arnott	Mexican creeper	Nat	R		<5>
Coccoloba uvifera (L.) L.	sea grape	Nat	U2, R	U, R	<1, 5>

Table 1 (continued).

FAMILY		STATUS	ABUNDANCE		NOTES
Species	**Common name**		**Wet Season**	**Dry Season**	
PORTULACACEAE					
Portulaca oleracea L.	pig weed	Nat	R	U	<1>
Portulaca pilosa L.	---	Nat	--	R	<3>
PRIMULACCACEAE					
Anagallis arvensis L.	scarlet pimpernel	Nat	R	---	<3>
RHIZOPHORACEAE					
Rhizophora mangle	American mangrove	Nat	--	R	<2>
ROSACEAE					
Rhaphiolepis umbellata (Thunb.) Makino	Yeddo hawthorn	Orn	R1	R1	<4>
RUBIACEAE					
Gardenia cf. *augusta* (L.) Merr.	gardenia	Orn	---	R	<4>
Gardenia taitensis A.P. de Candolle	tiare, Tahitian gardenia	Orn	R	---	<4>
Morinda citrifolia L.	*noni*	**Pol**	R, O	U, O	<4, 5>
Spermacoce assurgens Ruiz & Pav.	buttonweed	Nat	U	--	<3>
RUTACEAE					
Murraya paniculata (L.) W. Jack	mock orange	Orn	U	U	<4>
SCROPHULARIACEAE					
Bacopa monnieri (L.) Penell	*ʻaeʻae*	**Ind**	U	U	<2>
SOLANACEAE					
Lycium sandwicense A. Gray	*ʻōhelo kai*	**Ind**	R	R	<1>
Solanum americanum Mill.	*pōpolo*	**Ind**	U2	R	<3>
Solanum lycopersicum var. *cerasiforme* (Dunal) Spooner, G.J Anderson, & R.K. Jansen	cherry tomato	Nat	R	--	<3>
Solanum torvum Sw.	---	Nat	R	--	<3>
STERCULIACEAE					
Waltheria indica L.	*ʻuhaloa*	**Ind**	U	--	<3>
ULMACEAE					
Trema orientalis (L.) Blume	gunpowder tree	Nat	R	R	<5>

Table 1 (continued).

FAMILY		STATUS	ABUNDANCE		NOTES
Species	**Common name**		**Wet Season**	**Dry Season**	
VERBENACEAE					
Citharexylum spinosum L.	fiddlewood	Nat	--	R	<4>
Lantana camara L.	lantana	Nat	R	--	<1>
Stachytarpheta australis		Nat	--	U	<3>
Stachytarpheta jamaicense		Nat	R	R	<3>
Verbena litoralis Kunth	*ōwī*	Nat	--	R	<1>
Vitex rotundifolia L. fil.	*pōhinahina*	**Ind**	--	U	<4>
	MONOCOTYLEDONES				
AGAVACEAE					
Cordyline fruticosa (L.) A. Chev.	ti, *ki*	**Pol**	U	O	<4>
Furcraea foetida (L.) Haw.	Mauritius hemp	Nat	R?	R	<1>
Sansevieria trifasciata Prain	mother-in-law tongue	Orn	U2	U2	<5>
ARACEAE					
Epipremnum pinnatum ʻAureumʼ G.S. Bunting	pothos	Nat	R, R3	--, U	<1, 4>
Monstera delicosa Liebmann	monstera	Orn	R	R	<4>
Philodendron bipinnatifidum Endl.	selloum	Orn	R	R	<4>
Syngonium cf. *podophyllum* Schott	nephthytis	Nat	--	O	<5>
ARECACEAE					
Caryota cf. *mitis* Lour.	fishtail palm	Orn	R	R	<4>
Cocos nucifera L.	coconut, *niu*	**Pol**	R, C	R, C	<1, 4>
Dypsis lutescens (H. Wendl.) Beentje & Dransfield	golden-fruited palm	Orn	R	R	<4>
Phoenix dactylifera L	Phoenix palm	Nat	U, C	U, U	<2, 5>
Roystonia regia (Kunth) O. F. Cook	royal palm	Orn	--	U	<4>
Veitchia merrilli (Beccari) H.E. Moore	Manila palm	Orn	R	R	<4>
COMMELINACEAE					
Commelina diffusa N.L. Burm.	day flower	**Pol**	R	O	<2>
Tradescantia zebrina Bosse	*hohohonoʻula*	Orn	R	--	<4>
CYPERACEAE					
Bulboschoenus maritimus (L.) Palla	*kaluhā*	**Ind**	C	O	<2>
Cladium jamaicense Crantz	*ʻuki*, saw-grass	**Ind**	O3	O3	<2>
Cyperus halpan L.	---	Nat	R	--	<4>
Cyperus involucratus Rottb.	umbrella sedge	Nat	--	R	<2>

Table 1 (continued).

FAMILY		STATUS	ABUNDANCE		NOTES
Species	**Common name**		**Wet Season**	**Dry Season**	
CYPERACEAE (continued)					
Cyperus polystachyos Rottb.	---	**Ind**	O, U	U	<2, 3>
Cyperus rotundus L.	nut grass	Nat	O, O2	--, U2	<2, 4>
Eleocharis sp.	---	Nat	R, R	O, --	<2, 4>
Fimbristylis cymosa R. Br.	*mau'u*	**Ind**	R	U	<1>
Fimbristylis sp.	---	???	--	U	<2>
CYPERACEAE (continued)					
Kyllinga brevifolia Rottb.	*kili'o'opu*	Nat		U	<4>
Mariscus javanicus (Houtt.) Merr. & Metcalfe	*'ahu'awa*	**Ind**	--	R	<2>
Schoenoplectus lacustris (L.) Palla	*'aki'akai*, bulrush	**Ind**	O3	U	<2>
Schoenoplectus californicus (C.A. Mey.) Palla	great bulrush	Nat	A	A	<2>
IRIDACEAE					
Dietes bicolor (Steud.) Klatt	African iris	Orn	R	--	<4>
indet.	---	Orn	--	R	<4>
LEMNACEAE					
Lemna sp.	duckweed	Nat	--	R3	<2>
LILIACEAE					
Crinum asiaticum L.	giant lily	Nat	R	R	<1>
Crinum pedunculatum R. Brown	river lily	Orn	R	R	<4>
Hippeastrum striatum (Lam.) H.E. Moore	amaryllis; Barbados lily	Nat	R	--	<4>
Liriope sp	lilly turf	Orn	--	U	<4>
PANDANACEAE					
Pandanus tectorius Z	*hala*	**Ind**	R, U	U, U	<1, 4>
Pandanus tectorius cult. 'Veitchii'	*hala* cultivar	Orn	R	R	<4>
POACEAE (GRAMINEAE)					
Axonopus compressus (Swartz) P. Beau.	brd-lvd carpetgrass	Nat	O3	O3	<4>
Axonopus fisifolius	nrw-lvd carpetgrass	Nat	--	O	<4>
Bothriochloa pertusa (L.) Camus	pitted beardgrass	Nat	A	--	<4>
Cenchrus echinatus L.	common sandbur	Nat	U1	U	<5>
Chloris barbata (L.) Sw.	swollen fingergrass	Nat	U	O	<1, 3>
Chloris divaricata R. Br.	stargrass	Nat	R	--	<3>
Chloris virgata Sw.	feather fingergrass	Nat	U	U	<3>
Cynodon dactylon (L.) Pers.	Bermuda grass	Nat	O, AA	O, AA	<2, 4>
Cynodon x magennisii Hurcombe	Bermuda hybrid	Orn	R3	--	<4>

Table 1 (continued).

FAMILY		STATUS	ABUNDANCE		NOTES
Species	**Common name**		**Wet Season**	**Dry Season**	
POACEAE (GRAMINEAE) continued					
Dactyloctenium aegypticum (L.) Willd.	beach wiregrass	Nat	R	--	<1>
Digiteria ciliaris (Retz.) Koeler	Henry's crabgrass	Nat	O1	U	<3>
Digitaria insularis (L.) Mez ex Ekman	sourgrass	Nat	U, O	--, U	<1, 3>
Digitaria violascens Link	smooth crabgrass	Nat	U	--	<3>
Echinochloa crus-galli (L.) P. Beauv.	barnyard grass	Nat	O	O	<2>
Eleusine indica (L.) Gaertn.	wiregrass	Nat	O, C	,O	<1, 3>
Eragrostis brownie (Kunth) Nees ex Steud.	sheepgrass	Nat	R	R3	<3>
Eragrostis pectinacea (Michx.) Nees	Carolina lovegrass	Nat	A	U1	<3>
Eragrostis tenella (L.) P. Beauv. ex Roem. & Schult.	lovegrass	Nat	R1	R1	<3>
Eremochloa ophiuroides (Munro) Hackel	centipede grass	Orn	U	--	<3>
Panicum maximum Jacq.	Guinea grass	Nat	C3	A	<3>
Paspalum conjugatum Bergius	Hilo grass	Nat	C	O	<4>
Paspalum fimbriatum Kunth	Panama grass	Nat	U	--	<3>
Paspalum sp.		Nat	R	--	<3>
Pennisetum purpureum Schumach.	elephant grass	Nat	O	--	<2>
Paspalum vaginatum Sw.	seashore paspalum	Nat	O1	O1	<2>
Saccharum officinarum L.	sugar cane, *kō*	**Pol**	--	R	<4>
Setaria verticillata (L.) P. Beauv.	bristly foxtail	Nat	R	R	<3>
Sorghum bicolor (L.) Moench	---	Nat	R	R	<3>
Sporobolus cf. indicus (L.) R. Br.	dropseed	Nat	R	O2	<4>
Sporobolus virginicus (L.) Kunth	'aki'aki	Ind	AA	AA	<1>
Stenotaphrum secundatum (T. Walter) Kuntze	St. Augustine grass	Nat	U3	U	<1>
Urochloa mutica (Forssk.) Nguyen	California grass	Nat	A, R	C1,	<2, 3>
Zoysia matrella var. pacifica Gouds.	Mescarene grass	Orn	U, --	U, U	<1, 4>
STRELITZIACEAE					
Strelitzia reginae Dryander	bird-of-paradise	Orn	U	U	<4>
TYPHACEAE					
Typha latifolia L.	common cattail	Nat	R3	U2	<2>
ZINGERBERACEAE					
Alpinia purpurata (Viell.) K. Schum.	red ginger	Orn	R	--	<4>
Alpinia zerumbet (Pers.) B.L. Burtt & R.M. Smith	shell ginger	Orn	--	R	<4>
Etlingera elatior (Jack) R.M. Smith	torch ginger	Orn	--	U	<4>

Table 1 (continued).

Legend to Table 1

Status = distributional status

End = endemic; native to Hawaii and found naturally nowhere else.
Ind = indigenous; native to Hawaii, but not unique to the Hawaiian Islands.
Nat = naturalized, exotic, plant introduced to the Hawaiian Islands since the arrival of Cook Expedition in 1778, and well-established outside of cultivation.
Orn = exotic, ornamental or cultivated; plant not naturalized (not well-established outside of cultivation).
Pol = early Polynesian introduction (before 1778).

Abundance = occurrence ratings for plants in survey area.

R – Rare - only one, two, or three plants seen.
U - Uncommon - several to a dozen plants observed.
O - Occasional - found regularly around the site.
C - Common - considered an important part of the vegetation and observed numerous times.
A - Abundant - found in large numbers; may be locally dominant.
AA - Abundant - abundant and dominant in some areas surveyed, defining vegetation in those areas.

Numbers following a letter modify the letter to account for clustered distribution. Thus R3 would indicate a plant encountered ratrely (one to three times), but numerous where encountered.

Notes:

<1> Associated with beach, dune, and limestone shelf (strand vegetation)
<2> Associated with wetlands and golf course water hazard (aquatic) sites.
<3> Associated with disturbed areas around structures and golf course.
<4> Associated with the extensive mowed (lawn) areas; grounds landscaping; golf course.
<5> Associated with forest vegetation type inland of dunes.
<6> A plant which was lacking flowers or fruit; identification uncertain.

Botanical Surveys, Vegetation

"Vegetation" refers to the type of plants that dominate an area. For the SEIS lands, we can describe the following basic vegetation types: Landscape, Forest (several types), Shrub-scrub, Wetland, and, along a narrow zone at the coast, Strand. Each of these vegetation types and the distribution (shown in Figure 3) are discussed here, in order from the largest to smallest based upon proportion of area within the SEIS lands.

The Landscape Vegetation type (**Lnd**) refers to all areas where the dominant plants are controlled and maintained by humans. Included are hotel grounds, golf course (Figure 4) and other high resort use areas, Kuilima Estates, and other landscaped areas (roads and parking lots). Of course, many of the ruderal weed species (plants adapted to conditions of regular disturbance, such as mowing, grading, etc.) that occur on the property will be found in landscaped areas, since levels of maintenance will vary greatly dependent upon land use. Not all of these areas were surveyed (for example most of the hotel grounds and Kuilima Estates were excluded) because they represent completely developed areas where all botanical resources are managed and for the reasons stated in the Introduction. A sizable fraction (36 percent) of the listed flora occurs in the landscaped areas because this category constitutes a high percentage of the SEIS lands and because of contributions from both diverse plantings and ruderal weeds. This vegetation type has low numbers of native species with the exception of plants used in landscaping as discussed under Flora above and a few ruderal natives such as *pōpolo* (*Solanum americanum*) and *'uhaloa* (*Waltheria indica*), which were not very abundant in the surveys.

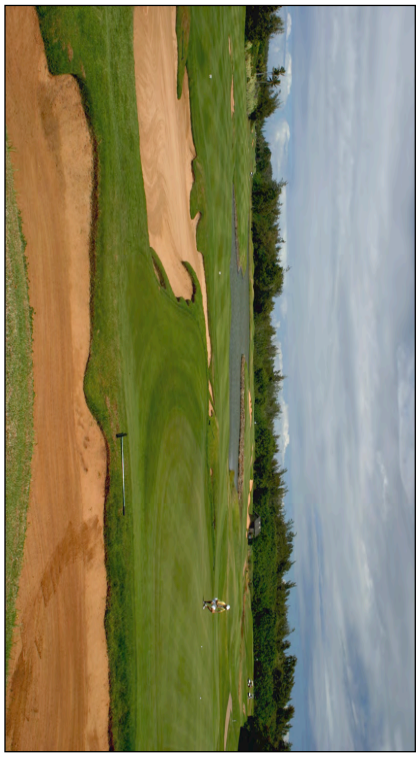

Figure 4 - View of highly manicured vegetation of the golf course at Turtle Bay Resort. Note aquatic feature (water hazard). Forest in background is actually trees in and around Punaho'olapa Marsh.

Figure 3 - Vegetation and "wetlands" map of the SEIS lands. Landward boundary of survey area shown in red and yellow dotted line. Wetlands and other aquatic features shown in blue, modified from National Wetland Inventory maps. Vegetation zones outlined in yellow: FoC - Ironwood forest; FoM - mixed forest; Grl - grassland and open disturbed areas; Lnd - landscaped and developed areas (and some highly disturbed areas); ShO - coastal shrubland; ShS - *koa haole* shrubland; STr - coastal strand.

The Forest Vegetation type (**Fo**) is the most complex on the property, consisting of trees forming a closed or nearly closed canopy. This vegetation covers a considerable proportion of the SEIS lands, and varies in composition from place to place, merging into all of the other vegetation types along boundaries that are, in places, not well-defined. For example, either planted trees or trees naturalized along the forest border may, at the interface between the Landscape and Forest types be included in the mapping as in one or the other. A line between the Forest and Strand cannot be accurately drawn where the strand is dominated by trees, such as ironwood (*Casuarina equisetifoilia*).

The ironwood forest (**FoC**) is the dominant Forest type on SEIS lands, found particularly close to the coast (Figure 5). Ironwood grows on dunes and immediately behind the beach (or rocky shore) in some places (see strand vegetation below). Ironwoods are very tolerant of the conditions that set the strand apart from inland plant communities, but are allelopathic (needle-like litter accumulated on the ground prevents most other species from germinating and forming an understory). Thus, an understory is either absent or sparse in dense ironwoods. In one area, the ground under the ironwoods is singularly covered by the vine, *Passiflora suberosa*, perhaps because scattered seedlings that do germinate can spread out over the surface unaffected by any allelopathic chemicals in the soil. Although obviously a useful species for the dry Kahuku Point area, and widely incorporated in the landscaping of the developed areas including the golf course, ironwoods should be considered invasive in two vegetation types: strand and wetland.

Figure 5 - Ironwood forest on dunes looking inland from the open part of the strand. Note the paucity of other vegetation under the dense canopy of the ironwoods.

Areas of forest not dominated by ironwood tend to comprise several common, mostly non-native tree species: Christmas berry (*Schinus terebinthefolius*), *Macaranga tanarius*, *milo* (*Thespesia populnea*), *koa haole* (*Leucaena leiucocephala*), Java plum (*Syzygium cumini*), and even hau (*Hibiscus tiliaceus*) as monotypic stands in a few low-lying areas. Ironwood is usually present, just not dominant. These forested areas are mapped as mixed forest (**FoM**). Many other species of trees, shrubs, and herbs occur in various parts of these forests, but tend not to be dominant. The understory typically includes Chinese violet (*Asystasia gangetica*), Guinea grass (*Panicum maximum*), and sourbush (*Pluchea indica* and *P. carolinenesis*), although many other shrubs and herbs are listed in Table 1 from this vegetation type. An area planted in Cook Island pines (**FoP**) occupies a part of the high dune just east of the Ocean Villas development.

Koa haole grows as a shrub or small tree, and can reach high densities. In areas where *koa haole* is the dominant species, the tall, woody plants approach a forest type, but here are labeled as scrub or shrub-scrub (**ShS**). Sometimes other trees occur scattered in this vegetation type or *koa haole* occurs as patches of scrub within the other forest types or diffused throughout the forest. The areas of purest shrub-scrub are areas of former sugar cane lands (see Figure 2) that have not been developed. Typical understory plants in the *koa haole* shrub-scrub are Guinea grass, Chinese violet, and gycine vine (*Neonotonia wightii*). Other scrublands occur (**ScO**) inland from the strand. These are dominated by *Pluchea* spp.

Wetlands on the SEIS lands are of two types: 1) former wetlands that were part of Punahoʻolapa Marsh and 2) wetlands and aquatic features associated with the golf course hazards. The latter were either constructed during grading for the courses (that is, are lined ponds), or incorporated (and perhaps dredged) from prior existing wetlands or stream courses. Aquatic features are mapped in Fig. 3 from the National Wetland Inventory (NWI) shape files provided by USFWS[1]. These shapefiles have been modified by removal of all features that are not ponds or wetlands (essentially NWI data base errors). Streams and marine habitats have also been removed, the former replaced by our stream designations. For "streams" and other water courses, and the boundary of Punahoʻolapa Marsh where not defined by a dredged moat, the map depicts results from a survey of these features undertaken by AECOS (2011).

Most of the features shown as "wetlands" on the property are in fact, open golf course ponds or moat-like ponds (Figures 4 and 6). Some, but not all of these ponds support wetland vegetation around their margins. Wetlands (as opposed to ponds) are present at

[1] The NWI includes errors (features that are not even aquatic),and may not be complete in some areas. The NWI is, therefore, a useful guide, but not a determiner of federal jurisdictional waters. Further, the NWI includes many aquatic features that are not wetlands at all, including nearshore marine habitats and anything USFWS thinks might be aquatic (such as lined ponds on the golf course, and treatment lagoons at the waste water treatment plant.

Punahoʻolapa Marsh, at an area east of the main entrance adjacent to Kamehameha Highway, in the lower part of the main drainage swale, and as a shallow manmade wetland/pond west of the latter (just northeast of Kulima Estates). These areas are not, or are only minimally maintained. Punahoʻolapa Marsh is the most interesting of the wetlands as it is part of a large complex of wetlands that existed in the distant past on the Kahuku Plain. The NWI indicates only the man-made moats surrounding Punahoʻolapa Marsh, despite the long history of a marsh frequently mapped in this location, (Land Study Bureau, 1963; USGS, 1965, 1983, 1998 Kahuku Quadrangle 7.5 Minute Topographic Series).

Figure 6 - Wetland interface between the golf course (Landscape vegetation) and the moat around Punahoʻolapa Marsh. Note abundance of ironwoods within Punahoʻolapa Marsh in background.

In Figure 3, the marsh is shown to consist of three areas outlined by the NWI moat-like features and the AECOS (2011) wetland delineation boundary in the area not mapped as moats (in fact, moats also occur in much of this area). Nearly all of Punahoʻolapa Marsh is overgrown with herbaceous vegetation. Many areas supporting tree growth are evident as well, including areas of *hau* forest (not mapped). There are however, extensive interior areas supporting *koa haole* shrub-scrub and ironwood forest. These areas were not visited, and therefore unknown is how much of the area enclosed by moats remains as wetland. Only one open pond area is seen in satellite images. Consequently, our map shows the extent of the former feature Punahoʻolapa Marsh, and does not further address the condition of the interior of that feature with respect to wetland function. Certainly a large portion of the outlined area remains a marsh, although densely covered with vegetation including various sedges (mostly natives), California grass (*Urochloa mutica*), *hau*, and

several patches of trees such as ironwood, and *koa haole* that might represent high (non-wetland) ground within the marsh border.

Starting along the shore, the substratum of the SEIS lands varies between consolidated limestone (rocky shore) and sand deposits (beaches; see Figure 7). Very few higher plant species can tolerate direct immersion in seawater or the shifting nature of sand deposits subjected to wave action. A number of environmental factors—brackish or saline groundwater, salt spray, absence of humus in the soil substratum, exposure to winds—are sufficiently harsh so as to limit the species that can survive in the strand. The Strand vegetation (**STr**) occupies a zone of variable width immediately inland of the ocean shore. Some of the vegetation grows on the upper part of active beaches (notably the vine, *pōhuehue* or *Ipomoea pes-caprae*) and *ʻakiʻaki* grass or *Sporoblus virginicus*, seeding and or invading down the beach by rhizomal growth. Mostly, this vegetation is found on sand moving slowly inland under the influence of the wind (which is predominantly onshore at this location) forming dunes, which—where active (that is where sand is actively on the move)—might be mistaken for beach rather than wind (or in some cases, storm wave) deposited material. As far as plant growth is concerned, the difference is one of stability. Where the sand is actively moving about at a fairly good rate (waves constantly rework the beach sand), plants cannot get established, or are buried (or the roots exposed) and die.

Figure 7 - View of the shore showing sand and limestone substrata. All the plants visible here are part of the Strand vegetation type. Note ironwoods on right are invasive to the strand.

The distance the strand extends inland from the beach or rocky limestone shore depends upon several factors: 1) how far inland the dunes extend, 2) how marked are salt air effects on extant vegetation, and 3) disturbances that damage the vegetation or the substratum. In most areas along the coast of the SEIS lands, the width of this vegetation zone is too narrow to indicate on our map (Figure 3)[2]. The widest areas of strand vegetation occur at the rocky points (Kahuku and Kuilima) and behind the shore extending east from Kahuku Point. The typical strand plant community is one dominated by several native species—*naupaka kahakai* (*Scaevola taccada*), *ʻakoko* (*Euphorbia degeneri*), *ʻakiʻaki* (*Sporobolis virginicus*), *hinahina* (*Heliotropium anomalum* var. *argenteum*), *maʻu* (*Fimbristylis cymosa*)—and at least one non-native tree (beach heliotrope or *Tournefortia argentea*). Along much of the shore, the area formerly occupied by dunes has been developed by the resort (golf course and hotel structures near the coast) or have been modified by the ironwood trees which grow nearly down to the shore; while these trees are a part of the strand vegetation, they are also a part of the ironwood and mixed forests that extend yet further inland. Thus, there is no simple way to differentiate the strand on the basis of vegetation alone where ironwoods predominate. As noted above, ironwoods can be invasive in this vegetation type.

Avian Survey

Point Counts

A total of 1735 individual birds of 27 species, representing 19 separate families, were recorded during the course of the wet and dry season point count surveys. Three of the species recorded, Common Gallinule (*Gallinula galeata sandvicensis*)[3], Hawaiian Coot (*Fulica alai*) and Hawaiian Stilt (*Himantopus mexicanus knudseni*) are endemic endangered waterbird species. One species recorded, Black-crowned Night-Heron (*Nycticorax nycticorax hoactli*) is an indigenous resident water obligate species, and four, Pacific-Golden Plover (*Pluvialis fulva*), Wandering Tattler (*Tringa incana*), Bristle-thighed Curlew (*Numenius tahitiensis*) and Ruddy Turnstone (*Arenaria interpres*) are indigenous migratory shorebird species. The remaining 19 species detected are considered to be alien to the Hawaiian Islands (Table 2).

There was very little difference between the results of the wet and dry season (spring and fall) bird surveys. We recorded two additional migratory shorebird species during the later survey that were not recorded during the course of the first survey. All of species detected during the wet season (spring) were also recorded during the dry season survey. These results were not unexpected, as the Hawaiian Islands unlike continental landmasses do not have a significant difference in avian species present during the course of a year. The significant intermonth differences in avian species usage of continental locations is a reflection of the presence and or absence of Neotropical migrant species in the Americas

[2] In reality, the strand probably does extend inland where the substratum is dune sand. However, these areas where a strand is too narrow for mapping have either development close behind the shore or ironwood forest, which interferes with defining where the strand/forest boundary occurs.

[3] The common and scientific names of this species were recently changed by the American Ornithological Union from Common Moorhen (*Gallinula chloropus*) to Common Gallinule (*Gallinula galeata sandvicensis*; Cheeser et al. 2011, Pg. 603).

and Palearctic migrants in Europe and Asia. The Pacific Islands do see some migratory shorebird and waterfowl species but no passerines.

Avian diversity and densities were in keeping with the vegetation and current usage of the site, most of which is either golf course, condos, apartments, forested lands, scrub lands or open maintained golf course. Four species, Common Waxbill (*Estrilda astrild*), Red-vented Bulbul (*Pycnonoyus cafer*), Zebra Dove (*Geopelia striata*) and Japanese White-eye (*Zosterops japonicus*) accounted for 51 percent of all birds recorded during station counts. Common Waxbill was the commonest species recorded.

Time Dependant Waterbird Counts

A total of 26 adult and two sub-adult Hawaiian Gallinule, three Hawaiian Coot, five Hawaiian Stilt and one domestic Muscovy (*Cairina moschata*) were recorded within water and wetland features on the property during the course of time dependant waterbird counts. These numbers reflect a best guess at a high count, as there are numerous water features on the property as well as on the adjacent USFWS Wildlife Refuge located to the south of Marconi Road and there is considerable temporal movement of birds between features.

Two sub-adult Hawaiian Gallinules were recorded, which may indicate on-site nesting activity. The two sub-adult birds were each seen with two separate sets of adults. No nests were observed in any of the water features, though unobserved nests could have been present with Punahoʻolapa Marsh, which in it's current state is not readily searchable for nesting waterbirds.

Table 3 – Avian Species Detected During Point Counts – Turtle Bay Resort, 2011

Common name	*Scientific name*	*Status*	*Wet Season*	*Dry Season*	*Comb. RA*
	PHASIANIDAE - Pheasants & Partridges				
	Phasianinae - Pheasants & Allies				
Domestic Chicken	*Gallus sp.*	D	0.20	0.35	**0.28**
	PELECANIFORMES				
	ARDEIDAE - Herons, Bitterns & Allies				
Cattle Egret	*Bulbucus ibidis*	A	2.20	1.45	**1.83**
Black-crowned Night-Heron	*Nycticorax nycticorax hoactli*	IR	0.15	0.25	**0.20**
	GRUIFORMES				
	RALLIDAE - Rails & Allies				
Common Gallinule	*Gallinula galeata sandvicensis*	**EE**	0.15	0.30	**0.23**
Hawaiian Coot	*Fulica alai*	**EE**	0.10	0.30	**0.20**
	CHARADRIIDAE - Lapwings & Plovers				
	Charadriinae - Plovers				
Pacific Golden-Plover	*Pluvialis fulva*	IM	1.60	1.20	**1.40**
	RECURVIROSTRIDAE - Stilts & Avocets				
Black-necked Stilt	*Himantopus mexicanus knudseni*	**EE**	0.25	0.25	**0.25**
	SCOLOPACIDAE - Sandpipers, Phalaropes & Allies				
	Scolopacinae - Sandpipers & Allies				
Wandering Tattler	*Tringa incana*	IM	0.10	0.05	**0.08**
Bristle-thighed Curlew	*Numenius tahitiensis*	IM	0.05	-	**0.03**
Ruddy Turnstone	*Arenaria interpres*	IM	1.40	-	**0.70**
	COLUMBIFORMES				
	COLUMBIDAE – Pigeons & Doves				
Spotted Dove	*Streptopelia chinensis*	A	1.25	1.15	**1.20**
Zebra Dove	*Geopelia striata*	A	4.75	4.15	**4.45**

Table 2 – Continued

Common name	*Scientific name*	*Status*	*Wet Season*	*Dry Season*	*Comb. RA*
	PSITTACIFORMES				
	PSITTACIDAE – Lories Parakeets, Macaws & Parrots				
	Psittacinae - Typical Parrots				
Rose-ringed Parakeet	*Psittacula krameri*	A	0.65	1.40	**1.02**
	PASSERIFORMES				
	PYCNONOTIDAE - Bulbuls				
Red-vented Bulbul	*Pycnonotus cafer*	A	6.45	0.50	**5.85**
Red-whiskered Bulbul	*Pycnonotus jocosus*	A	5.25	1.00	**0.75**
	CETTIIDAE - Cettia Warblers & Allies				
Japanese Bush-Warbler	*Cettia diphone*	A	0.15	0.30	**0.22**
	ZOSTEROPIDAE – White-eyes				
Japanese White-eye	*Zosterops japonicus*	A	2.95	2.45	**2.70**
	TIMALIIDAE - Babblers				
Red-billed Leiothrix	*Leiothrix lutea*	A	0.15	0.40	**0.28**
	TURDIDAE - Thrushes				
White-rumped Shama	*Copsychus malabaricus*	A	0.85	1.05	**0.95**
	STURNIDAE – Starlings				
Common Myna	*Acridotheres tristis*	A	5.80	4.80	**5.30**
	EMBERIZIDAE – Emberizids				
Red-crested Cardinal	*Paroaria coronata*	A	1.15	1.50	**1.33**
	CARDINALIDAE – Cardinals Saltators & Allies				
Northern Cardinal	*Cardinalis cardinalis*	A	1.15	1.35	**1.25**
	FRINGILLIDAE – Fringilline and Carduline Finches & Allies				
House Finch	*Carpodacus mexicanus*	A	1.50	1.70	**1.60**
	PASSERIDAE – Old World Sparrows				
House Sparrow	*Passer domesticus*	A	0.20	0.95	**0.58**
	ESTRILDIDAE – Estrildid Finches				
Common Waxbill	*Estrilda astrild*	A	7.05	5.80	**6.43**
Nutmeg Mannikin	*Lonchura punctulata*	A	0.95	2.30	**1.67**
Chestnut Munia	*Lonchura atricapilla*	A	1.95	3.40	**2.68**

Key to Table 2.

EE	Endangered Endemic Species – Native and unique to the Hawaiian Islands, also listed as endangered under the ESA, and State HRS 195D
A	Alien Species – Introduced to the Hawaiian Islands by humans
D	Domesticated species – not considered to be established in the wild on the Island of O'ahu
IR	Indigenous Resident Species – Native to the Hawaiian Islands, but not unique to the islands, non-migratory
IM	Indigenous Migratory Species - Native to the Hawaiian Islands, but not unique to the islands, does not breed in the Hawaiian Islands
Spring	Spring Survey – Relative Abundance – Number of bird detected, divided by the number of count stations (20)
Fall	Fall Survey – Relative Abundance – Number of bird detected, divided by the number of count stations (20)
A-3	Area 3 – Relative Abundance – Number of bird detected, divided by the number of count stations (11)
Comb RA	Combined Relative Abundance - Number of bird detected during both spring and fall counts divided by the total number of count stations (40)

Mammalian Survey

Eight terrestrial and one marine mammalian species were detected on site during the course of this survey (Table 3). With the exception of endangered Hawaiian monk seals (*Monachus schauinslandi*) seen hauled out on the beach during both field surveys, all of the mammals recorded on the site are alien to the Hawaiian Islands.

Table 3 – Mammalian Species Recorded – Turtle Bay Resort, 2011

Common name	Scientific name	Status	DT
	RODENTIA - Gnawers		
	Muridae - Old World Rats & Mice		
European house mouse	*Mus musculus domesticus*	**A**	V
	CARNIVORA- Flesh Eaters		
	Canidae - Wolves, Jackals & Allies		
Domestic dog	*Canis f. familiaris*	**A**	V, A, Sc, Tr
	VIVERRIDAE - Civets & Allies		
Small Indian mongoose	*Herpestes a. auropunctatus*	**A**	V, A, Sc, Tr
	FELIDAE- Cats		
House cat	*Felis catus*	**A**	V, Tr
	PHOCIDAE - Hair Seals		
Hawaiian monk seal	*Monachus schauinslandi*	**EE**	V
	PERISSODACTYLA - Odd-Toed Ungulates		
	Equidae - Horses, Asses & Zebras		
Domestic horse	*Equus c. caballus*	**A**	V, Sc, Tr
Donkey	*Equus a. asinus*	**A**	V, Sc, Tr
Mule	*Equus asinus x Equus caballus*	**A**	V, Sc, Tr
	ATRIODACTYLA - Even-Toed Ungulates		
	Suicidae - Old World Swine		
Pig	*Sus s. scrofa*	**A**	Sc, Tr, Si

Key to Table 3

- **A** Alien – Introduced to the Hawaiian islands by humans
- **EE** Endangered Endemic – native and unique to the Hawaiian Islands, also listed as an endangered species
- V Visual – animal that was seen
- A Auditory – an animal that was recorded by hearing its call or other distinct sounds
- Sc Scat – an animal that was detected due to the presence of fecal material
- Tr Tracks – an animal that was recorded by seeing tracks or other sign

Discussion

Botanical Resources

The percentage of native plants in the area is generally typical for lowlands on O'ahu (David & Guinther, 2006: 11 percent; David & Guinther, 2010: 12 percent) at 10.5 percent. As is also typical, for most of the SEIS lands, the abundance of natives in the vegetation is far below that of non-natives. This condition is not unexpected considering the long history of disturbance of the site going back over 100 years. Exceptions to these statements involve the wetlands (specifically Punaho'olapa Marsh) and the coastal strand vegetation. In these environments, native plants remain abundant (Figures 8 and 9) and, in some places are the dominant members of their respective botanical communities. With the exception of landscaping close to the ocean shore, the Landscape, Forest, and Shrub-Scrub have minimal botanical resource value based upon occurrence of native plant species. The only endemic species recorded in the survey was 'akoko, which was found exclusively on the dunes and mostly in areas where the dune vegetation is minimally disturbed.

Figure 8 - View across a moat into Punaho'olapa Marsh showing dense growths of several native plants: *neke* fern, backed by *'uki* (saw-grass), with *hau* still further back.

Figure 9 - Area of dunes supporting native plants: mostly naupaka here, but with ʻakiʻaki (grass) and a few ʻakoko and hinahina plants growing on sand in front of the naupaka.

From a resources conservation perspective, both the Strand vegetation and Punahoʻolapa Marsh are deserving of special attention with a goal towards preservation. Other wetlands and inland aquatic environments on the SEIS lands are either well maintained ponds with wetland plants or otherwise protected as likely jurisdictional waters under the federal Clean Water Act; but in all cases, are partly or wholly integrated into the golf course landscapes on the site. Punahoʻolapa Marsh is very well protected physically by moats that surround most of the former marshland. Expansion of the moat system is presently being contemplated by TBR Development to complete the ring around the marsh. Although not part of the present survey, the marsh appears to have sufficient hydrology but is overgrown with vegetation, much of it non-native and actually or potentially invasive. The majority of open water existing today in this marsh is the bordering moat system, providing habitats of value to water obligate birds. Thus, the resource value of the marsh, while not threatened, is certainly well below what it could be.

The native Strand vegetation is present but poorly represented along most of the SEIS lands coastline. However, from Kahuku Point eastward, this community is well developed, forming a broad zone in from the beach. This community is heavily invaded by non-native species further inland across the dune complex. The greatest threat to this community appears to be from off-road vehicular (ORV) traffic entering from the east. The numerous ORV trails across the beach and dunes have caused destruction of the native vegetation,

with resulting erosion (sand movement) and enhancement of the process of invasion by non-native weeds. Fortunately, strand plants are adapted to disturbances resulting from storm waves and moving sand, and tend to recover from man-made disturbances. However, there is a limit to such resilience and prevention of unwelcomed traffic on these dunes under the control of TBR Development should be made a priority.

Avian Resources

The findings of the avian survey are consistent with the current habitat present on the site and the land usage of the area surveyed. During the course of this survey 27 avian species, were recorded during the course of the wet and dry season surveys. Three of the species recorded, Common Gallinule, Hawaiian Coot and Hawaiian Stilt are endemic endangered waterbird species. The various water features on the site provide foraging and loafing habitat for these three endangered endemic waterbird species. The only areas within the property boundaries that likely support any nesting activity for any of these species is within water features which have fairly dense emergent vegetation, Punahoʻolapa Marsh in particular.

One species recorded, Black-crowned Night-Heron is a commonly occurring indigenous resident water obligate species, and four, Pacific-Golden Plover, Wandering Tattler, Bristle-thighed Curlew and Ruddy Turnstone are indigenous migratory shorebird species which nest in the high Arctic during the late spring and summer months, returning to Hawaiʻi and the Tropical Pacific to spend the fall and winter months each year. They usually leave Hawaiʻi for their trip back to the Arctic in late April or the very early part of May. The remaining 19 species detected are considered to be alien to the Hawaiian Islands.

Although no seabirds were detected during the course of this survey, several seabird species potentially overfly the site on occasion. The primary cause of mortality in resident seabirds is thought to be predation by alien mammalian species at the nesting colonies (USFWS 1983; Simons and Hodges 1998; Ainley *et al.,* 2001). Collision with man-made structures is considered to be the second most significant cause of mortality in locally nesting seabird species in Hawaiʻi. Nocturnally flying seabirds, especially fledglings on their way to sea in the summer and fall, can become disoriented by exterior lighting. When disoriented, seabirds often collide with manmade structures, and if they are not killed outright, the dazed or injured birds are easy targets of opportunity for feral mammals (Hadley 1961; Telfer 1979; Sincock 1981; Reed *et al.*, 1985; Telfer *et al*., 1987; Cooper and Day, 1998; Podolsky *et al*. 1998; Ainley *et al.*, 2001; Hue *et al*., 2001; Day *et al* 2003).

Mammalian Resources

The findings of the mammalian survey are consistent with the current habitat present on the site and the land usage of the area surveyed. All of the mammalian species detected with the exception of several Hawaiian monk seals seen hauled out on the beach fronting the property are alien species.

Although no rodents were detected during the course of this survey, it is likely that the four established alien *muridae* found on O'ahu, roof rat (*Rattus r. rattus*), Norway rat (*Rattus norvegicus*), European house mouse (*Mus musculus domesticus*) and possibly Polynesian rats (*Rattus exulans hawaiiensis*) use various resources found within the general project area on a seasonal basis. These human commensal species are drawn to areas of human habitation and activity. All of these introduced rodents are deleterious to native ecosystems and the native faunal species dependant on them.

No Hawaiian hoary bats were detected during the course of this survey. Given the paucity of documented records of this species on O'ahu, this finding was not unexpected (USFWS, 1998; David, 2011).

Potential Impacts to Protected Species

Botanical

No species of plant listed as threatened or endangered under state or federal statutes was recorded during either the March or September, 2011 surveys of the SEIS lands, and none is expected to occur on this highly disturbed site. Only endemic species or subspecies are likely to be listed, and only the one endemic species (*'akoko* recorded in the strand environment) was recorded in our surveys. There are a number of Hawaiian *'akoko* species either listed or considered species of concern (USFWS, 2011), but not *E. degeneri*, the species detected. However, *E. degeneri* and *'ohelo kai* (*Lycium sandwicense*) are uncommon species on O'ahu due to limitations on habitat (these species only occur in strand environments) and disturbances that the habitat is subjected to.

Waterbirds

Potential impacts to listed waterbird species that have been and may be further attracted to the wetland features run the gamut from temporary disturbance of individual birds that may be attracted to the area as potential modifications of the ditch around Punaho'olapa Marsh are constructed, to direct physical harm of individual birds. The use of certain herbicides, insecticides and fertilizers used in landscape and golf course maintenance can also pose threats to waterbirds, as can the unintentional migration of petroleum, oils, lubricants, cleaning agents and the like into water features. Golf course operations have the potential to result in physical harm to listed waterbird species that may use resources on the active golf course. As golf is and ongoing activity on the site it is unlikely that any expansion of the resort facilities will resulting any increased threats to waterbirds by the golf operations.

Following build out, and operation of the proposed improvements to the resort, nesting waterbirds could potentially be disturbed by human activity causing abandonment of the nest, broken eggs, trampled chicks, and increased predation of eggs and chicks when adults potentially flee human disturbance and leave their nests and young unguarded. An operating Resort will by its very nature attract certain human commensal species such as cats and rats, which also pose threats to these avian species, especially to young birds and

eggs. As the site is already operated as a resort it is unlikely that the proposed expansion of the facilities will attract any predators that are not already using resources on the property.

Seabirds

The principal potential impact that further modification of this site poses to protected seabirds is the increased threat that birds will be downed after becoming disoriented by lights associated with the project during the nesting season. The two main areas that outdoor lighting could pose a threat to these nocturnally flying seabirds is if, 1) during construction, if it is deemed expedient, or necessary to conduct nighttime construction activities, 2) following build-out, the potential use of streetlights or other exterior lighting during the seabird nesting season.

Hawaiian monk seal

No direct impacts to Hawaiian monk seals are anticipated from the further development of the SEIS lands is expected. The human activities of greatest concern to monk seals are the potential for entanglement in fishing gear, impact from boats, or predation by fishermen who may view the seals as direct competitors for fish resources. None of these sources of mortality are likely to increase as a result of resort development because the anticipated clientele are not likely to engage in these activities. However indirect impacts including increased interactions with fishermen, surfers, kayakers, and other ocean recreational uses may be anticipated as a result of improved access to the public and increases in shoreline population.

Hawaiian hoary bat

The principal potential impact that the further development of the Resort poses to bats is during the clearing and grubbing phases of construction as vegetation is removed. The removal of vegetation within the project site may temporarily displace individual bats, which may use the vegetation as a roosting location. As bats use multiple roosts within their home territories, the potential disturbance resulting from the removal of the vegetation is likely to be minimal. During the pupping season, females carrying their pups may be less able to rapidly vacate a roost site as the vegetation is cleared. Additionally, adult female bats sometimes leave their pups in the roost tree while they forage. Very small pups may be unable to flee a tree that is being felled. Potential adverse effects from such disturbance can be avoided or minimized by not clearing woody vegetation taller than 4.6 meters (15-feet), between June 15 and September 15, the period in which bats are potentially at risk from vegetation clearing. Given the likely very low levels of bat use of the site it is unlikely that construction activities will result in impacts to this species.

Recommendations

- If nighttime construction activity or equipment maintenance is proposed during the construction phases of the project, all associated lights should be shielded, and when large flood/work lights are used, they should be placed on poles that are high enough to allow the lights to be pointed directly at the ground.

- If streetlights or exterior facility lighting is installed in conjunction with the project, it is recommended that the lights be shielded to reduce the potential for interactions of nocturnally flying seabirds with external lights and man-made structures (Reed et al., 1985; Telfer et al., 1987).

- Punahoʻolapa Marsh, especially one that is further restored represents a wonderful educational and outreach opportunity. Development of an I&E program centered around the marsh, it's history and the native flora and fauna that use it is encouraged.

- Develop and implement an integrated monk seal and green sea turtle education program to educate coastal users of the property of the importance of not disturbing these trust resources.

- Future developments on the SEIS lands should continue utilizing appropriate native species in landscaping.

- Thinning of ironwood trees where these are invasive of either wetland or strand plant communities should be considered as a potentially valuable conservation activity.

- Efforts should continue or be increased to limit all access (but particularly by ORVs) to strand areas where the plant community is predominantly native.

Critical Habitat

There is no federally delineated Critical Habitat present on or adjacent to the property. Thus the further development and operation of proposed development will not result in impacts to federally designated Critical Habitat. There is no equivalent statute under state law.

Glossary

Ahupuaʻa – Traditional Hawaiian land division, usually extending from the uplands to the sea.
Alien – Introduced to Hawaiʻi by humans
Allelopathic – The inhibition of growth in one species of plants by chemicals produced by another species
Domesticated – Feral species, not considered established in the wild on the Island of Oʻahu
Endangered – Listed and protected under the Endangered Species Act of 1973, as amended (ESA) as an endangered species
Endemic – Native to the Hawaiian Islands and unique to Hawaiʻi
Indigenous – Native to the Hawaiian Islands, but also found elsewhere naturally
Makai – Down-slope, towards the ocean
Mauka – Upslope, towards the mountains
Muridae – Rodents, including rats, mice and voles, one of the most diverse family of mammals
Naturalized – A plant or animal that has become established in an area that it is not indigenous to
Nocturnal – Night-time, after dark
ʻŌpeʻapeʻa – Endemic endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*)
Pelagic – An animal that spends its life at sea – in this case seabirds that only return to land to nest and rear their young
Phylogenetic – The evolutionary order that organisms are arranged by
Ruderal – Disturbed, rocky, rubbishy areas, such as old agricultural fields and rock piles
Sign – Biological term referring tracks, scat, rubbing, odor, marks, nests, and other signs created by animals by which their presence may be detected
Threatened – Listed and protected under the ESA as a threatened species

DLNR – Hawaiʻi State Department of Land & Natural Resources
DOFAW – Division of Forestry and Wildlife
ESA – Endangered Species Act of 1973, as amended
USFWS – United State Fish & Wildlife Service
USGS – U.S. Geological Survey
TMK – Tax Map Key

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APPENDIX G:

SUPPLEMENTAL ARCHAEOLOGICAL INVENTORY SURVEY PLAN

G

FINAL

PLAN FOR SUPPLEMENTAL

ARCHAEOLOGICAL INVENTORY SURVEY

LANDS OF KAHUKU, PUNALAU, ULUPEHUPEHU, ʻŌIʻO, HANAKAʻOE, KAWELA AND ʻŌPANA

KOʻOLAULOA DISTRICT

ISLAND OF OAHU

TMK: (1) 5-6-03: 040-042, 044; 5-7-01:01, 013, 016, 017, 020, 022, 028, 030, 031, 033; 5-7-06: 01-017, 019, 020

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FINAL

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Summary

At the request of Turtle Bay Resort Development (TBR), Haun & Associates prepared this plan for a Supplemental Archaeological Inventory Survey (SAIS) within the c. 840-acre resort property situated in Kahuku, Ko'olauloa District, Island of O'ahu. The resort area spans seven traditional land divisions (Kahuku, Punalau, Ulupehupehu, 'Ōi'o, Hanaka'oe, Kawela, and 'Ōpana) and numerous (32) tax map parcels (TMK: [1] 5-6-003:040-042, 044; 5-7-001:001, 013, 016, 017, 020, 022, 028, 030, 031, 033; 5-7-006:001-017, 019, 020).

This plan was prepared in advance of the SAIS, in accordance with the requirements for an archaeological inventory survey plan detailed in Hawai'i Administrative Rules (HAR) §13-13-284-5(c) and §13-13-276-5 (a) and (b). This plan describes the current Turtle Bay Resort (TBR) facility and the environment of the area, presents the results of historical documentary and archaeological background research for the general Kahuku area and specifically for the TBR property. The plan also provides a synthesis of the background information and provides a research design with a methodology to guide the proposed SAIS work. This plan also discusses ongoing consultation with agencies and knowledgeable individuals.

Archaeological and historical background research indicate that in late prehistory the Kahuku Point vicinity was well populated and extensively cultivated. Land Commission Awards document continued traditional Hawaiian settlement in the mid-1800s. This traditional land use was soon displaced after the establishment Kahuku Ranch in the 1850s. The ranch prospered and expanded for nearly four decades until the establishment of Kahuku Plantation Company in 1890. The first sugarcane crop from 2,800 cultivated acres was harvested in 1892. By 1899, the OR&L railroad line extended from Honolulu to Kahuku to get the cane to market. By the early 1900s there were stations at Kawela and Kahuku Ranch. By 1935, 4,490 acres were cultivated in sugarcane and the plantation employed over 1,100 workers and a plantation camp was established on the TBR property.

The U.S. Army established Kahuku Army Airfield in 1942. The facility served as an auxiliary field that was used for flight training and coastal defense. Use of the airfield was short-lived and military use ended shortly after the end of World War II. Sugarcane cultivation continued until 1971 when the Turtle Bay Resort and the first golf course were constructed. Some inland portions of the property continued to be used for vegetable farming until the late 1980s. Private beach cottages lined the shores of Kawela Bay until 1990 when the area was cleared and preliminary construction for a hotel began, but was abandoned in 1991.

Based on previous archaeological research and historical documentary evidence, expected prehistoric to early historic remains on the TBR property include subsurface cultural deposits and a variety of subsurface features including fire pits, post molds and burials. Most of these features would date to between AD 1400 and 1800. Expected historic remains dating from the 1800s to 1900s include the OR&L railroad, plantation infrastructure (camps, roads, irrigation ditches, etc.) and walls marking property boundaries and Kahuku Ranch features relating to livestock control. Military-related remains dating from World War II include runways, revetments, defensive fortifications, and a variety of support facilities.

The proposed primary SAIS fieldwork effort will consist of subsurface testing that will build on the extensive previous archaeological work that has been conducted within the project area. The areas that are proposed for further testing were previously cleared for development with archaeological monitoring required. This clearance was based on the extensive archaeological subsurface testing and data recovery work conducted between 1977 and 1991, and on the extensive prior disturbance to the property by more than a century of sugar cane cultivation, the construction and operation of Kahuku Air Airfield, and the development of resort facilities since the 1970s.

Despite the prior clearance, TBR has elected to take a proactive approach to ensure the protection of cultural resources within the proposed expansion lands as part of the SEIS process. Toward that end a combined program of extensive systematic and discretionary archaeological test excavations, both mechanical and manual, are proposed for undeveloped areas of the property where substantial construction-related excavations are planned.

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INTRODUCTION

At the request of Turtle Bay Resort Development, Haun & Associates prepared this plan for a Supplemental Archaeological Inventory Survey (SAIS) within the c. 840-acre resort property situated in Kahuku, Koʻolauloa District, Island of Oʻahu (*Figure 1*). The resort area spans seven traditional land divisions (Kahuku, Punalau, Ulupehupehu, ʻŌiʻo, Hanakaʻoe, Kawela, and ʻŌpana) and numerous (32) tax map parcels (TMK: [1] 5-6-003:040-042, 044; 5-7-001:001, 013, 016, 017, 020, 022, 028, 030, 031, 033; 5-7-006:001-017, 019, 020– *Figure 2* and *Figure 3*).

This plan was prepared in advance of the SAIS, in accordance with the requirements for an archaeological inventory survey plan detailed in Hawaiʻi Administrative Rules (HAR) §13-13-284-5(c) and §13-13-276-5 (a) and (b). This plan describes the current Turtle Bay Resort facility and the environment of the area, presents the results of historical documentary and archaeological background research for the general Kahuku area and specifically for the present project area. The plan also provides a synthesis of the background information and provides a research design with a methodology to guide the proposed SAIS work. This plan also discusses ongoing consultation with agencies and local knowledgeable individuals.

TURTLE BAY RESORT

Turtle Bay Resort is currently owned and operated by Turtle Bay Resort Development (TBR). The resort was constructed in the early 1970s by casino developer Del Webb and opened its doors in May 1972 as the Kuilima Resort and Country Club. Hyatt Hotels operated the resort in the mid-1970s. Hilton Hotels and Resorts purchased it in August 1983 and renamed it The Turtle Bay Golf and Tennis Resort.

Today the resort encompasses the Turtle Bay Hotel located at Kuilima Point, the adjacent Ocean Villas and Beach Cottages, the Kuilima Estates development, restaurants, beachside amenities, two 18-hole golf courses, a clubhouse, ten tennis courts, several swimming pools, a horseback riding facility and parking lots (*Figure 4*). Access to the resort is from Kamehameha Highway via Kuilima Drive. The proposed resort expansion plans includes two hotels, 590 resort residential units, 160 affordable housing units and additional parks, shoreline setback areas and public shoreline access.

SUMMARY OF TBR ARCHAEOLOGICAL STUDIES

The Bernice Pauahi Bishop Museum (BPBM) conducted the first systematic archaeological survey of all undeveloped TBR property (649 acres) in 1977 for Prudential Insurance Company (Dye 1977). This pedestrian survey was followed by a series of subsurface testing projects conducted by Paul H. Rosendahl, Ph.D. Inc. (PHRI) in the mid-1980s. Beginning in 1984, PHRI (Bath *et al*. 1984) conducted a subsurface reconnaissance survey of thirteen areas throughout the resort property including further investigation of subsurface deposits initially identified by Dye. The initial reconnaissance testing project was followed by three intensive subsurface testing surveys conducted in 1986 that focused on cultural deposits identified by Bath *et al*. at Kawela Bay (Walker *et al*. 1988a), Kahuku Point (Walker *et al*. 1988b), and Punahoʻolapa Marsh (Davis *et al.* 1986).

In 1987, PHRI prepared an archaeological Data Recovery Plan (DRP; Walker *et al*. 1987) to mitigate the effect of resort expansion on archaeological sites at Kawela Bay, Kahuku Point, and Punahoʻolapa Marsh. The Plan was incorporated into a Memorandum of Agreement (MOA) executed in 1988 by the U.S. Army Corp of Engineers – Honolulu District (COE), the Hawaiʻi State Historic Preservation Department (SHPD) Officer, the Office of Hawaiian Affairs (OHA), the Advisory Council on Historic Preservation (ACHP), and the City and County of Honolulu (CCHONO). In addition to implementation of the DRP, the MOA required development and implementation of plans for archaeological monitoring and for burial disinterment and reburial. PHRI prepared the plans for

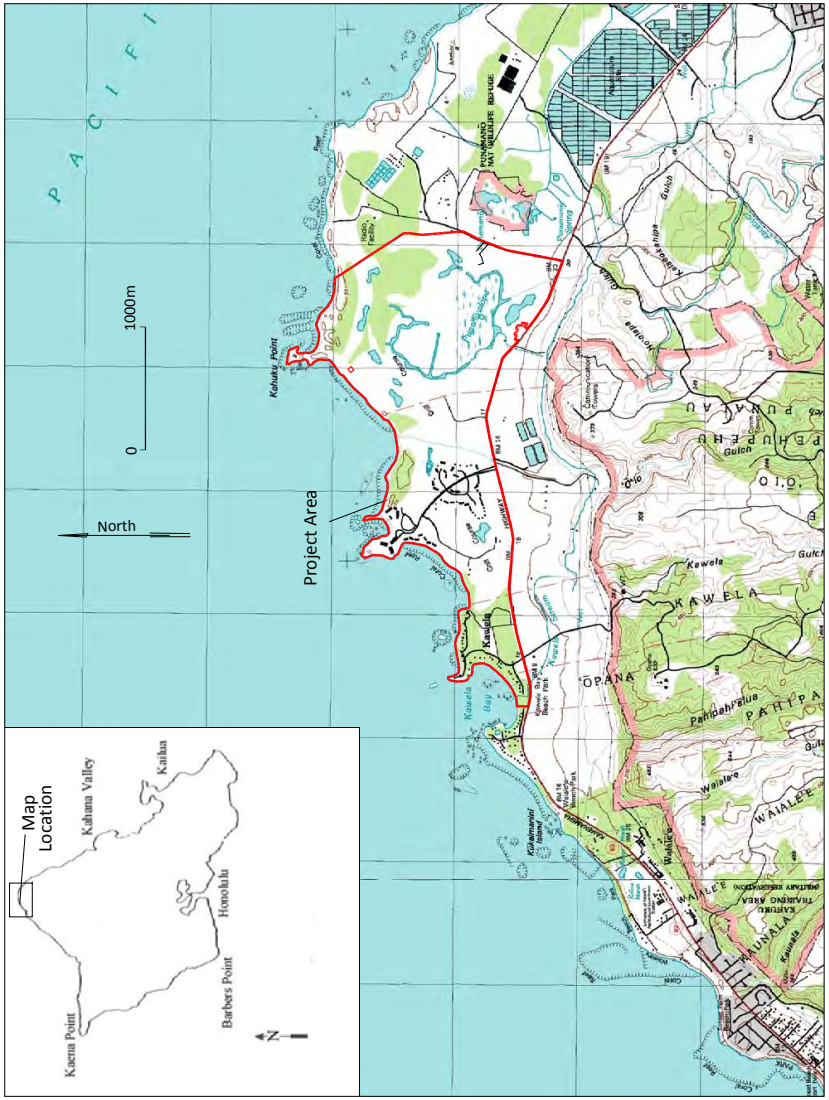


Figure 1. Portion of 1998 USGS Kahuku Quadrangle showing Project Area

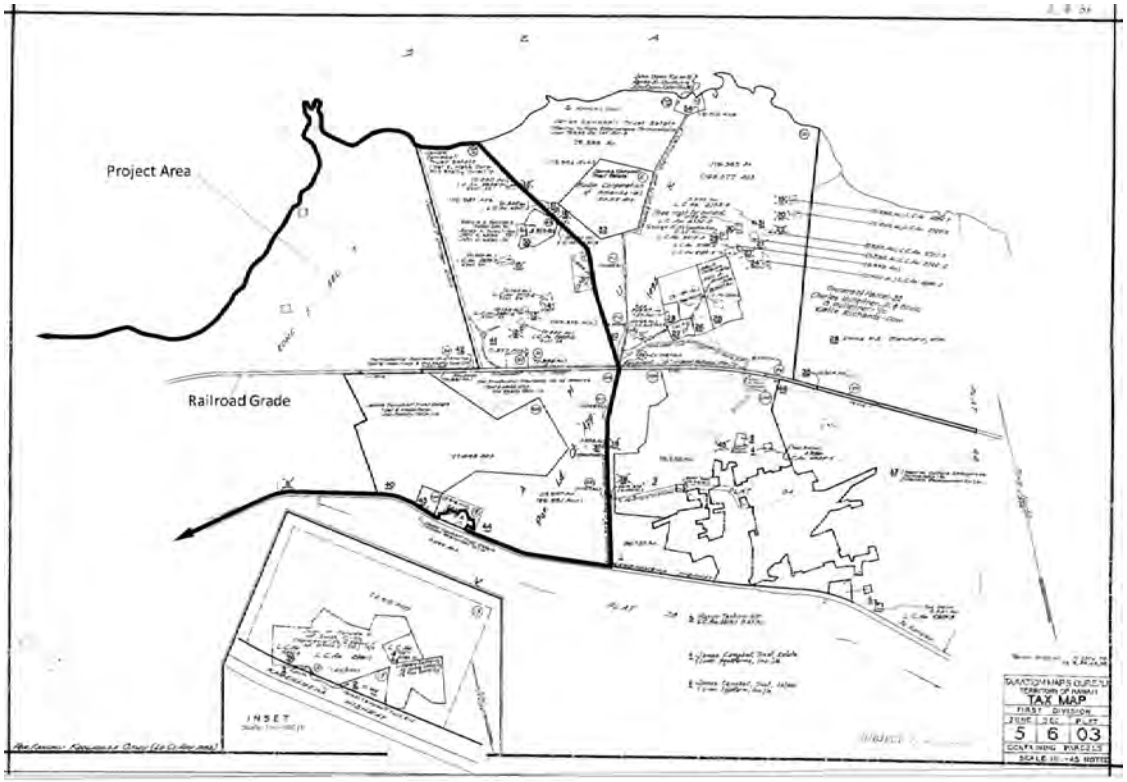


Figure 2. Tax Map Key 5-6-03 showing Portion of Project Area

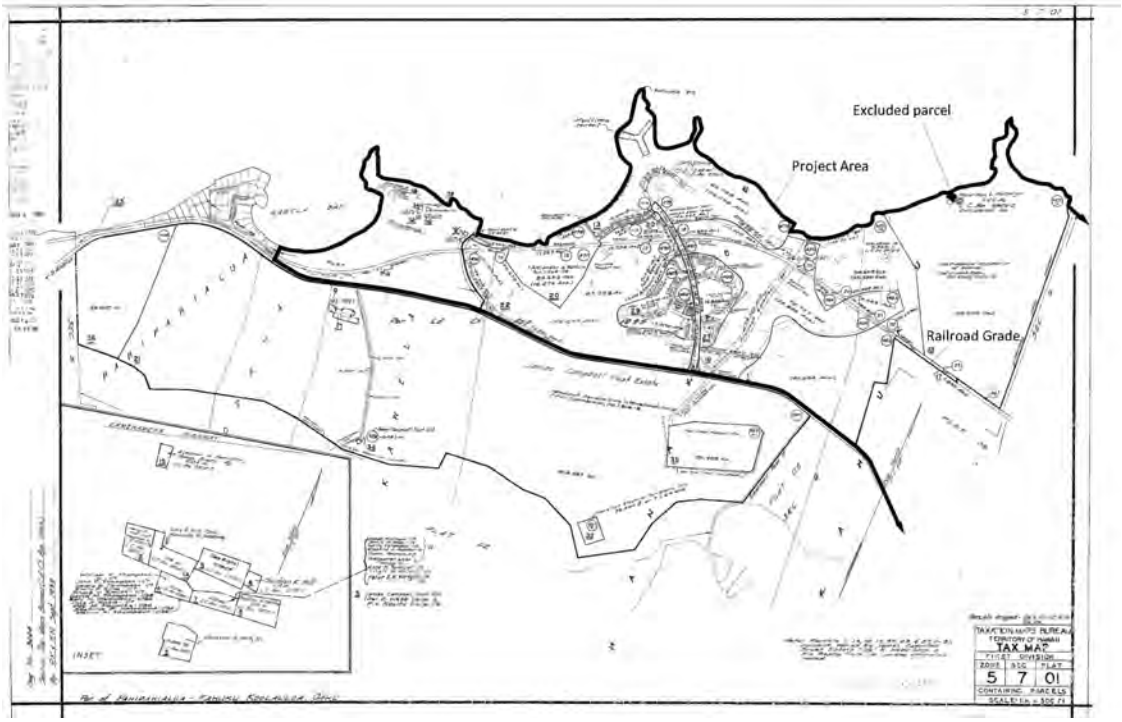


Figure 3. Tax Map Key 5-7-01 showing Portion of Project Area

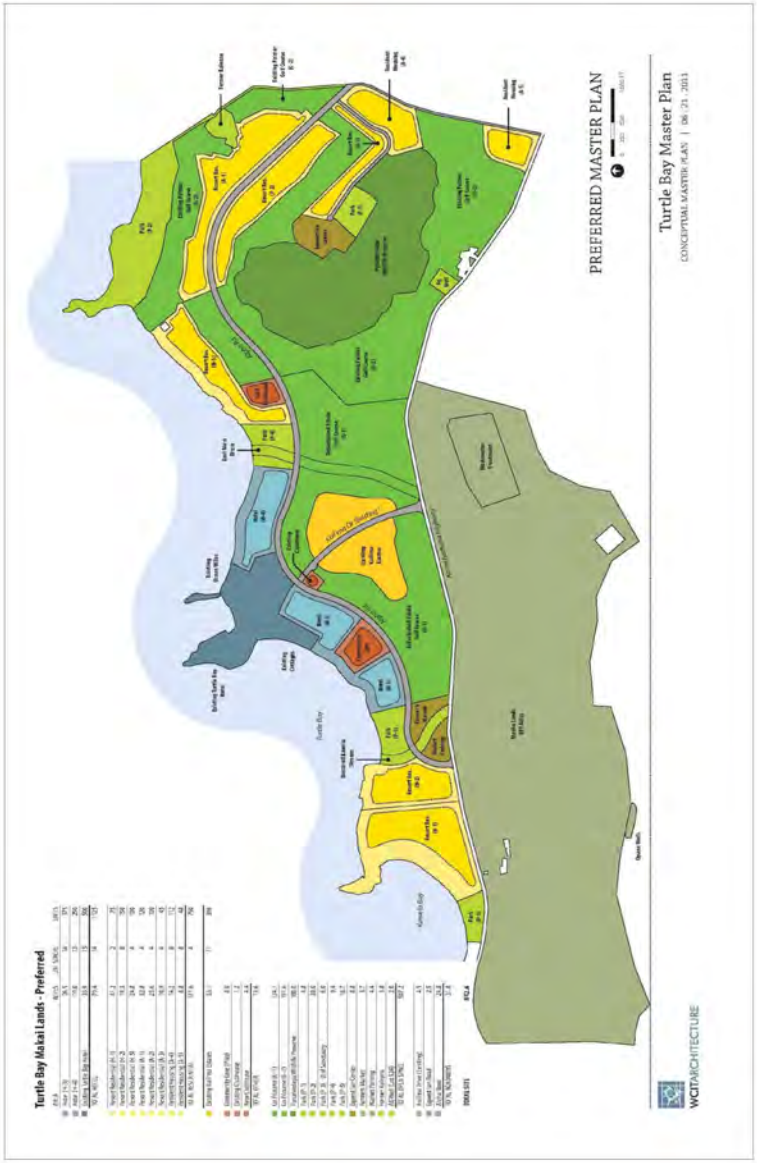


Figure 4. Turtle Bay Master Plan

monitoring and burial treatment (Jensen 1989b) that were approved by the Department of Land and Natural Resources (DLNR) State Historic Preservation Program Director in 1990 (January 9, 1990 letter from Don Hibbard to Paul Rosendahl).

The archaeological data recovery work and monitoring were conducted by PHRI from late 1990 to 1991. After initial data recovery excavations at the Kahuku Point Site were initiated, the landowner decided to halt further work and preserve the site. Monitoring fieldwork results were reported in a series of monthly status reports prepared by PHRI (Sullivan 1990, 1991; Dunn 1991; Donohue 1991). Corbin (2003) reported the full descriptive findings of the PHRI data recovery and monitoring fieldwork and subsequent analyses. DLNR-SPHD approved the Corbin (2003) report in 2005 (letter from Melanie Chinen to Paul Rosendahl March 11, 2005 LOG NO: 2005.0110; DOC NO: 0501SC05).

In 1992, PHRI prepared a Burial Treatment Plan (Maly and Rosendahl 1992) for the reburial and preservation of remains recovered during previous data recovery and monitoring. The plan was prepared to comply with legislation enacted in 1990 pertaining to the treatment of traditional Hawaiian burials under Hawai'i Revised Statutes (HRS) Chapter 6E:43, Act 306. The plan also included reburial of remains inadvertently discovered in 1992 near the resort hotel (Kennedy 1992) and in the mid-1980s at Kahuku Point (Neller 1984, 1989). MOA mandated osteological analysis of human remains by PHRI is reported by Kalima (1993).

In 1996 and 1999, a report on inadvertent discovery of additional burials was prepared by Archaeological Consultants of the Pacific (ACP) for human remains inadvertently discovered in 1996 (Carson *et al*. 1996, 1999). Cultural Surveys Hawai'i (CSH) conducted archaeological monitoring for golf course refurbishment in 2001 but encountered no cultural deposits (Borthwick *et al*. 2001).

ENVIRONMENT

The Turtle Bay Resort project area is a c. 840-acre parcel located on a broad, low-lying coastal plain at the north end of the Island of O'ahu. Kamehameha Highway borders the property on the south (inland) side. The west side terminates at the center of Kawela Bay, while Marconi Road and undeveloped land border the east side. The land is generally level, with the terrain sloping gently to the north towards the shoreline. Elevation rises from sea level at the coast to a maximum of c. 40 ft at the southeast corner of the property, extending one-quarter mile to just over a mile inland. Some dunes at the coast rise 20 ft above mean sea level (amsl), but much of the property is significantly less than 20 ft amsl, and Punahóolapa Marsh is only c. 3 ft amsl. An aerial view of the project area is depicted in *Figure 5*.

The property spans seven traditional land divisions within the Ko'olauloa District (*Figure 6*). From east to west these consist of Kahuku, Punalau, Ulupehupehu, 'Ōi'o, Hanaka'oe, Kawela and 'Ōpana. Only the boundaries of Kahuku, 'Ōpana and Kawela are individually defined on current USGS quadrangle and tax maps of the area. The Land of Kahuku occupies the largest portion of the project area, encompassing 480-acres or 57% of the total area; Kawela encompasses 68-acres (8%) and 'Ōpana 9-acres (1%). The four remaining *ahupua'a* are depicted on the maps with no boundary divisions between them. These *ahupua'a* (Punalau, Ulupehupehu, 'Ōi'o, Hanaka'oe) encompass 283-acres (34%).

Kawela Stream originates at the base of the coastal bluff in the Land of Kawela at c. 800 ft elevation and enters the property beneath the Kawela Bridge on the Kamehameha Highway and empties into the central portion of Kawela Bay; its original channel has long been covered by sediments and the stream course has been artificially channeled for quite some time. 'Ōi'o Stream originates in Waialua District 'Ōi'o Gulch at c. 1,400 ft elevation; it empties into the ocean between Kuilima and Kahuku Points. The 120-acre freshwater Punaho'olapa Marsh is located in the east half of the property. The James Campbell National Wildlife Refuge, administered by the US Fish and Wildlife Service (FWS), was established in 1976 and encompasses 1,100 acres, including Punamanō Marsh and Ki'i Pond, adjacent to the resort's east boundary.

Figure 5. Aerial View of Project Area (from Google Earth)

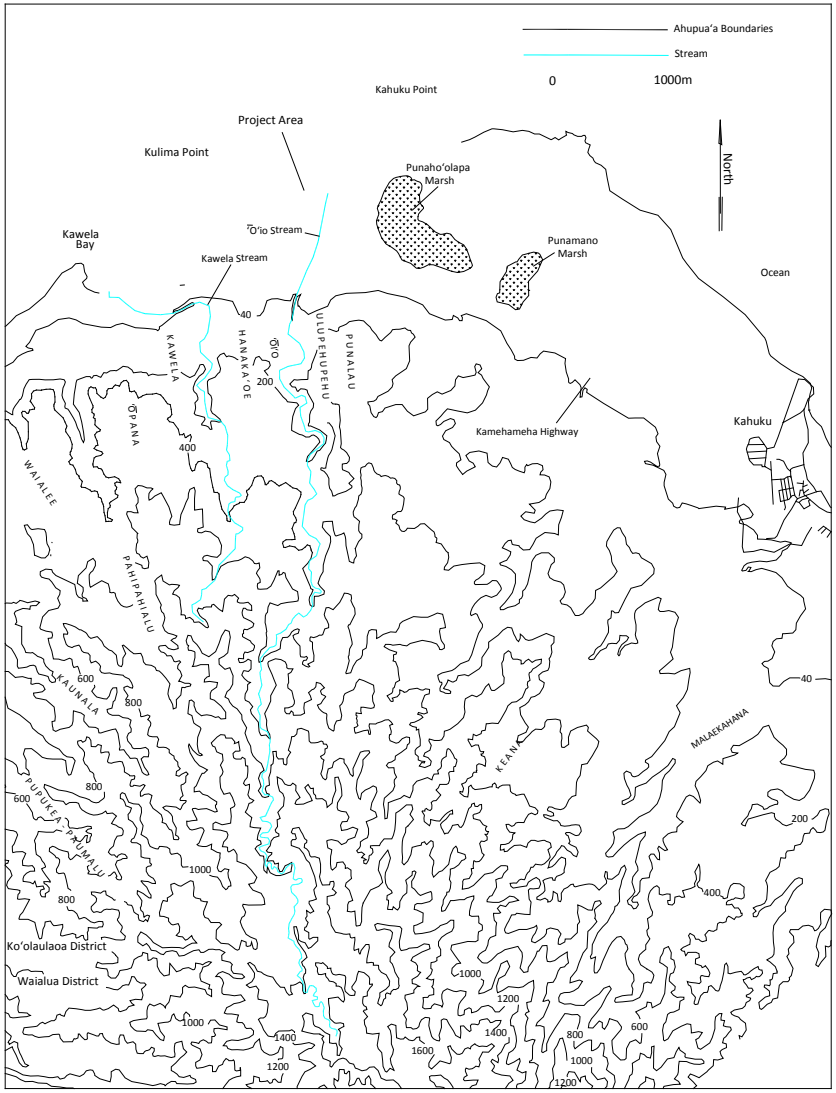


Figure 6. Ahupua'a Boundaries

Climate in the vicinity of the project area is typically mild with average year-round temperatures ranging from 71 to 79 degrees (city-data.com). Rainfall in the area varies from 30 to 40 inches along the coast and 40 to 60 inches per year in the inland areas (Juvik and Juvik 1998:56). The adjacent National Wildlife Refuge (FWS 2011) protects habitat for over 120 species, including four of six endangered native Hawaiian birds. It preserves coastal habitat for the endangered Hawaiian monk seal (*ʻilio holo i ka uaua*) and nesting habitat for threatened green sea turtles (*honu*) and important seabirds. The Refuge provides a strategic landfall for migratory birds coming from the northern Pacific Rim and wetlands birds including Northern pintail (*koloa mapu*), Northern shoveler (*koloa moha*), lesser scaup, Pacific golden plover (*kolea*) and ruddy turnstone (*ʻakekeke*). The migratory populations represent some of the largest concentrations of these species in Hawaiʻi and the Pacific. Other native species that benefit from the protected refuge habitat include the Hawaiian owl (*pueo*) and a species of rare damselfly. These fauna will probably also be found on the resort property.

Undeveloped portions of the TBR property support a variety of introduced plant species. The most prevalent are *koa haole* (*Leucaena glauca*), ironwood (*Casuarina equisetifolia*), Christmas berry (*Schinus terebinthifolius*) and banyan (*Ficus* sp.). Native plants include *hau* (*Hibiscus tiliaceus*), *naupaka* (*Scaevola sericea*), coconut palms (*Cocos nucifera*) and *milo* (*Thespesia populnea*). Sedges (*Scrious lacustris*), saw grass (*Cladium leptostachyum*) and ferns (*Cyclosoro interruptus*) dominate the Punahoʻolapa Marsh vegetation; Christmas berry and *hau* surround the perimeter. The adjacent National Wildlife Refuge marsh supports stands of bulrush and cattail. Invasive alien species targeted for removal on the adjacent refuge include California grass (*Urochloa mutica*), marsh fleabane (*Pluchea x fosbergii*), bullfrogs and feral mallards.

Geology, Hydrology and Soils

Oʻahu is just less than six million years old and encompasses two extinct shield volcanoes: Waiʻanae in the west and Koʻolau in the east (Juvik and Juvik 1998:41). The underlying bedrock on the TBR property was formed by lava deposited 1.7 to 2.5 million years ago from Koʻolau Volcano (*ibid*.:42). The Kahuku Plain is composed of an uplifted fossilized limestone reef formed underwater on the volcanic substratum. The reef formed during inter-glacial periods of higher sea level in the Pleistocene, 12,000 to 2,500,000 years ago (Macdonald *et al*. 1983). Sea level in the northern main Hawaiian Islands reached its Holocene maximum height (c. 2.00 m greater than present) 3,500 years before present (B.P.); subsequent sea level reduction, coupled with island uplifting, exposed the reef bench to high-intensity waves that eroded the reef surface and created the fossilized, stabilized and active sand dunes that formed along the shore (Grossman 1998, Grossman and Fletcher 1998).

The emerged limestone reef surface was eroded by waves and freshwater flows that created karstic features consisting of sinkholes, subterranean streams, fissures and caverns. The karst topography resulted in pools, ponds and marshes inland of the coastal dune fields on the nearly level Kahuku Plain. The water table is close to the surface. Small areas of limestone outcrop are still visible inland of Kawela Bay and Kuilima Point, where they are erroneously called "coral" outcrops (*Figure 7*).

Ground surface weathering also subsequently modified the limestone reef surface after the sea level receded. Accelerated weathering combined with alluvial deposition of sediments and rock derived from the volcanic uplands to essentially cover the Kahuku Plain's limestone surface with a mantel of silt and clay sediments. Talus and alluvial deposits are interbedded, bordered along the coast by wind and wave deposited sands, especially at Kahuku Point where extensive relict and modern dunes are present (Takasaki and Valenciano 1969; Soest 2011). At Kahuku Point, lithified dunes are "shaped by chemical weathering, intertidal bioerosion, and the northeast trade winds to which they are fully exposed" (*ibid*.). Lithified clay (laterite) covers the marine bench inland of the shore at Kahuku Point (Chapman 1946).

The north shore of Oʻahu receives the full brunt of massive waves of the North Pacific Swell in the winters, which move large quantities of sand to the shore. Beach sands are calcareous (calcium-rich) and coarse-grained, typical

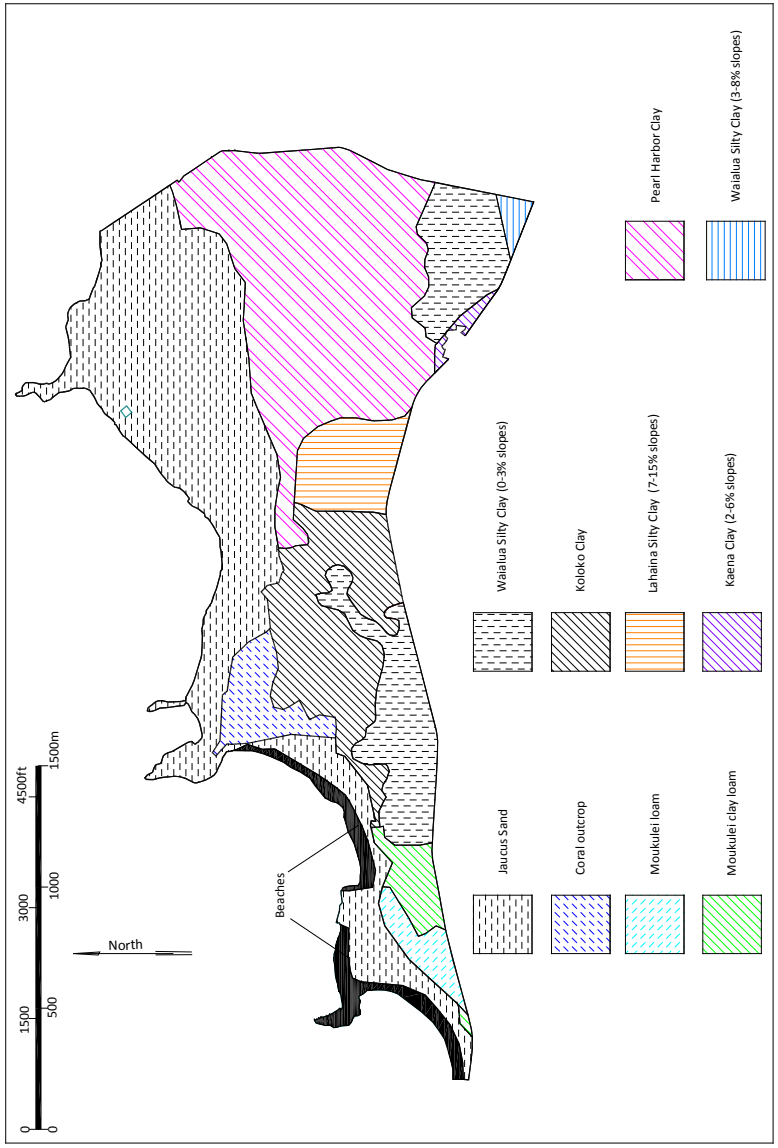


Figure 7. Distribution of Soils within Project Area

of high-energy waves that move detritus from the submerged reefs to shore. Active dunes at Kahuku Point "exist seaward of vegetated Holocene dunes" and "sand dunes and perched beaches along Kahuku Point are continuously reshaped by the persistent trade winds" (USGS 2011a). Catastrophic tidal waves and stream flooding from winter storm runoff are known hazards around the Kahuku Point coastline (*ibid*.):

> During the 1946 and 1957 tsunamis, flood inundation heights of 27 and 23 ft were recorded at Kahuku Point. The hazard associated with high waves is ranked high around the entire Kahuku Point, but…[t]he storm threat is ranked moderately low along the Kahuku coast because it is partly sheltered from the impact of the majority of tropical storms that historically track to the west and south of Oahu. Erosion is ranked moderately low for the small embayments lining the western portion of Kahuku Point, except along the rocky point immediately northeast of Kawela Bay beach where it is low.

On the Kahuku Plain, freshwater constitutes a major natural resource. Perennial and intermittent streams once provided ample water across the plain. Coastal brackish marshes on the Kahuku Plain formed in the elevated coral reef, fed by the numerous streams originating in the uplands to the south, by rainfall, springs and seeps (Hunt and De Carlo 2000; Takasaki and Valenciano 1969:48). Subterranean seawater extends inland from Kahuku west to Kawela and beyond, naturally contaminating the basal freshwater body (Takasaki and Valenciano 1969). Basal water channeled from volcanic dikes in the Kóolau Range recharges the shallow water table underlying the Kahuku Plain and is perched above the infiltrating seawater (*ibid*.). This provides sufficient pressure for springs, seeps and artesian wells. Flooding is most prevalent in March, but can occur throughout the year (*ibid*.:16).

Eleven soil types have been described and mapped in the property (Foote *et al*. 1972). These consist of beach sands, coral outcrops, Jaucus sand (0-15% slopes), Pearl Harbor clay, Waialua silty clay (0-3% and 3-8% slopes), Kaloko clay, Lahaina silty clay (7-15% slopes), Mokulei loam and clay loam, and Kaena clay (2-6% slopes). The distribution of these soils is shown in *Figure 7* and their characteristics are summarized in *Table 1*.

Jaucus Sand is the most widespread sediment, which encompasses 277 acres, or 33% of the property. It is exposed along the coastal margins and is characterized by well-drained single-grained sand to depths exceeding more than 60 inches. It is considered suitable for pasture, sugarcane, truck-crops, and urban development.

Pearl Harbor Clay is the next most extensive sediment, encompassing 227 acres, or 27% of the property. It largely coincides with the former extent of Punahoʻolapa Marsh and consists of poorly drained, mottled clay overlying mottled clay subsoil, formed on layers of muck or peat. Pearl Harbor clay is classified as suitable for pasture, sugarcane, taro and bananas.

Waialua Silty Clay covers 105 acres, or 12% of the total on gentle slopes in the southeastern corner of the property. It is moderately well drained and characterized by a silty clay surface layer overlying a subsoil of blocky silty clay formed on a mottled silty clay substratum. It is suitable for pasture, sugarcane and truck crops.

Kaloko Clay covers 96 acres, or 11% in the central portion of the property. It is developed in alluvium derived from igneous rock and is poorly drained. It consists of clay overlying multiple layers of clay and silt clay. It is classified as suitable for pasture and sugarcane.

Lahaina silty Clay covers 39 acres (5%) in the east-central portion of the property. It is derived from weathered igneous rock and is well drained, and is typically exposed on slopes above the coastal plain. The surface layer is severely eroded and overlies a blocky silty clay and silty clay loam subsoil, formed on weathered igneous parent material. It is classified as suitable for sugarcane and pineapple.

Coral Outcrops cover 27 acres, or 2% of the area, inland of Kuilima Point. The outcrops are composed of cemented coral or calcareous sand that formed in shallow ocean waters when the sea levels were higher. It is classified as suitable for military installations, quarries and urban development.

Table 1. Summary of Soils within Project Area

Soil Type	Acres	% of Project Area	Description	Permeability	Runoff	Erozion Hazard	Suitability
Jaucus Sand (0-15% slope)	277	33	Single grained sands	Rapid	Very slow to ponded	Slight	Pasture, sugarcane, truck crops, urban development
Pearl Harbor Clay	227	27	Mottled clay surface layer over mottled clay subsoil, over muck or peat	Very slow	Very slow to ponded	Slight	Pasture, sugarcane, taro, bananas
Waialua Silty Clay (0-3% slope)	105	12	Silty clay surface layer over subsoil of blocky silty clay over mottled silty clay substratum	Moderate	Slow	Slight	Pasture, sugarcane and , truck crops
Kaloko Clay	96	11	Clay surface layer over clay and silt clay subsoils	Moderately slow to slow	Slow to very slow	Slight	Pasture and sugarcane
Lahaina Silty Clay (7-15% slope)	39	5	Severely eroded silty clay surface layer over blocky silty clay and silty clay loam subsoil over weathered igneous rock substratum	Moderate	Medium	Moderate	Sugarcane and pineapple
Coral outcrop	27	3	Cemented coral or calcareous sand	n/a	n/a	n/a	Military installations, quarries, urban development
Mokulei Clay Loam	20	2	Clay loam surface layer over sand and loamy sand subsoils	Moderate	Very slow	Slight	Pasture, sugarcane and truck crops
Beaches	19	2	Sandy, gravelly or cobbly areas	n/a	n/a	n/a	Recreation
Mokulei Loam	18	2	Clay loam surface layer over sand and loamy sand subsoils	Moderate	Very slow	Slight	Pasture, sugarcane and , truck crops
Kaena Clay (2-6% slope)	6	1	Clay surface layer over clay subsoil over highly weathered gravel	Slow	Slow	Slight	Pasture, sugarcane, homesites
Waialua Silty Clay (3-8% slope)	5	1	Silty clay surface layer over subsoil of blocky silty clay over mottled silty clay substratum	Moderate	Slow	Slight	Pasture, sugarcane and truck crops
Total	840	100					

Mokulei Clay Loam encompasses 20 acres or 2% of the project area. An area of Mokulei loam (18-acres, 2%) is located in the southwest portion of the parcel. This soil is characterized as well-drained clay loam surface layers, over sand and loamy sand subsoils (1972:96). These soils are classified as suitable for pasture, sugarcane and truck crops.

Beaches cover 19 acres or 2% of the total property area and are restricted to Turtle Bay and Kawela Bay. The coastal strands in these bays are characterized as sandy, gravelly or cobbly and are classified as suitable solely for recreation.

Kaena Clay encompasses 6 acres, or 1% of the property, and is found only along the southeast edge of the resort. The clay is very deep, poorly drained, and is exposed on alluvial fans and talus slopes. It is characterized by a clay surface layer overlying clay subsoil, formed on a highly weathered gravel substratum. It is classified as suitable for pasture and sugarcane.

HISTORIC BACKGROUND RESEARCH

Place names of prominent locales often reference memorable historic people and deities, notable events, or significant activities. These have come to encapsulate salient aspects of local Hawaiian history. Hawaiian toponymic etymology explains or elaborates on important aspects of the physical environment, such as fresh water sources, food sources and prominent natural features. Place names also reference the locations of specific structures and often persons explicitly associated with a site. Legendary history recounts mythical events in the distant past and historical events tied to genealogical lineages of a particular place or general area. These provide the basis for developing a cultural context for understanding the area's social geography.

Place Names

Pukui *et al*. (1974) offer the following translations (or possible translations) for several of the project area land divisions. The literal translation of Kahuku is "the projection" or "the hillock", and Punalau means "many springs". ʻŌiʻo is the Hawaiian word for "bonefish" and ʻŌpana, which is perhaps related to *ʻōpā* translates as "the squeeze". Kawela is translated as "the heat" which is also the name used to describe the coastal portions of the Pahipahiʻāula, the land bordering Kawela to the west. No translations for Hanakaʻoe or Ulupehupehu are presented in Pukui *et al*. (*ibid*.).

Several other natural features within the project area and adjacent lands have traditional Hawaiian names (*Figure 8*). The shoreline at Kawela Bay was referred to as "Wākiu" meaning "northwest wind sound" (Clark 1977:132). A fishpond of the same name was reportedly once located inland from this beach. The east section of Kawela Bay was called "Waikalae", or "divided water", which is likely a reference to ʻŌiʻo Stream that formerly divided in this area with one fork extending to Kuilima Bay and the other emptying into Kawela Bay. (*ibid*.:132-133). A small offshore island and reef north of the northern end of Kawela Bay is called "Pāpaʻamoi" which translates as "scorched threadfish"; "Pāpaʻamoi" was frequented by the gods Kanaloa and Kane who went there to "scoop up fish" (McAllister 1933:147).

"Kuilima" is a recent name for the area between Kawela Bay and Kahuku Point. Kuilima translates as "to go arm in arm", which is a reference to a story of three men who walked across the plains with linked arms (Clark 1977:133). The point of land at Kuilima was once referred to as "Kaleokaunui" or "the point of the altar" and the eastern end of the cove is called "Kalaekamanu" or "the point of the bird". The cove between these points is called "Kalokoiki" or "the little pool".

The traditional name for the broad bay between Kuilima and Kahuku Point was "Kaihalulu" or "roaring sea", likely in reference to the large waves that crash upon the shoreline (*ibid*.:134). "Kalaeokauna'oa" is the traditional name

Figure 8. Named Places within and Adjacent to Project Area

for Kahuku Point, which translates as “the point of kauna‘oa” (*ibid*.). The area to the west of Kahuku Point was called “Punapalaha” or “slippery spring” with the area to the east of this called “Kauhala” or “to move up and down as waves” (*ibid*.). Punaho‘olapa Marsh located inland of Kahuku Point means “restless spring” (Pukui 1983:229).

Kapi Pond is located just outside the project area to the west. A spring feeding this pond is called Punáulua, which means “*ulua* (crevalle jack) spring” in reference to the abundance of *ulua* (Crevalle jack) just offshore. The abundance of this fish in this area was attributed to the mixing of salt water with the fresh water from the spring (Clark 1977:131-132).

A *heiau* once existed in the vicinity of the project area, likely situated inland of Kamehameha Highway. Although destroyed prior to McAllister’s survey of Óahu, informants indicated to him that it was called Pu‘uala Heiau and was “located on the ridge overlooking Kahuku Ranch” (McAllister 1933:152). According to the “Legend of Kāma‘akamahi‘ai”, the area around Púuala Heaiu was used for sports:

> When Keaua‘ula reached Pu‘u-‘ala in Kahuku, he met some people who were indulging in sports there….They were spear throwing and moa sliding and they urged him to stop and play (J.W.K. Kauaililinoi, originally published in Hawaiian in the newspaper *Ku‘oko‘a,* Nov. 5, 1870, translation in Sterling and Summers 1978:149).

Legendary History

The following discussion of the legendary background of the project area vicinity is largely derived from Lehua Kalima’s research presented in Corbin (2003). Although Kahuku is an *ahupua‘a* of the Ko‘olauloa District, it is often referenced a district or region, with many references to its physical volatility. An example of this is presented in the following Hawaiian adage: *Kahuku ‘aina lewa* (Kahuku an unstable land). O‘ahu, according to legend, was once two islands that grew together; Kahuku is the part that bridges the gap (Pukui 1983:144).

There are several accounts of Kahuku once being a floating island that created a disturbance when it would collide with Oahu, causing the Ko‘olauloa people to attach it to the mainland with fishhooks (Boswell 1958:68):

> Kahuku District, according to legend, was once a floating island blown about by the winds. As it banged against Oahu, it made noises, which disturbed the old women guarding the Princess Laieikawai. The old women grappled the island with fishhooks and attached it securely to Oahu. Polou pool on the sea side of the Kahuku Mill is one spot where the hook was fastened. The other end was fastened in Kukio.

The missionary Levi Chamberlain (1957:35-36) heard the following legend during a tour of the island in 1928:

> The natives tell a marvelous story respecting the origin of this district, which they say floated in from the sea, and attached itself to the ancient shore of the island, that there was a subterranean communication between the sea and the ancient shore, by which a shark used to pass and make depredation up on land. The basis of the tract, which is from 5 to 7 miles in length and from 1 to 2 miles in breadth appears to be of coral and it was evidently redeemed from the sea, as a good deal of the land, in many places along the shore around the whole circuit of the island, evidently has been.

The following legend indicates that the floating island of Kahuku was once the home of the Menehune (Paki In Silva 1984:3):

> Kahuku section of O‘ahu was once a separate island...It was an islet whose people were the Menehune, or Dwarfs as they are called today. Many stories are told about the miraculous feats

> performed by the Little People of ancient Hawaii. It is known, also that they always worked from just after sunset until just before dawn.
>
> Legend tells us that Kahuku was a floating island situated several miles out to sea. For a long time, the people of O‘ahu had planned to make the island a part of their land, for they say it came close to O‘ahu's shores. The floating island of the Menehune did not have any fresh-water springs because there were no high mountains covered with verdure and trees to capture the rains. So, the Little Folk used to paddle their islet into the bays of O'ahu at night to haul water from the springs of the large island.
>
> One day, a resident of Kahuku suggested that all the people gather together to make strong hooks of whalebone and attach them to a stout rope made of sacred Olona fibers. This was done.
>
> The Menehune came to take water as usual, then the residents of O‘ahu attached the large hooks to the floating isle while the Little Folk were off at the water-springs. When the water was loaded, the Menehune started to paddle off again, but they could not move their islet or free it from the ivory hooks and Olona ropes.
>
> Today, many people who travel Kahuku section of O‘ahu and see the many islets seeming to float off shore, and hear the sea singing its songs, they say, "Listen to the Menehune grumbling while they try to move their island that used to float!" The rumbling and grumbling is heard only at night, for that is the time for the Menehune to be working at Kahuku.

Pukui (1983:239) presents a proverb that indicates that the Kahuku region was once connected to Waipahu via an underground stream: “*Pukana wai O Kahuku*” (The water outlet of Kahuku). This stream is also cited in Thrum who indicates that it flowed between Punaho‘olapa Marsh in Kahuku and Waipahu Stream in Waipahu (Thrum 1910:130-131):

> A kapa-beating log of peculiar sound, unlike any other known on the island, which was placed in its waters at the close of a kapa-making season to keep it smooth and free from cracks that would impart an impression to the cloth in its manufacture, was missed, and, believing it to have been stolen, search was made all through the Koolau, Waialua, and other districts till at last it was found in use at Waipahu. Recognizing it by its resonant tone, it was claimed by the searching owner and right thereto by those in possession as vigorously maintained. To test the truth of ownership as claimed, the Ewa people accompanied the claimant back to Kahuku to visit the scene and witness a test of the underground stream theory. A bundle of ti leaves were gathered, which was wrapped together and consigned to the Waters of Punahoolapa. In the course of a few days they were lost to sight, whereupon the party set out for Ewa, and after careful watching, as predicted, the bundle of ti leaves came forth on the bosom of the waters of the Waipahu stream. The kapa log was thereupon recognized as the rightful property of the Kahuku claimant.

Handy and Handy (1974:443) support the potential existence of this legendary subterranean water course :

> It is said that Oahu’s most famous burial cave was in Kanehoalani. Its name was Pohukaina. One entrance was in the northern cliffside facing Ka‘a‘awa and another is at a spring named Ka‘ahu‘ula. This great cavern was believed to run right through the Ko‘olau range. There was an opening in Moanlua on the leeward side of the island, and others were in Kalihi, Puiwa, and Waipahu. Still another was in Kahuku. The “roof” of the cavern was called Kauhuhu, and this was “in the mountain Konahuanui, sloping down toward Kahuku.” Many are said to have gone with *kukui* nut candles from Kona (leeward Oahu) to Kahuku. In the caves are “many creeks, rivers and streams” (*Ke Au Hou,* June 28, 1911).

Early Historic Period (Contact to 1846)

The first western description of the Kahuku region comes from Captain Clerke on February 28, 1779 (quoted in Nakamura 1981). Clerke, who had taken command of the H.M.S. Resolution following the death of Captain Cook two weeks earlier, observed a large settlement in the vicinity of Kahuku Point and described the land as "exceedingly fine and fertile" (ibid.: 1). Another member of the crew, Lieutenant James King, provided the following account of the region between Kaneohe Bay and Waialua (quoted in McAllister 1933:153):

> It [O'ahu] is by far the finest island of the whole group. Nothing can exceed the verdure of the hills, the variety of the wood and lawn, and the richly cultivated valleys, which the whole face of the country displayed.

In 1792, the British ship Daedalus, part of Vancouver's squadron, anchored in Waimea Bay to obtain water. The shore party, consisting of the commander, the astronomer, and two seamen, was attacked and all were killed except one seaman (Kuykendall 1967). In 1794, Vancouver (1798: Vol. III: 71) described the Kahuku region as less flourishing and inhabited than King had earlier described, a situation that Nakamura (1981) attributed to depopulation:

> …In every other respect our examination confirmed the remarks of Captain King excepting, that in point of cultivation or fertility, the country did not appear in so flourishing a state, nor to be so numerously inhabited, as he represented it have been at that time, occasioned most probably by the constant hostilities that had existed since that period.

During Levi Chamberlain's 1828 tour of the area he stopped at several schools in the vicinity of the project area, including those in the communities of Lāʻie, Mālaekahana and Kahuku. There is however no mention of any schools in any of the other project area *ahupuaʻa*, which suggests that these communities were too small to support a school (O'Hare and Hammatt 2006:14). According to Chamberlain (1957: 35-36):

> Tuesday Feb. 5th. After breakfast I examined two schools, belonging to Laie & Malaekahana, and was pleased with the appearance of the scholars. At a quarter before 11 A.M., we set out for Kahuku, and after traveling about two hours over a level sandy country, arrived at the school house, where we found 83 scholars assembled, waiting to be examined.

Land Commission Awards (1846-1855)

A significant transition from the traditional land tenure system to the introduced concept of private land ownership occurred in Hawaii in the mid-1800s. "At that time, Kamehameha III relinquished absolute ownership of lands in the Islands and individuals were allowed to register legal verifiable claims to their households and agricultural plots" (Bath *et al.* 1984: C-15). Further, "[t]he old feudal arrangement of joint and undivided ownership had given place to the system of individual allodial tenures, and aliens had been admitted to the enjoyment of the same rights as Hawaiian subjects in the ownership and use of land" (Kuykendall 1967:298).

Ahupuaʻa within the project area are depicted in several ways depending on the source. The current USGS quadrangle maps of the area depicts seven land divisions including Kahuku, Punalau, Ulupehupehu, ʻŌiʻo, Hanakaʻoe, Kawela and ʻŌpana (see *Figure 1*); however, an 1878 Government Survey Map of the island only depicts Kahuku, Kawela and a combined area including ʻŌiʻo and Hanakaʻoe (*Figure 9*). O'Hare and Hammatt (2006:14) suggest this disparity may be the result of politics: "It seems likely that prior to the conquests of Oʻahu by the chiefs of Maui (c. 1783) and Hawaiʻi Island (1795) that Ōiʻo 1 & 2, Ulupehupehu, Punalau, Hanakaʻoe and Kawela were understood as separate *ahupuaʻa* but that they were combined for political purpose by 1848".

Kahuku and Kawela were designated as Crown Lands of King Kamehameha III (Indices 1929:27-28) while the remaining *ahupuaʻa* in the project area were taken as government land (1929:40-44). The Waihona ʻAina (2000)

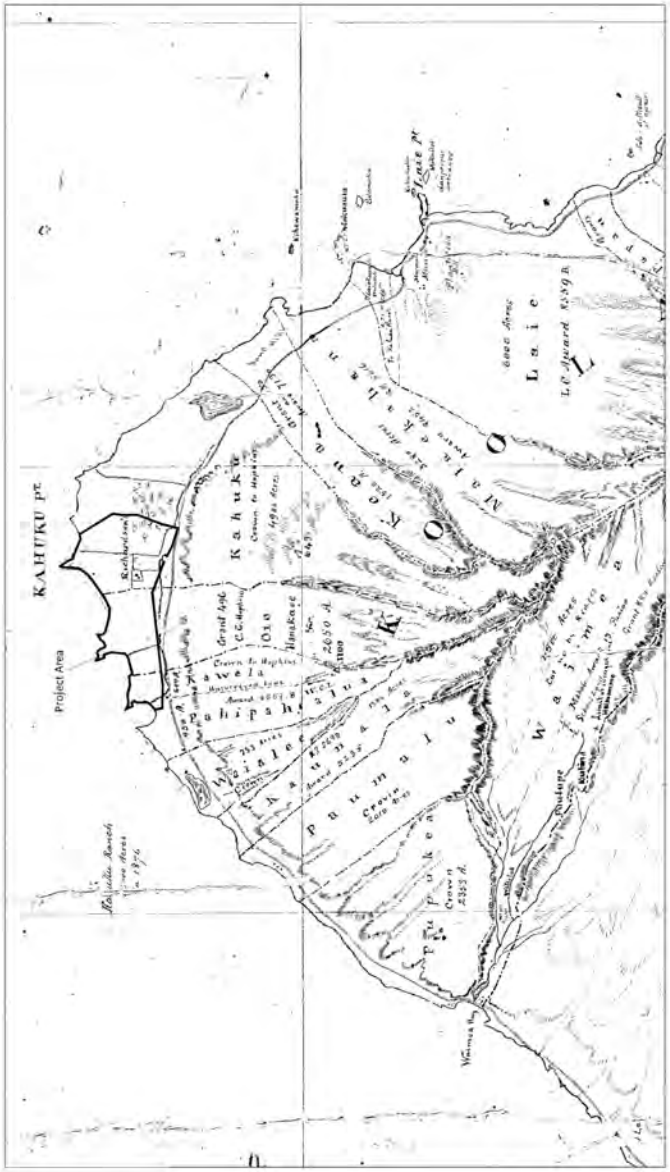


Figure 9. Portion of Lyon's 1878 Government Survey Map of Oahu

Mahele Database is a compilation of data from the Indices of Awards (Indices 1929), Native Register (NR n.d.), Native Testimony (NT n.d.), Foreign Register (FR n.d.) and Foreign Testimony (FT n.d.). The Database lists 101 land commission award (LCA) claims for the project area *ahupua'a*. Of these 101 claims, only 88 were awarded. The Database also reflects the disparity in the names of the project area *ahupua'a* because 'Ōpana, Ōi'o, Hanaka'oe, Ulupehupehu and Punalau are sometimes referred to as separate *ahupua'a*, although in other instances are referenced as *ili* of Kahuku or Kawela.

Of the 101 LCAs, 35 are located within the boundaries of the project area and 66 are located in the surrounding area. The locations of the LCAs were determined through analysis of historic maps and tax maps. The majority of the 66 LCAs are depicted in *Figure 10* and summarized in *Table 2*. Sixty-six LCAs name 64 individuals: single claimants filed on 62 LCAs and the remaining four LCAs were awarded to two claimants (Kaio LCAs 4394 and 4396; and Uha 2681 and 3748).

Of the 66 LCA claims, most are listed in the Land of Kahuku (n=47). Of the 19 remaining claims, seven list Kawela. Three list Kahuku and Punalau. Two list Kawela and Kahuku. Two list Kahuku and Ulupehupehu. Two list Kahuku, Punalau and Ulupehupehu. One lists Ōi'o. One lists Ōi'o, Hanaka'oe and Kahuku. One lists Kahuku, Ulupehupehu, 'Ōi'o, Hanaka'oe, Kawela and 'Ōpana. The claims outside of the project area are clustered in four areas, with the majority located in Kahuku, in the vicinity of the Kamehameha Highway (see Inset 1 on *Figure 10*). A second cluster is situated seaward of the first in the central Kahuku area. Four LCAs are situated to the east of the first cluster. The fourth cluster is located in the Land of Kawela, just inland of the highway (see Inset 2 on *Figure 10*).

Thirty-five LCAs within the project area are summarized in *Table 3* and their locations are presented in *Figure 11*. Thirty-five LCAs name 31 individuals: single claimants filed on 27 LCAs and the remaining eight LCAs were awarded to four claimants (Waanui – LCA 2698, Hoolae – 2716, Pakanaka – 2744, Kaohele – 2861). Of these 31 individuals, 21 claimed parcels in areas adjacent to the project area. These additional claims are indicated by asterisk in *Table 3* and are depicted on *Figure 10*. The majority of the LCAs within the project area and several east of the project area are also depicted on the 1890 map of the Kahuku Plantation (*Figure 12*).

Most of the claimed parcels are located in Kahuku Ahupua'a (n=17). Eleven are located in Kawela. The remaining seven claims list Kahuku and one or two additional *ahupua'a*. Three list claims in Kahuku and Punalau, three list Kahuku, Punalau and Ulupehupehu and one lists claims in Kahuku and Ulupehupehu.

'Ōpana, Ōi'o, Hanaka'oe, Ulupehupehu and Punalau are sometimes listed as *ili* of Kahuku and Kawela. Claim testimonies mention additional *ili* land divisions within both Kahuku and Kawela. The *ili* in Kahuku include Aamo, Ahamau, Kakala, Kalimaloa, Lanahu, Lauhine, Mookini, Mookahi, Punama, Puaakea and Uwalakui. The *ili* in Kawela include Kamalua, Kamooiki, Kaneloko, Kaunala, Kawelaluna, Keokea and Kumpali. Most parcels were conveyed to claimants during the time of Kamehameha I (n=12). Seven were conveyed during the time of Kamehameha III and four during the time of Kamehameha II. Testimonies from two claims indicate they were conveyed in 1842.

House lots are mentioned in 24 claims. There are 36 *lo'i* (pondfields) described in the claims with three claims specifically mentioning *kalo* (taro). Testimonies refer to cultivated bananas (6 references), sweet potatoes (6), *wauke* (6), sugar cane (3), bitter melon (3), *noni* (2) and orange tree (1). Other named plants are *Pandanus* trees or *hala* groves (2) and *koa* trees cultivated for canoes (1). One claim mentions a *puna pa'akai* or brackish spring and one mentions a fishery.

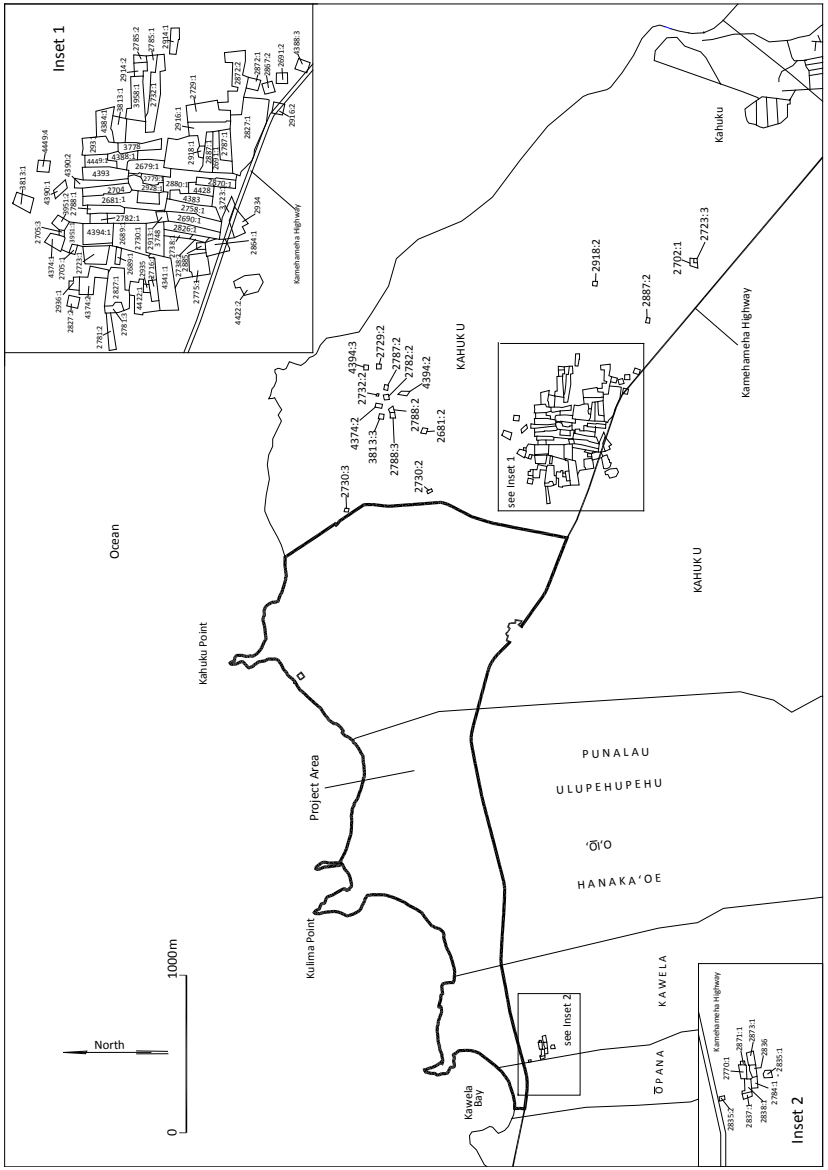


Figure 10. Land Commission Awards outside Project

Table 2. Summary of Land Commission Awards outside of Project Area

LCA	Claimant	Ahupua'a	Ili	Awarded
2681	Uha	Kahuku		Yes
2691	Luamea	Kahuku	Akamau, Kaipauloa, Puulu, Kalehunui	Yes
2702	Waialua	Kahuku	Kaupoo, Koolina, Mahukini	Yes
2704	Haui	Kahuku		Yes
2705	Hao	Kahuku		Yes
2723	Puu	Kahuku	Kaupoo, Koolina, Mahukini	Yes
2729	Polena	Kahuku		Yes
2730	Pahanui	Kahuku	Keahupuaa, Ahamau, Punakaipo	Yes
2732	Pukawale	Kahuku	Keekee	Yes
2758	Napoe	Kahuku	Ulepehupehu	Yes
2771	Maulua	Kahuku	Oio	Yes
2776	Mahoe	Kawela	Keokea	Yes
2778	Mahu	Kawela		Yes
2780	Muli	Kawela		Yes
2782	Makole	Kahuku, Punalau	Punalau Ahamau, Oio, Luahine, Kahala, Amo	Yes
2785	Makakiekie	Kahuku	Ahamau	Yes
2787	Makaokalai	Kahuku	Luahine, Hanumoha	Yes
2788	Mauoli	Kahuku	Hanapaua, Poohalulu, Waiula, Manono	Yes
2789	Mooni	Kahuku	Waiula, Ahamau, Kakala, Haleamani, Poohalulu, Kaea	No
2817	Kimo	Kahuku		Yes
2826	Kalaweaumoku	Kahuku	Mookini, Punalau, Ulupehupehu, Ahamau	Yes
2827	Kanahuna	Kahuku	Mana, Ahamau	Yes
2836	Kelemana	Kawela, Kahuku	Mahealani	Yes
2864	Kiha, Josua	Kahuku	Kahuku, Punalau, Ulupehupehu	Yes
2867	Keino	Kahuku	Limalaa, Amo, Kaloaloa	Yes
2868	Kapaiaala	Kahuku		
2870	Kai	Kahuku		Yes
2872	Kaihikapu	Kahuku		Yes
2873	Kaunahi	Kawela		Yes
2875	Kaopuu	Kawela, Kahuku	Mahealani	No
2878	Kekua	Kawela	Kamooiki	Yes
2885	Kupihea	Kahuku, Punalau, Ulupehupehu		Yes
2887	Keawe	Kahuku	Ahamau	Yes
2888	Kaupaona	Hanakaoe, Kawela, Oio, Kahuku, Opana, Ulupehupehu	Lanahu, Uwalakui	No
2889	Kekohai	Oio, Hanakaoe, Kahuku		No
2890	Kaika	Kahuku		No
2892	Kainalu	Kahuku, Punalau	Lanahu, Haleaniani, Amo, Niukolu	Yes
2906	Kaaumakua	Kahuku, Ulupehupehu	Ikemaka	Yes
2909	Kamalama	Kahuku, Punalau, Ulupehupehu	Kaunala	Yes
2914	Keakaokawai	Kahuku	Ahamau	Yes
2916	Kaluau	Kahuku	Ahamau	Yes
2918	Kawaa	Kahuku		Yes
2931	Keawelekini	Kahuku	Ahamau, Keana	Yes
2932	Kailiuku	Kahuku, Ulupehupehu	Puuakea, Oio, Hanakaoe	Yes
2934	Kalahana	Kahuku	Oio	Yes
2935	Kekuauli	Oio, Hanakaoe, Kahuku	Oio, Ualakui	Yes
3712	Moku	Kahuku		No
3723	Male	Kahuku	Keahupuaa, Makapala, Ahamau	Yes
3748	Uha	Kahuku	Ahamau, Poohalulu, Puulu, Kahani	Yes
3778	Aaiki	Kahuku	Ahamau, Ao, Wiwikalani	Yes
3813	Pakui	Kahuku	Ahamau, Poohalulu, Keahupuaa	Yes
3871	Palau	Kahuku		No
3951	Niau	Kahuku	Puohalulu, Kakaako	Yes
4329B	Kuapuhi	Kahuku		Yes
4374	Kuapuu	Kahuku	Paohaulu, Pauwela	Yes
4383	Kula	Kahuku	Makaha, Kapawa, Keana	Yes
4384	Kekipi	Kahuku	Ahamau, Kahauloa, Makapala, Kalimaloa, Poohalulu	Yes
4388	Kau	Kahuku	Ahamau, Amo, Poohalulu	Yes
4390	Kupaihea	Kahuku	Ahamau, Paohalulu	Yes
4393	Kaumi	Kahuku	Ahamau, Paohalulu	Yes
4394	Kaio	Kahuku, Punalau	Ahamau, Poohalulu, Wikiwikilani	Yes
4396	Kaio	Kahuku		No
4422	Kaumualii	Kahuku	Nanahu, Waihokahala, Luahine, Ahamau, Ulupehupehu	Yes
4428	Kuhoopohopoho	Kahuku		Yes
4449	Kaaikaula	Kahuku	Ahamau	Yes
8810	Kawahaku	Kahuku		No
10931	Uluhao	Kahuku		No

Table 3. Summary of Land Commission Awards within Project Area

LCA	Claimant	*Ahupua'a*	*Ili*	Apana Claimed	Apana Awarded	Other Claims	Section No.	Land Use	Boundary North	Boundary East	Boundary South	Boundary West	Date Rec'd	Giver	Acreage	Royal Patent	Sources	Comment
235M	Kuli	Kawela		2	1			House lot, 5 kalo patches	Kauaula's land	kohanaiki land	Koolaoo's land	kohanaiki land			0.41	508	FT 11:239	Claimant died in 1849 and left property to his daughter Nihui)
2679*	Umeume	Kahuku	Punaunu, Moolaki,	2	1		2	House lot, *puna pa'ak ai* (Brackish spring?), two hala trees	kula	kula	kula	kula			0.25	259	NR 3: 679 FT 10:174	
2680*	Luiki (Luihi?)	Kahuku	Ulupehupehu	2	1		2	House lot	Land fence	weed grown kula	weed grown kula	kula	Kam I times		0.25	339	NR 3:591-592 FT 10:164	
2698*	Waanui	Kahuku, Ulupehupehu	Oio	3	2			2 *loi*	Lokoa's land	Kolihala's land	Napoe's land	Kam III times				340	NR 3:595-596 FT 10:165	
							2		n/d	n/d	n/d	n/d	Kam III times					
							3	Open flat lands	n/d	n/d	n/d	n/d	Kam III times					
2706	Holoaia	Kahuku	Lanahu	2	1		2	House lot	kohanaiki land	kohanaiki land	kohanaiki land	kohanaiki land			0.25	244	FT 10:186	His daughter Kalekiai is Hihkuli's heir
2716*	Hoolae	Kahuku	Oio, Lanahu, Hanakaoe	3	1		1	House lot	Kaumaulii's land	Kaukaiha's land	Matilina's land	kohanaiki land	Kam II times		0.6	8000	NR 3:601-602 FT 10:161	
							2	*loi* with wauke, sweet potatoes, bananas, bitter melon, sugarcane, koa trees										
2724	Paku	Kawela	Kamalu, Kumupali	3	1		3	House lot	kohanaiki land	kohanaiki land	kohanaiki land	Kalekekoa's land		Kinau	0.25	514	NR 3: 698 FT 10:156	
2734	Paulea (Pakoa)	Kawela	Opana	1	2	1	3	House lot, 2 *loi*	kula	kula	kula	Koolaoo's land					NR 3: 617 FT 10:158	
2738*	Palu	Kahuku	Oio, Ulupehupehu, Ahamau	3	1		3	House lot	kula	kula	kula	kula	Kam II times		0.25	518	NR 3: 614 FT 10:183	Property left to his widow Beihei
2744	Pakanaka (Manaka)	Kahuku	Oio	2	1			1 *loi*	Makole's land	Kainalu's land	Kainalu's land	kohanaiki land	Kam I times		0.38		NR 3:617-618 FT 10:177	
							1		Kanahiha's land	kula	Pa land	Ocean						
							2	House lot	kohanaiki land	kohanaiki land	kohanaiki land	kohanaiki land						
2770*	Makaino	Kawela	Keokea	2	1	1	2	House lot, 1 *loi*, 1 fishery	kohanaiki land	kohanaiki land	kohanaiki land	kohanaiki land	Kam II times	Kaeo	0.25	513	NR 3: 628 FT 10:155	
2775*	Makalua	Kahuku, Punalau		2	1		2	House lot	Land fence	hala grove	hala grove	hala grove	Kam III times		0.25	534	NR 3: 630 FT 10:166	
2779*	Makilo	Kahuku					2	Open flat land with bananas and wauke	kohanaiki land	kohanaiki land	kohanaiki land	kohanaiki land	Kam III times		0.75	539	NR 3: 266 FT 10:167	
2781*	Manukoolaeo	Kahuku, Punalau	Uwalakui	2	1		1	House lot and 4 4 *loi* with wauke, sweet potatoes, bananas, bitter melon	kohanaiki land	kohanaiki land	Lono's land	Kanahuna's land	1842		1.09	533	NR 3: 632-633 FT 10:177	
2784*	Moo	Kawela		2	1		2	House lot, 4 *loi*	Heea's land	kohanaiki land	Kaumahi	Kalhelelua	Kam I times	maula's	0.13	512	NR 3: 634, FT 10:156	
2835*	Kuhelelua	Kawela	Opana	2	1	5	2	2 *loi*	Kekua's land	kula	kula	kula			0.5	514	NR 3: 657, FT 10:157	
2837*	Kamakai	Kawela	Kaunala	2	1		2	House lot	kula	sea	sandy beach	Peelalua's land		Kaeo	0.09	507	NR 3:638, FT 10:158	
2838*	Kauwahi	Kawela	Kaunala	3	1		2	House lot	kohanaiki land	kohanaiki land	kohanaiki land	Punalau's land	Kam I times		0.25	510	NR 3: 358 FT 10:159	
2850	Kawi	Kawela	Kumupali	1	1	1			pond	Moo's house	land fence	sea				515	NR 3: 663, FT 10:155	
2861	Kaohele	Kahuku, Punalau, Ulupehupehu	Oio	1	1		1	House lot	Makoli's land	kula	kula	kohanaiki land	Kam I times		n/d	n/d	NR 3: 667-668 FT 10:153	
							2	5 *loi*	Makoli's land	kula	kula	kohanaiki land						
2868	Kapaiaala	Kahuku		2	1		2	House lot	kula	kula	kula	kula			0.25	531	NR 3: 670 FT 10:153	

Table 3. Summary of Land Commission Awards within Project Area (cont.)

2878	Kekua	Kawela	Kamooiki	3	1	1	2	House lot	Kauwahi's land	Kaunahi's land	Kelemana's land	kula	1842	Kaeo	0.43	515	NR 3: 676 FT 10: 155	
2880*	Kupau	Kahuku		2	2	1	2	Cultivated land planted in sweet potato, noni, sugarcane and banana	kohanaiki land	path	kohanaiki land	kohanaiki land	Kam I times	Kahahana	0.14	338	NR 3: 675 FT 10: 164	Liuki also assumes claim as Kupau died before completion of award
2897	Kookoo	Kawela, Punalau		2	1		2	3 kalo patches, 1 house lot	Kaili's loi	kula	kula	Peelalau's land	Kam I times		0.25	506	NR 3: 683, FT 10: 159	
2913*	Kekua	Kahulau, Punalau, Ulupehupehu	Aamo, Ahamau, Mookahi	3	1	1	2	2 kalo patches with wauke, sweet potatoes, bananas, oranges	Luiki's land	Napoe's land	Luiki's land	water course	Kam I times		0.47	337	NR 3: 690-691 FT 10: 180	On Kekua's death land was left to Luiki
2928*	Kauihaiwale	Kahuku		1	1		2	House lot	Mala of wauke	Taro *loi*	kula	kula	Kam III times		0.25	251	NR 3: 697 FT 10: 168	
2936*	Kauihikai	Kahulu, Ulupehupehu	Lanihau, Uwalakui, Oio, Hanakaoe	2	1		2	House lot, 5 *loi* with noni, wauke, halu, sweet potatoes, bananas, bitter melon, sugarcane	kohanaiki land	kohanaiki land	Keea's land	kohanaiki land	Kam III times		0.52		NR 3: 701 FT 10: 186	Kauaihikai died in 1848, leaving land to his widow Upai
3809	Lokea (Waanui)	Kahuku	Puaakea, Kakala, Kalimaloa	1	1		1	House lot, 7 *loi*	Puu's land	Heea's land	Kaukaha's land	Pahanui's land	Kam I times		0.27	334	NR 4: 174 FT 10: 165	Waanui also assumes claim as Lokea had died before completion of award
3815	Pailalau (Peelalau)	Kawela	Kaneloko, Kawelaluna, Kalimaloa, Hanakaoe	1	1		1	House lot	stone wall	Kamakai's lot	Kamakai's lot	stone wall	Kam II times	Kaeo	0.1	511	NR 4: 176, FT 10: 170	
3958*	Naukuhao (Naukuhae)	Kahuku	Ahamau, Lauhine, Kalimaloa	2	1		2	House lot	kohanaiki land	kohanaiki land	kohanaiki land	kohanaiki land	Kam I times	Parents	0.25	254	NR 4: 200 FT 10: 151	
4341*	Kaukaha	Kahuku		2	1		2	House lot	Pasture	kula	kula	kula	Kam I times		0.25	526	NR 4: 266 FT 11: 320	

2679* = Also claimed parcel outside project area but within project area ahupua'a

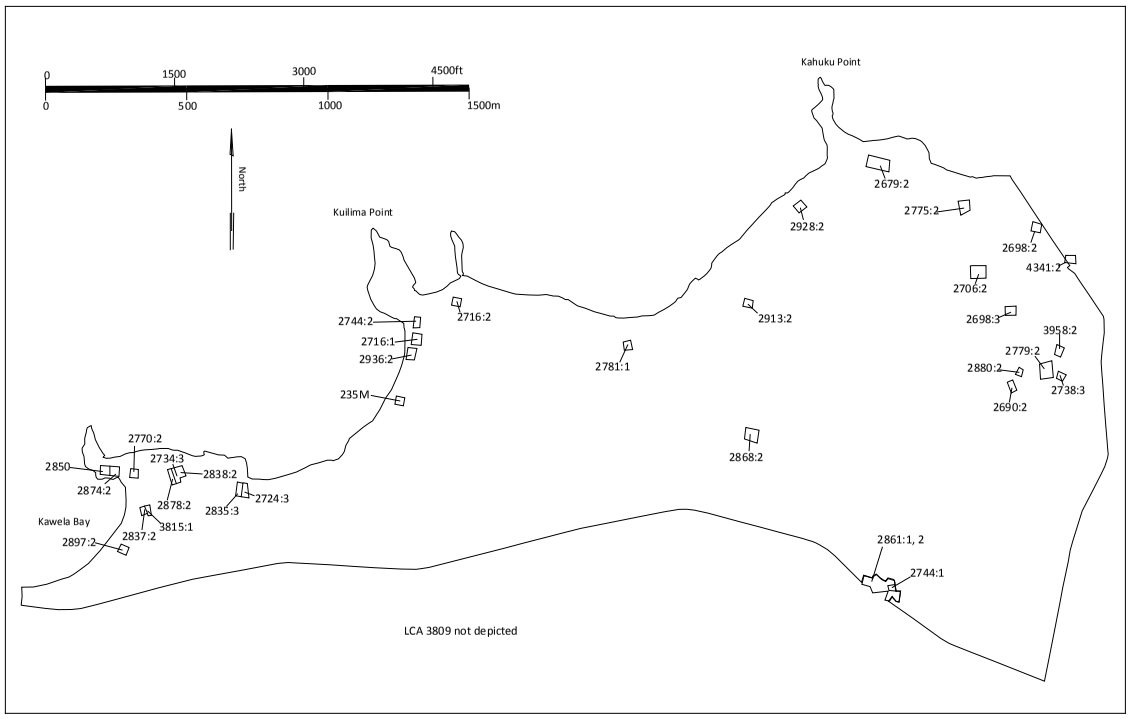


Figure 11. Land Commission Awards within Project Area

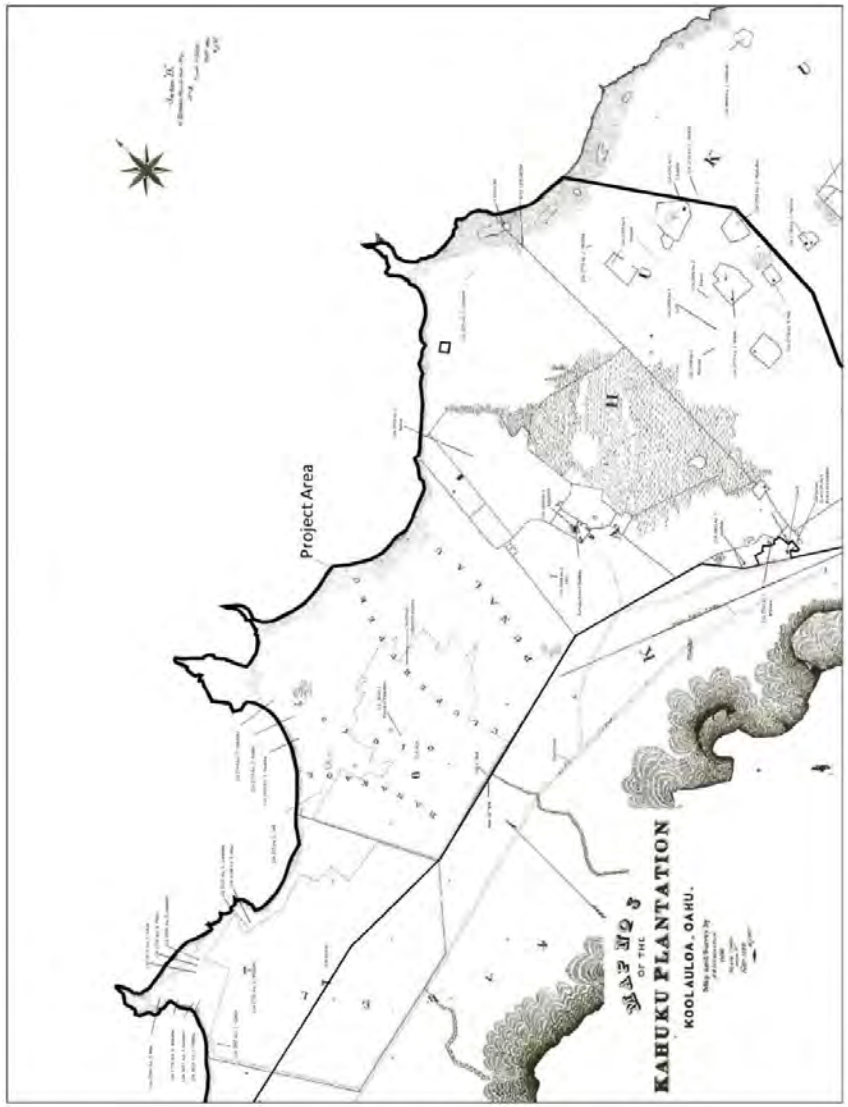


Figure 12. Portion of Loebenstein's 1890 Map of Kahuku Plantation

Kahuku Ranch (1850-1880)

Charles Hopkins, an Englishman, purchased 8,000 acres at Kahuku in 1850-1851 from Kamehameha III and established a sheep and cattle ranch, which he named Kahuku Ranch. Hopkins venture had immediate impacts on the landscape, which were particularly disturbing to the Hawaiian inhabitants of the area. According to O'Hare and Hammatt (2006:16):

> The natives became concerned for their lush and legend-filled homeland. Kahuku and the *hala* (*Pandanus*) trees in whose shade it had slept through the centuries, was being threatened by a new kind of white stranger. The herds and flocks ran over the small homesteads scattered here and there through the land, stripping it of verdure. The Hawaiians asked in vain for protection of their trees and vegetable patches. They wrote to the missionary, Emerson, who urged them to build fences and appealed to authorities on their behalf asking that government pounds be set up to enforce newly established trespass laws.

McAllister (1933:153) also cites the impact of the ranch on the Kahuku Plain during an interview with local informant Mrs. John Kaleo: "She remembers the time when trees, now found only on the mountains, covered the Kahuku plain, now a desolate, windswept area". The destruction of the native landscape was accompanied by a decline in the local Hawaiian population. According to census data there were 1,345 people in Koʻolauloa District in 1853 (Schmitt 1977:12). The population declined to 1,187 in 1860 and by 1878, only 1,082 people remained.

By 1856 a carriage road was completed between Honolulu and Kahuku (Haun and Henry 2001b). During the mid-1860s through the 1870s, the Kahuku Ranch changed hands several times. Robert Moffitt purchased the ranch from Hopkins and in 1873; H.A. Widemann gained ownership from Moffitt. In 1873 the ranch consisted of 15,000 acres including the *ahupuaʻa* of Kaunala, Pahipahíāula, ʻŌpana 1 and 2, Kawela, Hanakaʻoe, Ōiʻo, Ulupehupehu, Punalau, Kahuku, Mālaekahana, Keana, and part of Lāʻie. In 1874, Widemann sold "Kahuku and Mālaekahana Ranch" to Julius Richardson for $45,000.00. Richardson sold the ranch to James Campbell for $63,500.00 in 1876. An 1876 Government Survey Map of the Island Oʻahu depicts the extent of "Richardson's" Ranch and what appear to be a series of walled enclosures (see *Figure 9*). An article in the Hawaiian Gazette (cited in Bath *et al*. 1984:C-16) describes the ranch at the time of the 1876 sale to Campbell (excerpted from the Hawaiian Gazette, 10/4/1876, p. 3:2):

> Kahuku Ranch. This fine ranch, covering the north portion of Oahu, formerly the property of the late R. Moffitt, and more recently of Julius L. Richardson, Esq., was last week sold by the latter to James Campbell, Esq., one of the proprietors of the Pioneer Sugar Mill of Lahaina, for the sum of $63,500 cash. It includes 25,000 acres in fee simple, and large tracts of mountain land under long leases, with $34,000 worth of livestock, including 3,000 head of cattle, with the choice band of merino sheep and horses now on it. It is unquestionably the best stock ranch on these islands and it has been brought to a high state of perfection under the management of the late proprietors, who divided the plain into ten or twelve large paddocks, walled with heavy stone walls. It stretches from Laie to Waimea, a distance of thirteen miles and those who have ever visited it must have admired its lovely green pastures of manienie grass so fattening to stock. It is the intention of Mr. Campbell to increase his band of sheep to 30,000 of the choicest breed. The price paid is a handsome one, securing to its present proprietor the most desirable ranch on the Island, and to Mr. Richardson a comfortable fortune, and result in part of his industry and good management, and in part of the Reciprocity Treaty, the first fruit from which he has been so fortunate as to reap…

James Campbell operated the Kahuku Ranch until November 1889 when much of the land was leased to Benjamin Franklin Dillingham (Kuykendall 1967:69). George Bowser (1880:409) describes the extent of the ranch as it was in that year:

> Kahuku Ranch. Main Road, Kahuku: Proprietor, James Campbell, Esq., of Honouliuli: Manager, W.R. Buchanan: post office address, Kahuku, 38 miles [61 km] from Honolulu, at the northern point of Oahu: 23,608 acres [9554 hectares] occupied as a cattle ranch: extends 14 miles [22 km] along the coast, in close proximity to the sea. A valuable fishery is attached to this property.

Kahuku Plantation (1890-1971)

In 1889, Benjamin Franklin Dillingham chartered the O'ahu Railroad and Land Company (OR&L) and commissioned two hydrographic engineers to investigate the potential for a commercial sugar cane plantation at Kahuku. In that same year he leased the Kahuku lands of James Campbell for 50 years. Dillingham then subleased the lands to James Castle. Castle's Kahuku Plantation Company received its charter in 1890.

The company began commercial production of sugarcane using pumped spring water, streams and rain for irrigation. This mode of irrigation was soon found to be inadequate for the amount of land available and artesian wells became the primary irrigation water source. A total of 2,800 acres were planted in sugarcane with the first crop harvested in 1892 (Kuykendall 1967:69). The Loebenstein 1890 Map of the Kahuku Plantation (see *Figure 12*) shows the location of the Kahuku Plantation and on the east side of the ranch buildings a series of walled enclosures, which correspond to Land Commission Awards. An old school and a church are located seaward of the Old Government Road and the Kahuku Ranch buildings are located in the central portion of the TBR property, west of Punaho'olapa Marsh.

By 1898, the OR&L railroad line extended from Honolulu to Waialua; in 1899 it reached Kahuku. According to O'Hare and Hammatt (2006:21):

> No record appears to survive which gives the date the railroad was started at Kahuku Plantation. Annual reports do not appear prior to 1893. However, the road must have been started soon after the January 30, 1890 charter, for the Baldwin Locomotive Works records note an order for the first Kahuku motive power, Keana, on February 2, 1890 and a second order for Kahuku in 1891.

The Loebenstein map also depicts "Two Rocks called Pohakulanai" located in the Land of Ulupehupehu. Pohaku Lanai is also the name of a rock feature located on the west side of Kaiaka Bay Beach Park in Haléiwa, well to the northwest of the project area; the Hale'iwa site (State Inventory of Historic Places, hereafter SIHP, 80-04-0218; National Register of Historic Places, hereafter NRHP, 50-OA-226) consists of two massive balanced limestone boulders, one on top of the other (NRHP n.d.). Legendary explanation (Alameida 1994) has it that the boulders floated ashore from the distant land of Kahiki and were used as a lookout by fish spotters (*kilo i'a*). The presence of the "Two Rocks called Pohakulanai" on the 1890 map in Kahuku is unexplained. Perhaps they were destroyed by natural forces or as a result of development. McAllister did not document the two rocks in Kahuku in his 1930s inventory.

A 1906 train schedule indicates that the train ran from Waimea Station to Kahuku in 24 minutes with no stops (Mayberry and Haun 1988). The railroad is depicted on Donn's 1906 map of Óahu (*Figure 13*) and on King's 1928 map of the Kahuku Forest Reserve (*Figure 14*). The 1930 USGS Lā́ie Quadrangle depicts the railroad extending through the TBR property with stations at Kawela and Kahuku Ranch (*Figure 15*). Marconi Station was located just east of the property at Punamanō Marsh.

The Kahuku Plantation continued in operation through the 1920s and 1930s. By 1935, 4,490 acres were cultivated in sugarcane, with the plantation employing 1,137 workers (O'Hare and Hammatt 2006:21). A 1920s map of the Kahuku Plantation (*Figure 16*) depicts a series of numbered sugarcane fields occupying the inland portion of the TBR property. The extent of the sugarcane fields and a plantation workers camp (Camp 3) beside the OR&L railroad are depicted on a 1932 USGS map (*Figure 17*). The map shows sugarcane fields extending to the coast and a line of houses fronting Kawela Bay. The map also shows a rock wall extending inland from the coast approximately half

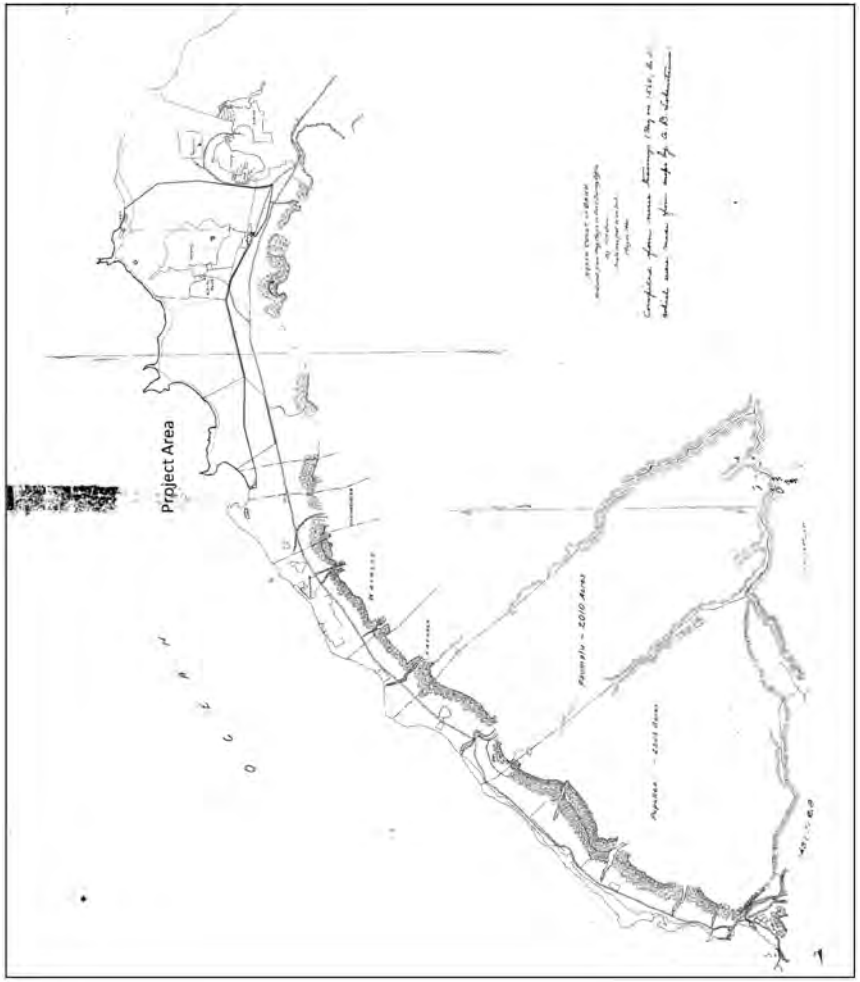


Figure 13. Portion of Donn's 1902 Map of North Coast of Oahu

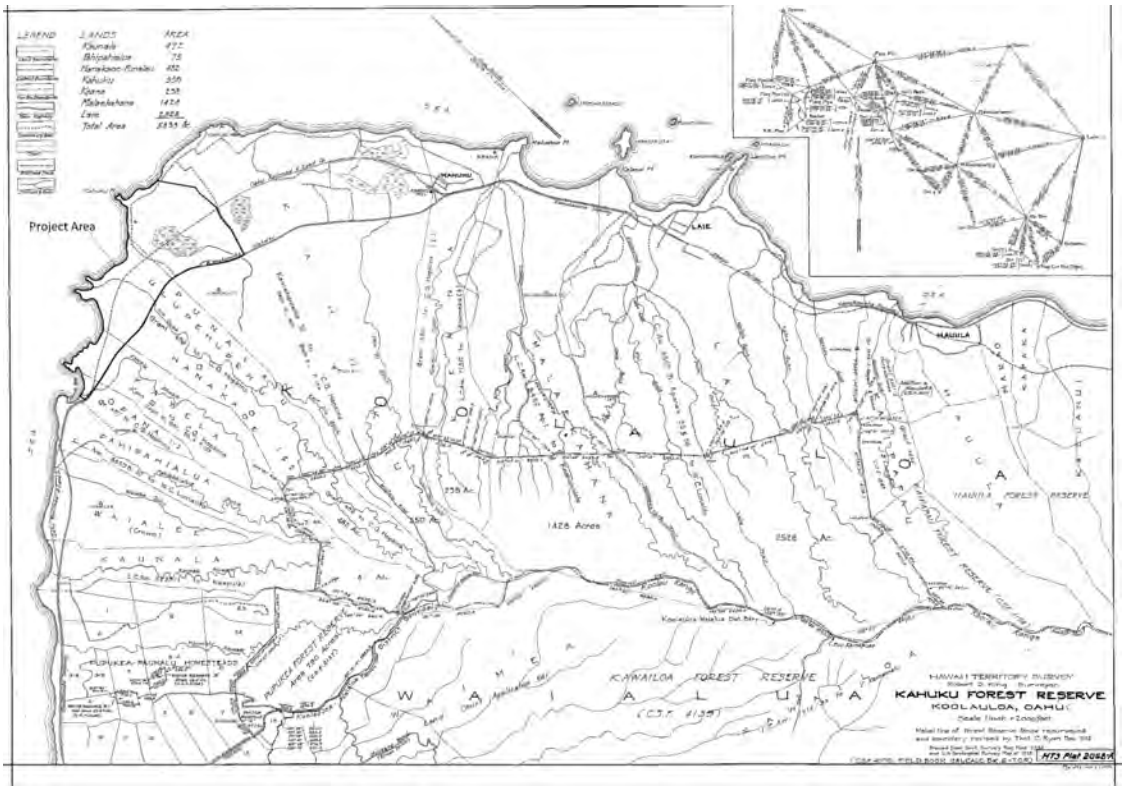


Figure 14. King's 1928 Map of Kahuku Forest Reserve

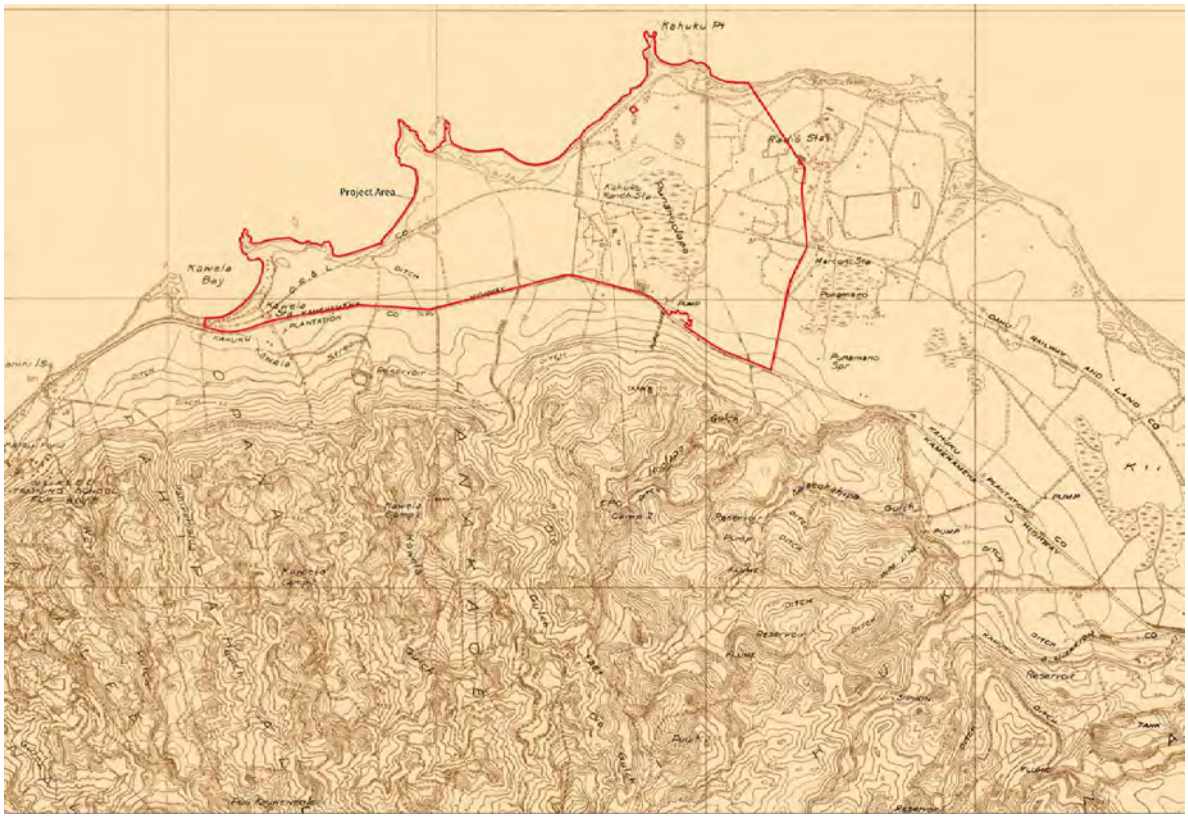


Figure 15. Portion of 1930 USGS Laie Quadrangle

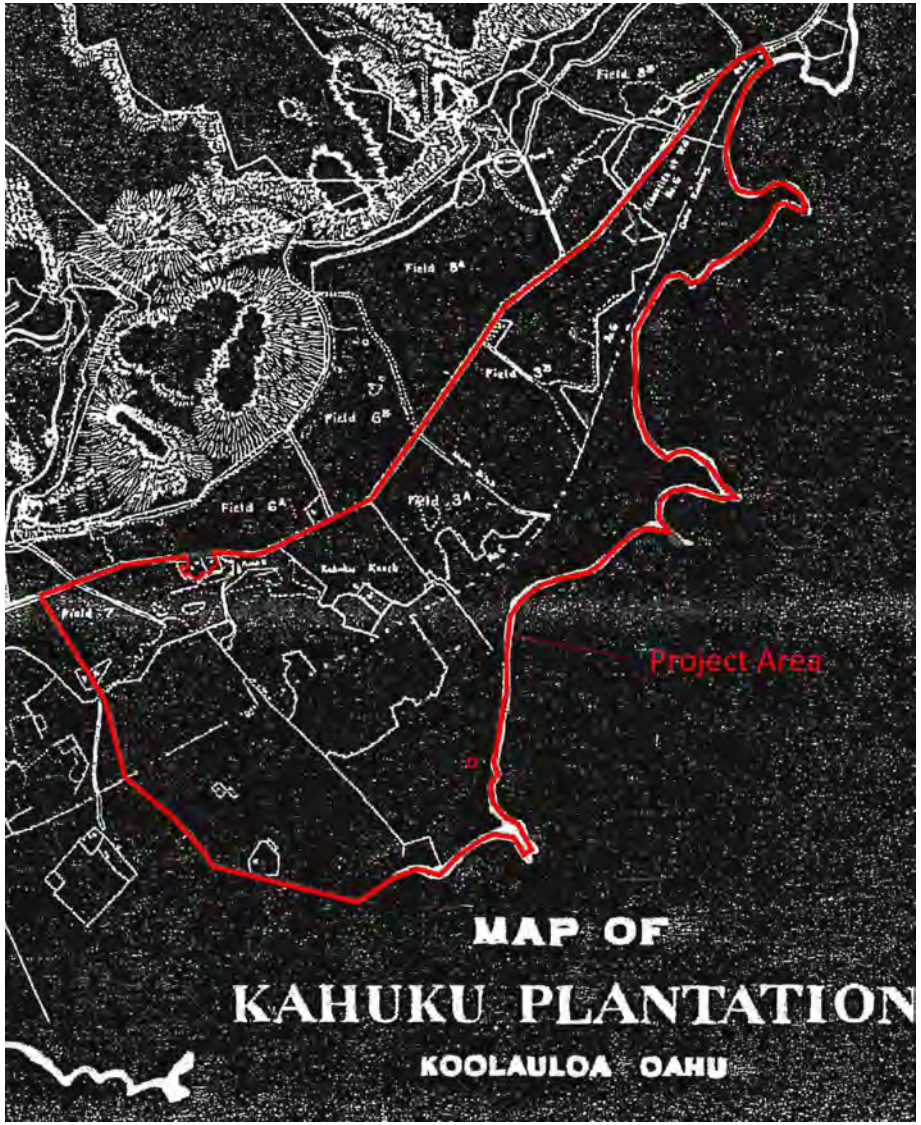


Figure 16. 1920's Map of Kahuku Plantation

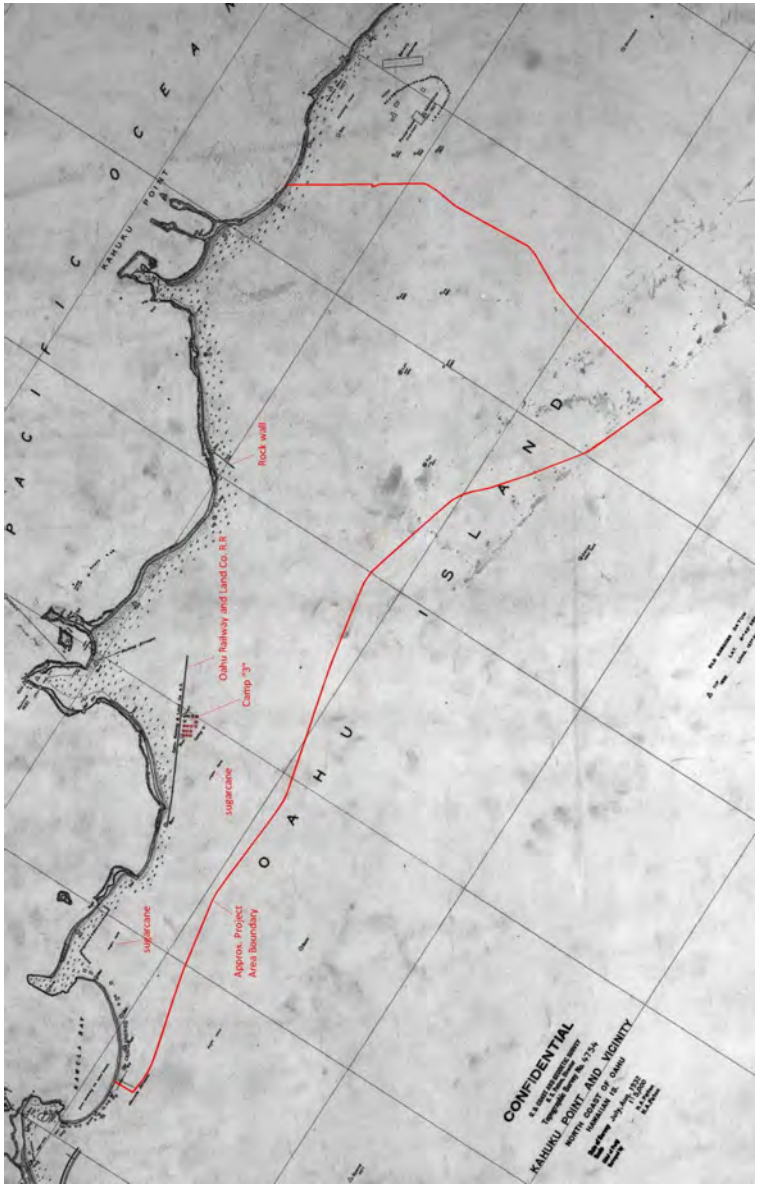


Figure 17. Portion of 1932 U.S. Coast and Geodetic Survey Map of Kahuku Point Area

way between Kahuku Point and Kuilima Point. The wall appears to correspond with one in the same location depicted on the 1890 Loebenstein map (see *Figure 12*).

In addition to sugarcane, pineapples were also extensively cultivated at Kahuku Plantation. According to Nakamura (1981:13), a lease was signed in 1916 between the plantation and C. Okuyama whereby Okuyama contracted to lease 171.5-acres for $10.00 per acre per year. Following acquisition of the leased lands, Okuyama entered into a restrictive agreement with the Hawaiian Pineapple Company:

> On November 9, 1916, Okuyama signed a "chattel mortgage" with the Hawaiian Pineapple Company Limited for a financial advance of $2,000 and further advances not to exceed $13,000. Okuyama possibly used the initial $2,000 to pay his first year's lease rent with the remainder used to buy equipment and supplies. In addition to repayment of the advance, Okuyama was obligated to contract to deal only with the Hawaiian Pineapple Co. Ltd.

Additional smaller tracts of land were also leased to pineapple growers from the OR& L Railroad Company (*ibid*.). These primarily Japanese farmers also signed "chattel mortgages" with the Hawaiian Pineapple Company. By 1934, a total of 38 mortgages had been signed between the small growers and the California Packing Corporation (CPC). Following the expiration of the leases, the Kahuku Plantation leased large tracts of land to the CPC, driving out the smaller farmers. The CPC changed its name to the Del Monte Corporation in 1967 (*ibid*.: 14).

World War II- Kahuku Army Airfield

Portions of the plantation within the TBR property were used by the U.S. Army to construct the Kahuku Airfield in 1942 (*Figure 18*). The airfield encompassed runways, taxiways, revetments, bunkers and artillery emplacements. A composite of three blueprint sheets of the airbase shows its various components (*Figure 19*); note the U-shape revetments used for airplane storage located adjacent to the runways. A recent aerial photograph of the TBR property shows the extent of the Kahuku Army Airfield facility superimposed on it (*Figure 20*) as well as a large area for barracks and other facilities inland of the airfield. According to *Figure 20*, the airfield and barracks occupied approximately 195 acres (23%) of the property.

David Trojan of the Hawaiian Aviation Preservation Society (Trojan, n.d.) presents a brief history of the construction and use of the airfield:

> There are references to Kahuku as an emergency field dating to the 1930's, but it was not until the United States entered World War II that the airfield was developed. Kahuku Army Airfield was classified as an auxiliary field and had a very short life span, from 1942 until it was closed in the late 1940's. Ground troops were stationed in the area to protect the airfield and man the shoreline fortifications. The northern tip of Oahu had a total of three airfields in close proximity during World War II. The Kahuku Point Airfield was located near the tip of Kahuku Point, and was evidently the most elaborate.
>
> The Kahuku Army Airfields were used for training of pilots from Wheeler AAF for instrument flying on different types of aircraft. The airfield was ideal for training because it had a good approach, runway length, and take off clearance. This field was not over populated like Hickam or Wheeler. It is documented that the 18th Air base Group, 47th Pursuit Squadron was stationed there along with B-24s and B-17s that were based at Kahuku for short periods of time during World War II.
>
> At the end of World War II, the military returned the Kahuku property to its owners when it was no longer needed to defend Oahu from attack and all three of the Kahuku airfields were closed.

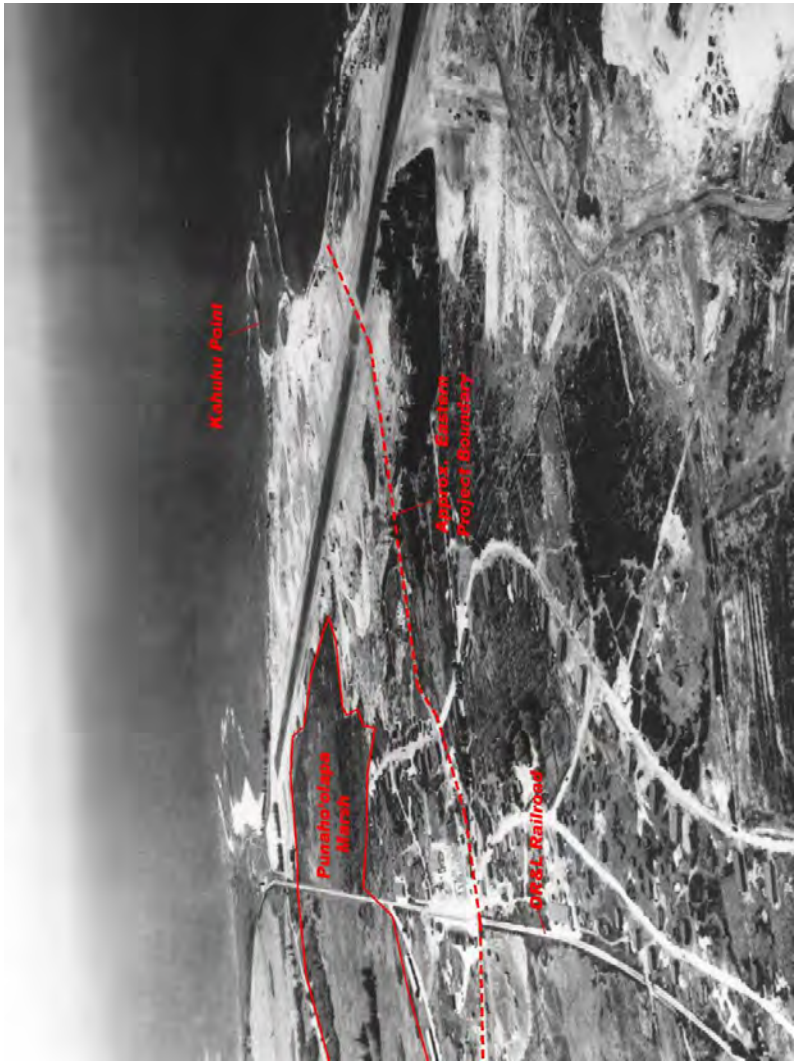


Figure 18. August 20, 1942 Photograph of Kahuku Point Airfield

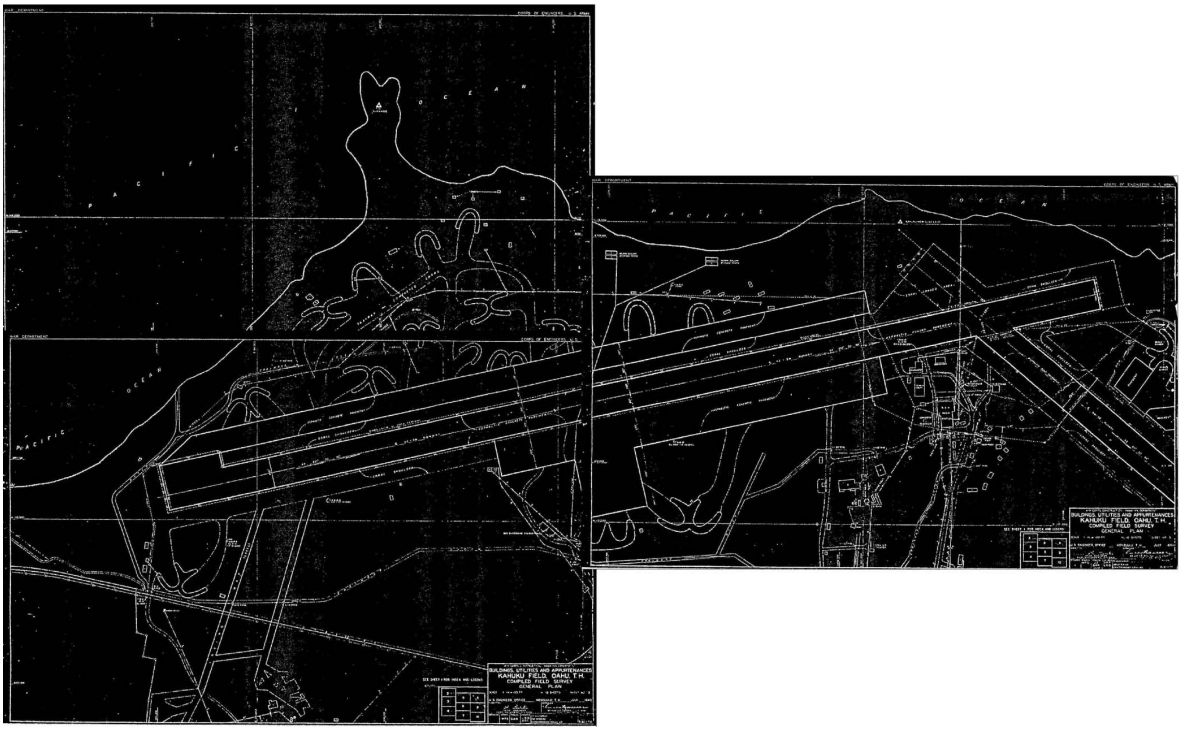


Figure 19. Composite Map of Kahuku Army Airfield (Sheets 2, 3 and 5)

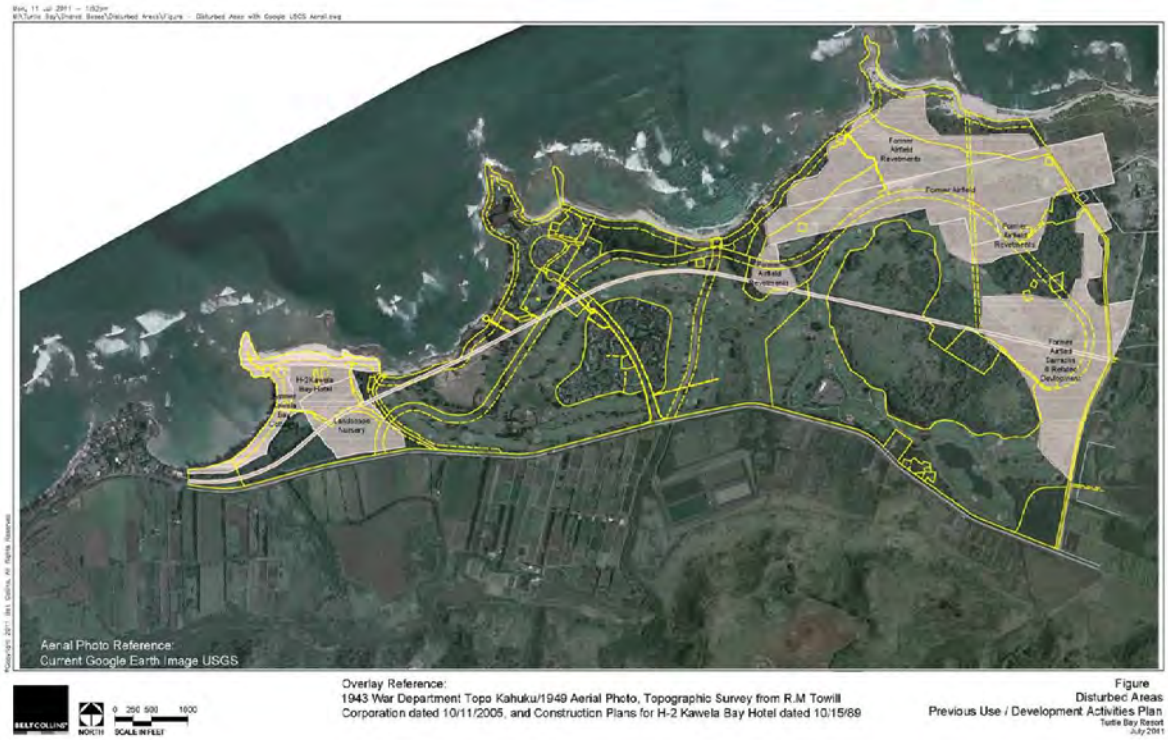


Figure 20. Aerial Photograph of Project Area showing Extent of Kahuku Army Airfield

Kahuku AAB was depicted on the 1947 Hawaiian Islands Sectional Chart as a closed airfield, having a 6,500' hard-surface runway. This was presumably the former "Kahuku Point" Airfield. The other two Kahuku airfields were not depicted at all. No airfields at Kahuku were depicted on the October 1954 Hawaiian Islands Sectional Chart. In the early 1960s prior to the opening of the Campbell Race Course, the Kahuku airfield runways were used for both drag racing & the first Hawaii Grand Prix sports car race…. At some point between 1954-77 the former Kahuku Point airfield was apparently reused as a private civil airfield, as that is how "Kuilima Air Park" was depicted on the December 1977 Hawaiian Islands Sectional Chart. It was depicted as having a single 2,700' hard-surface runway. The 1983 USGS topo map depicted a single 2,800' runway at the location of the former Kahuku Point Airfield, labeled simply "Landing Strip". However, it also depicted much longer (5,200') cleared area resembling another runway, running south of the "Landing Strip" to the south. At the site of the former Kahuku Golf Course Airfield, it depicted a 6,500' long cleared area, unlabeled.

Very little remains today of the three Kahuku Army Airfields. The Turtle Bay Hilton's golf course has absorbed two of the runways. This site is typical of a former airfield converted into a golf course. The long runways are ideal for golf fairways. Ironically, the only airfield to survive is a short length of the Kahuku Golf Course Airfield. The northwestern portion has been covered by aquaculture equipment built on the runway by a lease tenant. Very little evidence of Kahuku's World War II fortifications remain except one bunker site that is keeping its past military secrets. The entrance to the bunker is buried in sand and brush leaving only two concrete structures exposed. Scattered concrete pillboxes covered by low brush and debris can be found in the surrounding jungle. No historical markers indicating the area's past could be found. All guests and hotel staff questioned had no idea of the area's history. Currently, a small privately owned heliport for daytime VFR use only is located at the Turtle Bay Hilton next to the main hotel building.

A major catastrophic event, which is not mentioned in the preceding airfield history, but had a massive destructive impact on the recently abandoned airfield facility was the tsunami that struck Hawai'i on April 1, 1946. A recent analysis of the event's effects on the airfield at Kahuku (Keating 2008:157-168) provides a fuller understanding of the impact of such events that have influenced land use in the vicinity for centuries. The estimated 7.2 m run-up of the waves caused widespread flooding that extended 1,600 m inland and covered nearly the entire airfield facility. Following the event, standing water covered the seaward revetments and runway (see *Figure 19*). An estimated 2 million cubic meters of sand where moved by the event, both by the force of the incoming water and as it receded. Wooden buildings were destroyed and "the flood of salt water damaged vegetation and salt water infiltrated the porous soil and underlying reef rock" (ibid.:165). Massive reworking of sediments resulted from the repeated cycles of run-up and draw down that occurred with each pulse of wave energy. As many as twenty waves were recorded on a Honolulu tide gauge.

As documented, the Kahuku Army Airfield was reused as a civilian airfield after control was relinquished by the military. The civilian airport is depicted in *Figure 21*, labeled as the "Kahuku Airfield (Abandoned)". This map depicts a c. 2,250 ft long runway that extends outside the project area to the east-northeast, and a smaller 1,930 ft long runway parallel to it on the seaward side. A third runway extends southeast from the east end of the main runway for a distance of c. 3,150 ft.

Figure 21 also depicts a series of houses or beach cottages present along the east side of Kawela Bay and on the coast to the east of the bay. A second cluster of buildings inland of Kuilima Point and a row of buildings in the southeast portion of the TBR property is visible along the seaward side of Kamehameha Highway.

Figure 21. 1954 Kahuku Quadrangle

The use of the Kahuku area by the government for military training occurred between the 1950s and the early 1980s. According to Nakamura (1981:14):

> A brief investigation of the use of Kahuku land for military training purposes shows a number of leases between the United States government, C.P.C, and the Campbell Estate dating from the mid 1950s. A lease between the United States government and C.P.C is dated August 1956 and consisted of nearly 200-acres at Kahuku (TMK [Oahu] 5-6-05:1). Of more importance was the lease signed in October 1956 between the United States government and the Campbell Estate. This lease involved over 3,500 acres of land at Kahuku (TMK [Oahu] 5-6-08:1 and 5-7-02:1. Military training is practiced today at Kahuku.

The TBR property was used for sugarcane cultivation until 1971 when the property was purchased by casino developer Del Webb for the subsequent construction of the Kuilima Resort and Country Club. Aerial photographs of the TBR property taken on June 10, 1970 (*Figure 22*) and September 11, 1970 (*Figure 23*) by the Del E. Webb Corporation indicate that the majority of the parcel was under sugarcane cultivation at the time of the sale.

PREVIOUS ARCHAEOLOGICAL WORK

A search of the DLNR-SHPD archaeological report database and other sources identified 27 survey and excavation projects undertaken in the project area vicinity in the Koʻolauloa District from the Lands of Kaunala to the east and Mālaekahana to the west. These projects are summarized in *Table 4* and their locations are presented in *Figure 24*. Not included in the figure or table are the general studies by McAllister (1933), which focused on major sites throughout Oʻahu, and Sterling and Summers (1997), which also lists McAllister's sites along with information from legends and early historic observations.

Previous Archaeological Work in Vicinity of Project Area

McAllister reported nineteen sites along the coast from the Kahuku side of Waimea Bay to Kahuku Point. The sites consist of four fishing shrines, three *heiau*, six stone and rock formations with legendary significance, three fishponds, an area of saltpans, a water hole, and cliff face burial caves. Sites in the general vicinity of the project area consist of Site 255, a lava shelf with a group of lava boulders of legendary significance in the water at Pūpūkea; Site 256, a stone on the side of a bluff at Paumalū said to resemble George Washington; Site 258, Kapi Pond near Kawela Bay, and Site 262, Kukio Pond situated south of Kahuku Point.

The projects in *Table 4* cover more than 3,500 acres identifying 60 sites with 210 features. To aid in reconstructing settlement patterns, features were quantified by probable age and function, and the studies are ordered by elevation. Traditional Hawaiian features were categorized as habitation, agricultural, burial (including possible burials) and ritual. Features not assignable to these categories were categorized as miscellaneous or indeterminate. Traditional sites in this category include petroglyphs and *ahu*. Habitation sites are further subdivided into temporary and permanent for studies making this distinction. Historic features were not segregated by function in *Table 4*. The majority of the historic features are ranch walls, plantation-related features and WWII military features.

Density values are given for sites, features and habitation features. Overall, the studies have identified 5 permanent habitation features, 11 temporary habitations, 13 agricultural features and 17 burials. Density values for survey areas larger than 35 acres do not show any consistent trends by elevation. Overall feature density values for these studies vary from 0.01 to 5.0 features per acre. Habitation feature density ranges from 0.01 to 0.12

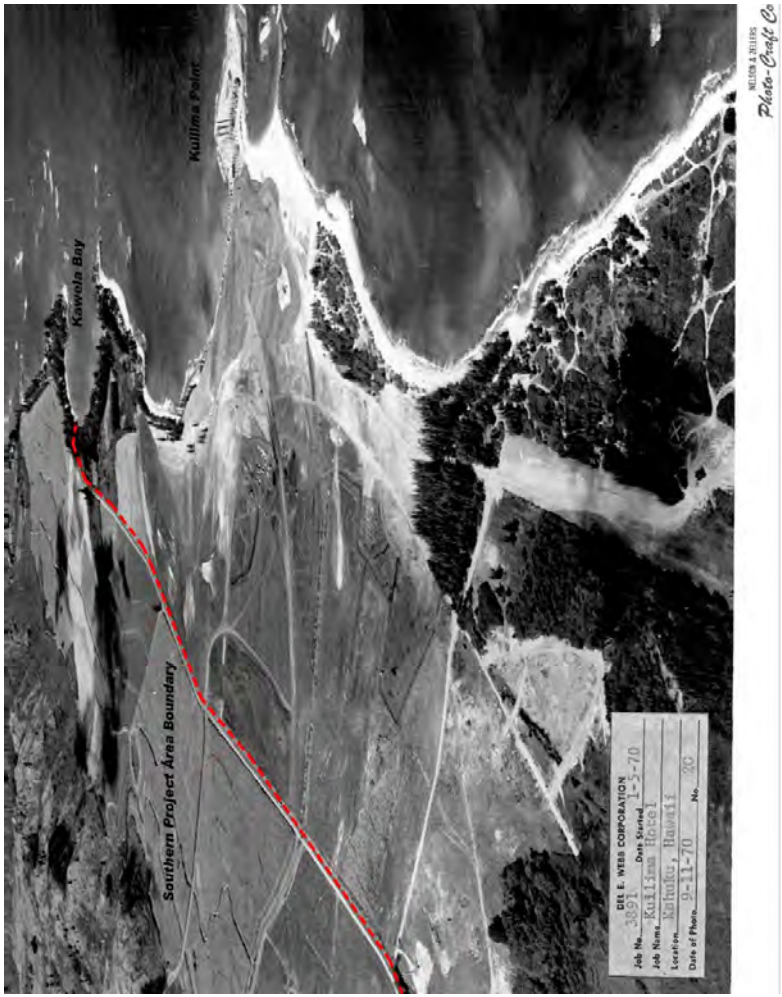


Figure 22. 1970 Aerial Photograph of Project Area

Figure 23. 1970 Aerial Photograph of Project Area

Table 4. Previous Archaeological Work in Project Area Vicinity

Author	Land	Study Type	Elevation (ft)	Historic Use	Area (ac)	Total Sites	Sites/ acre	Total Features	Features/ acre	Hab. Features	Hab. Features/ acre	Perm. Hab. Features	Temp. Hab. Features	Ag. Features	Burial Features	Historic Features	Misc. Features
Rogers-Jourdane (1982)	Kahuku	RN	0-10	Ranching, Sugarcane	45.00	0		0									
Dagher (1993), Jourdane (1994b)	Malaekahana	BR	5	?	<1	2	2.000	5	5.000						5		
Collins (1999)	Kaena	BR	5	?	<1	1	1.000	1	1.000						1		
Komori (1992)	Kahuku	BR	5	?	<1	1	1.000	1	1.000						1		
Jourdane (1994a), Hibbard (1997)	Kahuku	BR	5	?	<1	1	1.000	2	1.000						2		
Davis (1982)	Kahuku	RN	5-10	Sugarcane	1.00	0		0									
Haun and Henry (2001b)	Kaunala	IN	5-10	?	19.19	4	0.21	6	0.31	2	0.10					4	
Sinoto (1981)	Kahuku	IN	5-10	?	103.00	1	0.01	1	0.01							1	
Collins and Nees (2006)	Opana	CIA	5-10	?	<1	0		0									
Calis and Tome (2002)	Kahuku	MN	10	?	1.00	0		0									
O'Hare et al. (2004)	Kahuku	DOC	10	Processing	8.00	1	0.125	1	0.125							1	
Kennedy (1990)	Kahuku	EX	10	Processing	1.25	1	0.800	1	0.800							1	
Perzinski and Hammatt (2001)	Kahuku	IN	15-20	?	2.00	0		0									
Clark (1978), Barrera (1979), Schilt (1979), Sinoto (1986)	Kahuku and Kaena	RS	15-20	Sugarcane	57.30	10	0.175	17	0.297	7	0.12			6	3	1	
Barrera (1981, 1985), Walker and Rosendahl (1986), Jensen (1989a), Stride et al. (1992), Rechtman (2010)	Pahipahilu to Malakahana	RN, IN	20-800	Ranching, Sugarcane, Pineapple, Military	3310.00	37	0.011	148	0.045	46	0.01	5	11	7	5	72	2
Farrell and Cleghorn (1995)	Ulupehupehu and Punalau	IN	190-300	Ranching, Sugarcane, Military	18.00	1	0.07	27	1.80							27	
Hammatt (1996)	Malaekahana	RN	200	Ranching	0.50	0		0									
				Total/Average	**3566.94**	**60**	**0.20**	**210**	**0.48**	**55**	**0.08**	**5**	**11**	**13**	**17**	**107**	**2**

IN = Inventory Survey, RN = Reconnaissance Survey, MN = Monitoring Project, EX = Excavation, DOC = Documentation, CIA = Cultural Impact Assessment, BR= Burial Discovery

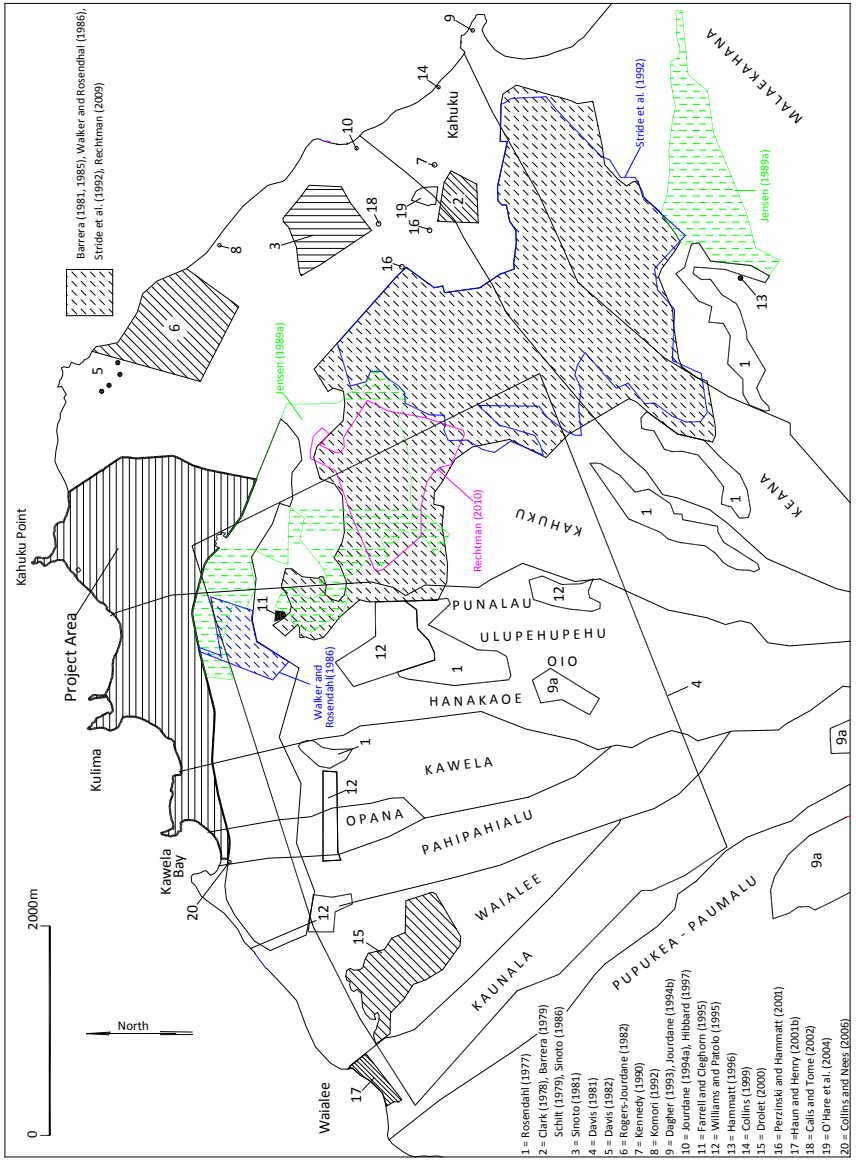


Figure 24. Previous Archaeological Work in Project Area Vicinity

features per acre. The near absence of agricultural features is also notable. The density values are extremely low compared with areas in the Kona Field System of Hawai'i Island (Haun and Henry 2000a, 2001a) where sugarcane was not cultivated historically, but are similar to values from the Hana District on Maui (Haun and Henry 2000b) where ranching and sugarcane cultivation dominated the region for over 150 years, as is the case for the project area vicinity.

Most coastal habitation sites consist of subsurface cultural deposits containing artifacts, food remains and a variety of pit features. These sites are usually interpreted as permanent habitations. Most of the temporary habitation features are overhangs along the base of cliffs at the inland edge of the coastal plain. Burials are frequently found eroding from the sand dunes along the coast and in caves in the cliff faces.

The largest survey in this area consists of a reconnaissance survey of three parcels totaling approximately 2,500 acres by Barrera (1981). Subsequent studies by Barrera (1985), Walker and Rosendahl (1986), Stride *et al*. (1992) Jensen (1989a) and Rechtman (2010) included areas within or adjacent to Barrera's (1981) study area. The combined area of these overlapping projects is approximately 3,310-acres. Thirty-six sites with 130 features are reported for this area, the majority of which are related to sugarcane agriculture. The following summaries of individual surveys are organized by land division.

The Barrera (1981) survey area was extensively impacted by sugarcane cultivation. He identified three areas containing cultural remains, all within the Land of Kahuku. In 1985, Barrera surveyed three proposed well sites in Kawela, Hanaka'oe and Kahuku but identified no sites.

In 1986, Walker and Rosendahl conducted a reconnaissance survey of a 70-acre parcel located directly inland of the TBR property on the south side of Kamehameha Highway. This project was done in conjunction with the development of a wastewater treatment plant for TBR. The survey identified an agricultural terrace and two historic irrigation ditches.

Stride *et al*. (1993) conducted an inventory survey of a 785-acre portion of the 1,666-acre Kahuku Agricultural Park located in Kahuku, Keana and Mālaekahana. Six sites consisting of four temporary habitation sites with overhangs, a temporary habitation enclosure, and a complex of permanent habitation walls, terraces, an overhang and a terrace were documented. Subsurface testing at one of the overhangs revealed a human burial.

Rechtman (2010) conducted an inventory survey of a 230-acre property for a proposed wind farm located in Kahuku. This survey identified remnants of the Kahuku Sugar Plantation (Site 4707) with individual features consisting of flumes, ditches, pipes, reservoirs, wells, pumps, markers, roads and bridges.

Jensen (1989a) surveyed two areas totaling 866 acres for proposed golf courses at Punamanō (638 acres) and Mālaekahana (228 acres). The survey identified 20 sites with 38 features consisting of temporary habitation sites, sugarcane infrastructure features and remnants of World War II military utilization.

Clark (1978) conducted an archaeological reconnaissance survey of the Ko'olauloa Housing Project and an adjacent park expansion area, located within the Lands of Kahuku and Keana. The park expansion area was subsequently developed into Kahuku Elementary School and the Kahuku District Park. Local informants identified an area referred to as "the sacred way" within the housing area. A stone platform was relocated in the park area that corresponds to Site 269 recorded by McAllister (1933). A coral slab on the platform surface was identified as a *kū'ula* or god-stone used to attract fish. Although situated outside Clark's project area, the nearby Keana Cave (McAllister Site 270) was also examined and determined to contain human remains. Schilt (1979) surveyed a 4-acre Kahuku School expansion area. The Site 269 platform and Keana Cave (Site 270) were relocated and two newly identified sites, a stone mound and an overhang, were documented.

In 1979, Barrera (1979) returned to the housing project area to conduct additional archaeological survey and subsurface testing. Five sites were identified: (1) two walls, (2) a rock-lined depression, (3) a complex of three

walls, three stone mounds and a cave, (4) a wall segment and (5) a soil mound with an attached L-shaped wall. No subsurface remains were identified during testing.

Sinoto (1981), Davis (1982), Rogers-Jourdane (1982) and Kennedy (1990) conducted archaeological reconnaissance surveys in Kahuku. The Davis and the Rogers-Jourdane surveys identified no sites. Kennedy (1990) reported no sites, although he reports that the Ki'i Ditch extended through the survey area. Sinoto (1981) identified a section of the OR&L railroad grade and documented the 100-acre Ki'i Wetlands that were assigned Bishop Museum Site No. 50-Oa-F4-10/11. The wetland also is referred to as "Kahuku Fishpond", although according to McAllister, it was always a swamp and was not used as a fishpond (1933:154).

Farrell and Cleghorn (1995) conducted an inventory survey of a 15-acre parcel situated in Ulupehupehu and Punalau. A single site with 27 features related to the agricultural and military use of the area was documented. Perzinski and Hammatt (2001) conducted archaeological inventory surveys of two detour roads to be used in conjunction with a proposed drainage improvement project. The associated drainages are located to the southwest of the Kahuku Village Subdivision and were designated as the Hospital Ditch and the Ki'i Drainage. No archaeological sites were identified in either area.

In 2001, Haun and Henry (2001b) conducted an inventory survey of a 19-acre parcel in coastal Kaunala. This project consisted of a pedestrian survey and excavation of 32 backhoe trenches. The study documented three features associated with the historic OR&L railroad, an historic house foundation and the truncated remnants of two subsurface cultural deposits. Subsequent data recovery work (Haun *et al*. 2003) documented a late prehistoric habitation deposit and the remains of a burial, both in secondary contexts.

Calis and Tome (2002) conducted archaeological monitoring for a wastewater force main replacement in the Land of Kahuku. Twelve trenches were excavated along the 670 m long corridor and exposed deposits interpreted as imported fill related to sugarcane cultivation.

O'Hare *et al*. (2004) documented the remains of Kahuku Mill. The report provides a detailed history of the mill including a summary of the various types of mill equipment used at the facility. The study included Historic Architectural and Engineering Record (HAER) photographic documentation.

Collins and Nees (2006) prepared a Cultural Impact Assessment for the replacement of the Kawela Stream Bridge located in 'Ōpana Ahupua'a. The area was surveyed during the project but no sites were identified.

On several occasions, inadvertently discovered human remains eroding from the coastal sand dunes in the Lands of Kahuku, Keana and Mālaekahana were reported to DLNR-SHPD. SHPD personnel documented the finds (Komori 1992; Dagher 1993; Jourdane 1994a and 1994b; Hibbard 1997; and Collins 1999), and the remains were returned to the original locations and stabilized to prevent further disturbance.

The studies by Walker *et al*. (1988a, b), Jensen (1989a) and Stride *et al*. (1992) report 38 radiocarbon dates. Many of the age determinations results produced multiple age ranges or long single age ranges between the 1600s and 1950. When all portions of all potential age ranges are examined, two results span the AD 1000s, three each include the 1100s and 1200s, eight span the 1300s, 18 include the 1400s, 19 span the 1500s, 28 span the 1600s and 16 each include the 1700s and 1800s. The results suggest initial use of the area occurred between A.D. 1000 and 1200, followed by a gradual increase between the 1300s and 1500s. The most intensive use dates to the 1600s with declining use in the 1700s and 1800s.

Figure 24 also depicts a series of four surveys that were conducted within the Kahuku Training Area (KTA) by Rosendahl (1977), Davis (1981), Williams and Patolo (1995) and Drolet (2000). These projects are not however included in *Table 4* as the majority were not available for review. The findings from these surveys, summarized in Drolet (2000) are presented below.

Rosendahl (1977) conducted a limited survey of several inland gulches within the KTA. This was followed by a brief reconnaissance-level survey by Davis (1981) conducted in unspecified portions of the KTA area. These studies identified nine sites associated with historic and pre-contact agricultural and habitation activities. Williams and Patolo (1995) undertook a subsequent study of inland gulches and bluff areas in the KTA. This survey identified seven sites with traditional agricultural, habitation and ritual functions and two World War II era military bunkers.

Drolet (2000) conducted an inventory survey of ac. 410-acre portion of the c. 16,000-acre Area A-1 of the KTA. This study resulted in the identification of 13 sites consisting of a burial cave, two temporary habitation rock shelter sites, two agricultural terrace sites, an *ahupua'a* boundary wall, an historic road, two World War II era bunkers and four sites that were assigned an indeterminate function.

Previous Archaeological Work within the Project Area

At least sixteen archaeological studies have been conducted within the boundaries of the TBR property. In addition, a mitigation plan, a data recovery plan and a burial treatment plan have been prepared for project area cultural resources. These studies and plans are summarized in *Table 5* and their locations are presented in *Figure 25*. Twenty-six sites have been identified, including 25 burials. These studies report a total of 654 excavations of various types consisting of 444 auger cores, 153 "test" units, 29 backhoe trenches, 21 surface exposures and 7 shovel tests. The exposures consist of places where subsurface strata were evident in eroded sand dune faces, drainage banks and old excavations. Most of the "test" units are 1 sq m excavations conducted during testing phases or work; however, the Corbin (2003) report describes 32 "test" units that actually are designations for block excavation units at Kawela Bay (Areas A and D). Eight of these "test" units are 4 sq m in area and the rest are 1 sq m, yielding a total of 71 square meters of data recovery excavations.

J. Gilbert McAllister of the Bernice P. Bishop Museum conducted the earliest archaeological investigation during his island-wide survey of O'ahu. One site in the project area was identified, consisting of Kukio Pond. According to McAllister (1933:153):

> Site 262. Kukio Pond, a natural basin filled with brackish water, located about 300 feet [90 m] from the sea, Kahuku Point. The pond was formerly much larger and contained many kinds of fish. It is said to have been surrounded by a large Hawaiian settlement. Mrs. John Kaleo is probably the only survivor and her former friends and relatives have been buried in shallow graves in the sand between the pond and the sea.

Kukio Pond was filled, probably during the construction of the Kahuku Army Airfield. The estimated location of the pond is presented in *Figure 26*, inland of Kahuku Point and seaward of the north side of Punaho'olapa Marsh. According to Handy and Handy (1972:462), taro terraces once existed around the pond, but:

> There seems no evidence of old terraces in the uplands along either branch of Kahuku Stream, but in the seaward swampland north and south of Kukio Pond [which would have included Punaho'olapa Marsh] there are such remains.

The B.P. Bishop Museum conducted an archaeological reconnaissance survey of 649-acres in the project area (Dye 1977). The study included pedestrian survey of a 98-acre area to the west of the TBR property along Kawela Bay and a 551 acre area to the east of the resort at Kahuku Point. Four sites were identified by Dye (1977): a remnant of Kapi Pond, two cultural deposits and a possible cultural deposit. The remains of Kapi Pond were identified along the west side of Kawela Bay, outside the project area. This pond was previously identified by McAllister (Site 258) and was subsequently assigned BPBM Site No. 50-OA-F3-1.

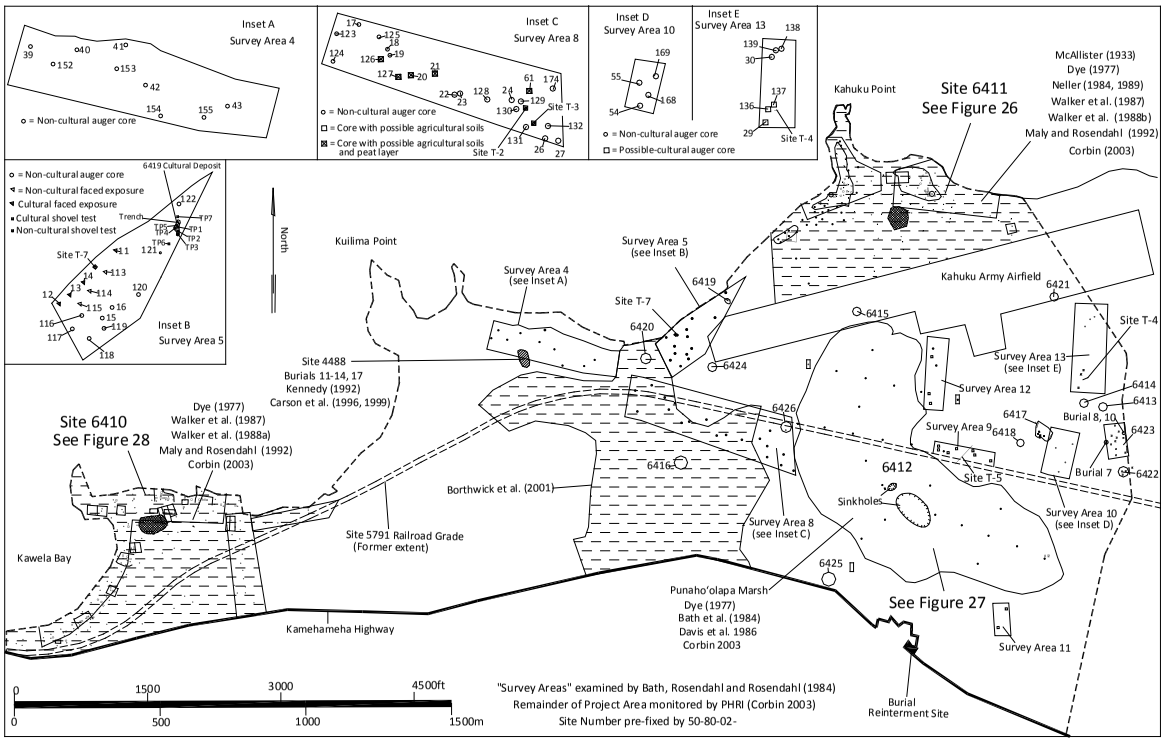


Figure 25. Location of Previous Archaeological Work in Project Area

Table 5. Previous Archaeological Work within Project Area

Author	Company/ Organization*	Location	Study Type	Excavations					Comment
				Auger Tests	Test Units	Backhoe Trenches	Exposure Examinations	Shovel Tests	
McAllister (1933)	Bishop Museum	Survey of Oahu	General Survey						Identified Kukui Pond (Site 262), filled in during construciton of Kahuku Airfiled
Dye 1977	Bishop Museum	Kawela Bay, Kahuku Point, Punaho'olapa Marsh	Reconnaissance		1	1			Identified Kapi Pond (Site 258) remnant, two cultural deposits and one poss. cultural deposit
Neller (1984)	SHPD	Kahuku Point	Osteological examination						Examination of three sets of human remains exposed in dune area
Bath et al. (1984)	PHRI	Kuilima Resort Expansion	Surface and Subsurface Testing	124			11		Examined 13 survey areas and identified four surface features and five subsurface deposits
Davis et al. (1986), Corbin (2003)	PHRI	Punaho'olapa Marsh	Subsurface Testing and Mapping of Sinkholes	27	4	3			Data recovery excavations in Punaho'lapa Marsh
Walker et al. (1987), Corbin (2003)	PHRI	Kuilima Resort	Data Recovery Plan	43	44	5			Data recovery plan and excavations at Kahuku Point and Kawela Bay
Walker et al. (1988a)	PHRI	Excavations with Kawela Bay Archaeological Area	Subsurface Testing	140	36				Identified four discrete cultural deposit areas with abundant cultural remains numerous subsurface features and two burials
Walker et al. (1988b)	PHRI	Excavations with Kahuku Point Archaeological Area	Subsurface Testing	105	38		8		Identified three discrete cultural deposit areas with abundant cultural remains numerous subsurface features and three burials
Neller (1989)	SHPD	Kahuku Point	Osteological examination						Examination of human remains exposed n dune area
Jensen (1989b)	PHRI	Kuilima Resort	Mitigation Program						Proposed four-phase mitigation program for Kawela Bay Archaeological Area and Punaho'olapa Marsh
Sullivan (1990, 1991), Dunn (1991), Donohue (1991), Corbin (2003)	PHRI	Kuilima Resort	Archaeological Monitoring	5	30	20	2	7	Identified 14 new sites
Maly and Rosendhal (1992)	PHRI	Kuilima Resort	Burial Treatment Plan						Burial treatment plan for human remains noted within project area
Kennedy (1992)	ACH	Kuilima Point Burials	Burial recovery/testing						Examination of human remains noted during construciton
Carson et al. (1996, 1999)	ACH	Kuilima Point Burials	Burial recovery/testing						Examination of human remains noted during construciton
			Total Excavations	444	153	29	21	7	

** ACH = Archaeological Consultants of the Pacific, PHRI = Paul H. Rosendahl, Inc., SHPD = State Historic Preservation Division*

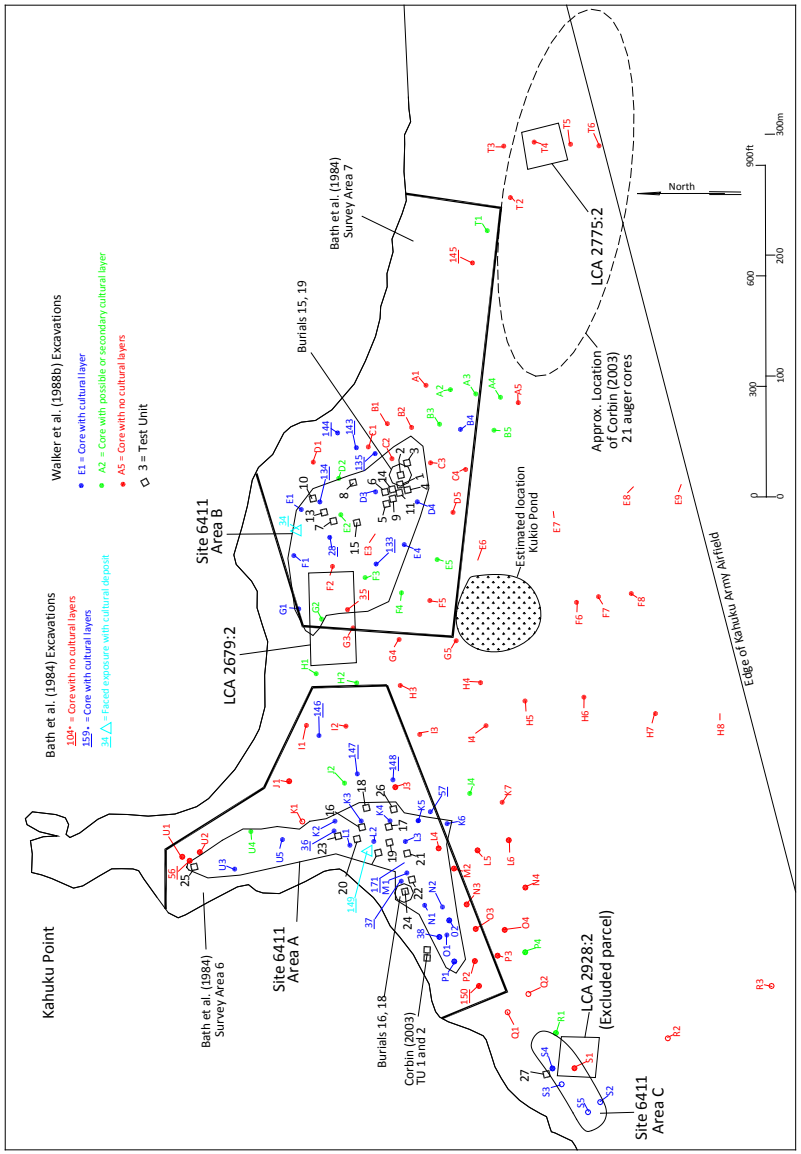


Figure 26. Excavations within Kahuku Point Archaeological Area (Site 6411)

One cultural deposit was identified along the inland side of the sand dunes at Kahuku Point (see *Figure 26*). This site was designated BPBM Site 50-OA-F4-14 and was subsequently assigned State Inventory of Historic Places (SIHP) Site 50-80-02-6411. A test unit was excavated into the deposit revealing four stratigraphic layers. No cultural remains were present in Layers I and II. Layer II contained fire pits, midden, a stone fishing sinker and metal debris. Charcoal was present in the Layer IV deposit.

BPBM Site 50-OA-F4-15 (SIHP Site 6412) is a cultural deposit located adjacent to the OR&L railroad grade near Punahoʻolapa Marsh area (*Figure 27*). The deposit was evident in the wall of a backhoe trench and included a black clay layer that was interpreted as the remnant of a prehistoric agricultural plot. It is likely that this deposit corresponds to the cultivated swampland described for this area by Handy and Handy cited previously.

The fourth site reported by Dye (1977) consisted of two layers of gray sand noted in the eroded face of a dune west of Kahuku Point in the vicinity of Kahuku Army Air Field. These soil layers were considered to be a "possible site", but were not assigned a site designation because no test excavation was conducted to confirm the nature of the deposit (*ibid.*: 3).

In 1984, the discovery of human remains in the dunes east of Kahuku Point was reported to DLNR-SHPD. Sand vehicles using the area disturbed the remains. Earl Neller (1984) of the SHPD visited the site and examined the remains that had been collected. These remains consisted of two complete human skeletons and a partial skeleton. The site was subsequently designated "Burial 15" of Site 6411 (see *Figure 26*).

Later in 1984, Paul H. Rosendahl, Ph.D. Inc. (PHRI) conducted an archaeological reconnaissance survey of the Kuilima Resort Expansion Area (Bath *et al*. 1984). The survey area included a proposed golf course adjacent to the existing TBR and a proposed hotel at Kawela Bay.

The PHRI survey work consisted of seven specific tasks (*ibid*.:3):

1. Inspection of all existing subsurface exposures for presence of cultural deposits or features (especially burial features with skeletal remains);
2. Subsurface testing of proposed drainage and stream alignments or realignments passing through both the Kuilima Resort property and the adjacent shoreline area (State Conservation District);
3. Subsurface testing in vicinity of Site F3-1, Kapi Fishpond, for presence of buried cultural deposits (Dye 1977:2);
4. Subsurface testing of the previously identified "possible site" to determine if exposed gray deposit is cultural (Dye 1977:3);
5. Subsurface testing of Site F5-15 to determine if the exposed black layer represents evidence of prehistoric wetland agriculture (Dye 1977:6);
6. Subsurface testing at Site F-4-14 to clarify the nature, age and horizontal extent of previously identified buried cultural deposits (Dye 1977:3-5); and
7. General subsurface reconnaissance testing to sample remaining areas within the expansion project area.

Task 3 subsequently was deleted from the scope of work because the area was outside the resort expansion property. This task was replaced with additional subsurface testing in several areas bordering Punahoʻolapa Marsh. The subsurface testing work included excavation of 124 auger tests and the documentation of 11 exposures along berms, road cuts and sand dunes. The auger tests were located in 13 "Survey Areas" (Nos. 1-13; see *Figure 25*). Several discretionary test units were also excavated. The survey identified seven new sites (T-1 through T-7), of which five were tested in addition to subsurface testing at two previously identified sites (F4-14, -15). The tested sites are described below in the order as originally presented by Bath *et al*. (1984). The untested sites consist of an enclosure of wooden posts and corrugated sheet metal (Site T-3) in Survey Area 8 and a stacked limestone wall (Site T-5) in Survey Area 9.

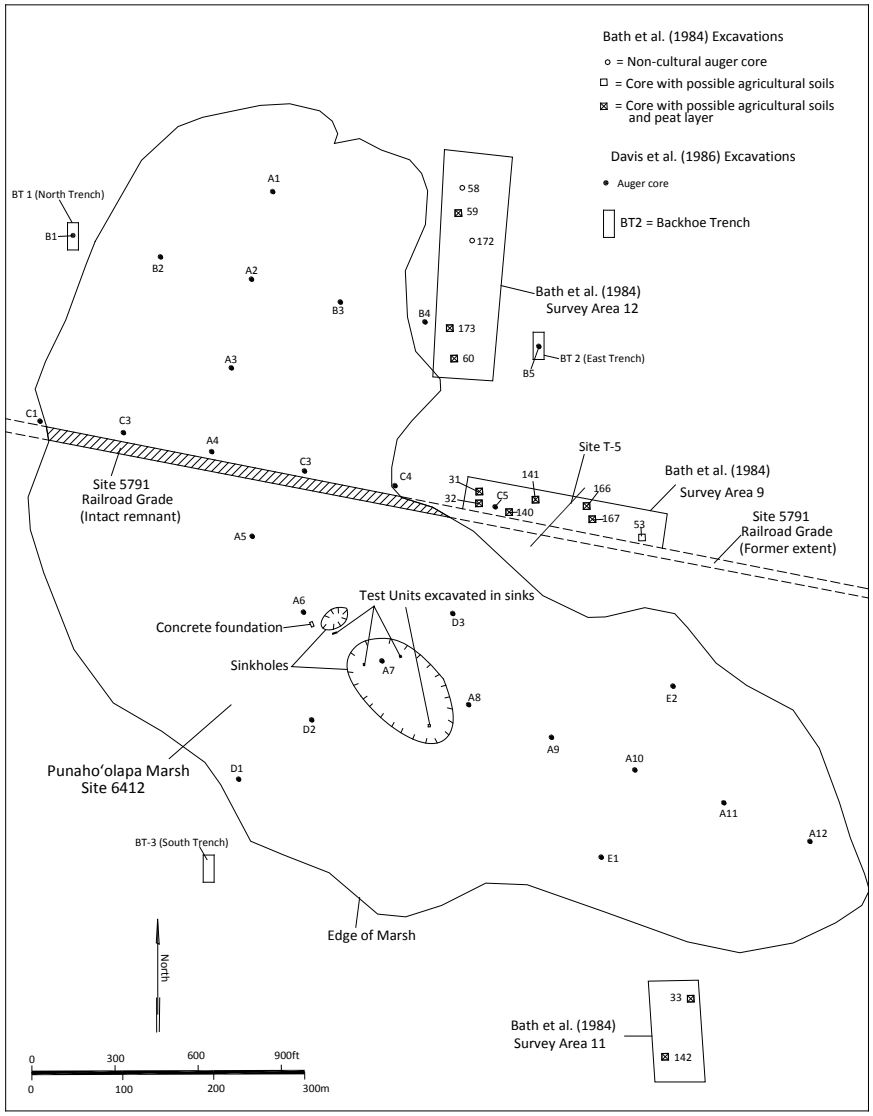


Figure 27. Location of Excavations within and adjacent to Punahoʻolapa Marsh (Site 6412)

Site T-6 (subsequently assigned SIHP Site 6410) is located in Survey Area 1 (*Figure 28*). It consists of a subsurface cultural deposit identified as a result of the excavation of 20 auger tests along the east shore of Kawela Bay and the shoreline north of the bay. The cultural deposit was evident in 17 of the tests. The deposit is described as a 0.12 to 0.56 m deep surface layer of a brown to black silty sand containing large quantities of marine shells, charcoal and a bone fishhook. One auger test (TU-112) penetrated a "capped underground solution chamber" and recovered a piece of human bone and three basalt flakes (Bath *et al*. 1984:22). The site was determined to likely extend west along the bay outside the project area, but not inland of the "coastal fringe" to the east where the land had been plowed for farming since at least 1927, based on review of aerial photographs.

Site T-7 is the "possible site" noted by Dye (1977) located in Survey Area 5 between Kuilima and Kahuku Points (see *Figure 25*). Nine auger tests and seven faced exposures were documented in this area (Bath *et al*. 1984: 25); four exposures encountered two cultural layers in the seaward face of coastal dune. The cultural layers overlie a non-cultural sand deposit (Layer IV). One auger test, which was excavated on the inland side of the dune where the two cultural layers were absent, recovered ironwood tree needles and cones from beneath Layer IV. Based on the assumption that the Layer IV deposits on the seaward and inland sides of the dune were contemporaneous, Bath *et al*. (1984) indicated that the two cultural layers were likely historic in origin because ironwood trees were introduced to Hawaii in the 19th century.

Site 50-Oa-F4-14 (SIHP Site 6411, Area B) is a cultural deposit documented by Dye (1977) at Kahuku Point that is located in the Bath *et al*. (1984:27-29) Survey Area 6, where 11 auger tests and one faced exposure were documented (see *Figure 26*). Nine of the auger tests encountered two to three cultural layers containing charcoal, bone and shell midden. The uppermost cultural layer was considered to be historic in age and the lower ones attributed to prehistoric occupation.

Site T-1 (subsequently assigned SIHP Site 6411, Area A) is located in the Bath *et al*. (1984) Survey Area 7, east of Kahuku Point (see *Figure 26*), where eight auger tests and one exposed face were documented. Two cultural layers, encompassing an area 240 m long (east-west) by 140 m wide, were identified in the auger tests. Marine shells, bones (bird, fish, and mammal), charcoal and a single volcanic glass flake were recovered from the auger tests. Several of the auger tests were excavated in the vicinity of the three burials reported by Neller (1984) and one test exposed additional human remains.

Site T-2 is an L-shaped wall made of limestone in Survey Area 8, where 23 auger tests were excavated without encountering any cultural material. A single test (TU 25) was excavated next to the T-2 wall that Bath *et al*. (1984:23) noted might correlate with walls depicted on Loebenstein's 1890 map of Kahuku Plantation (see *Figure 12*).

Five auger tests were excavated and two exposed faces were documented in Survey Area 9, near Punahoʻolapa Marsh where Site 50-OA-F4-15 (SIHP Site 6412), a cultural deposit initially identified by Dye (1977), is located (see *Figure 27*). Three of the auger tests identified a layer of dark gray clay over a black peat deposit. This formation is typical of the Pearl Harbor clay soil type and led Bath *et al*. (1984) to re-interpret it as natural deposit instead of an agriculturally modified soil, as originally suggested by Dye (1977).

Site T-4 is a military feature in Survey Area 13 where six auger tests were excavated without encountering cultural material. The feature is described as an octagonal, formed concrete structure with no roof that is 2.25 m in diameter and 1.22 m high (Bath *et al*. 1984:37). A second concrete structure was located nearby but not recorded.

Bath *et al*. (1984) identified an isolated human incisor on the ground surface in Survey Area 12 and a burial was observed eroding from a dune to the west of Kahuku Point. The burial was reported to the Honolulu Police Department, who disinterred it on April 3-4, 1986. These remains were subsequently examined by Neller (1989) and were eventually designated as Feature 16 of Site 6411 (see *Figure 26*).

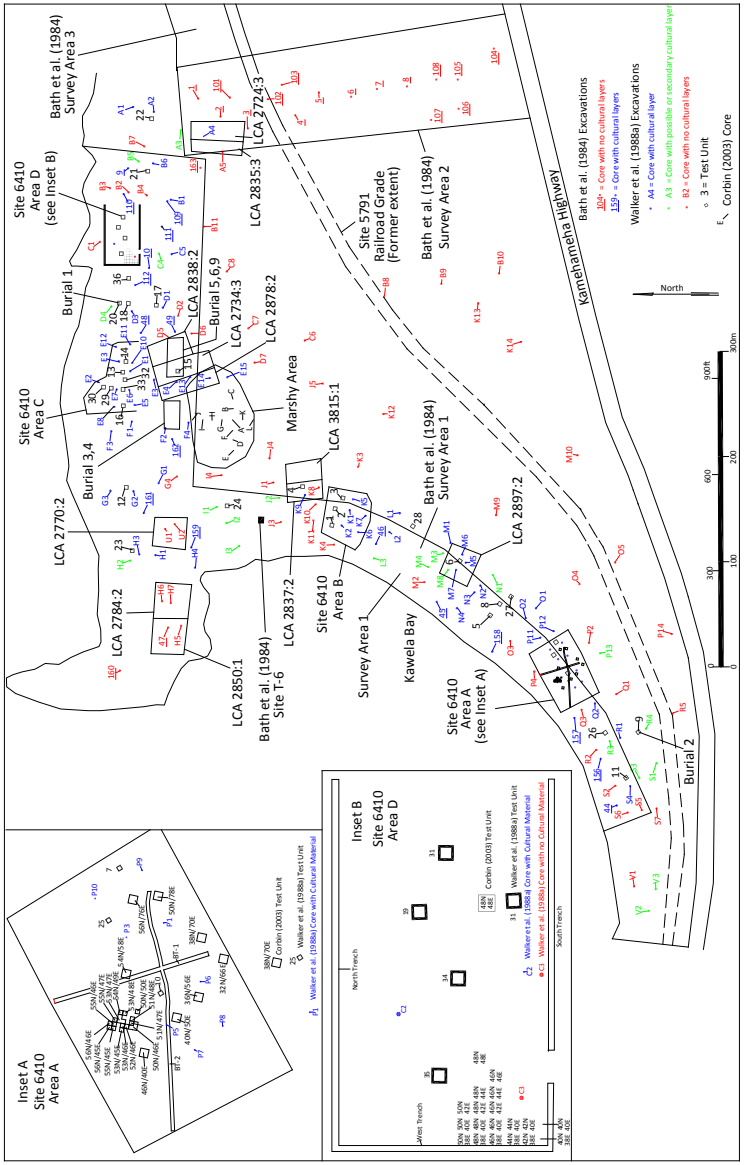


Figure 28. Excavations within Kawela Bay Archaeological Area (Site 6410)

In January and February of 1986, PHRI (Walker *et al*. 1988a) undertook a survey at the Bath *et al*. (1984) Site T-6 at Kawela Bay. The site was named the Kawela Bay Archaeological Area and assigned the BPBM Site No. 50-Oa-2899. The site was subsequently assigned SIHP Site No. 6410 and was determined to be eligible for nomination to the NRHP in an August 13, 1985 letter from Susumu Ono of SHPD to Everett A. Flanders of the U.S. Army Engineer District.

Walker *et al*. (1988a) excavated 140 auger cores and 36 test units along the east side of Kawela Bay and the shoreline to the north (see *Figure 28*). The testing effort extended inland from the coast approximately 300 m. Cultural deposits were identified in 64 cores, primarily in cores located seaward of a dirt road that paralleled the beach. Thirty-six test units were excavated along the shoreline to define four cultural deposits, designated A-D (see *Figure 28*). Area A is on the east-central portion of the bay, Area B is on the east side of the bay, and Areas C and D are on the shoreline north of the bay. Large quantities of food remains consisting of marine shells and bones (bird, fish, and mammal), and 454 artifacts of shell, bone and stone were recovered from the excavations. The excavations also documented 50 subsurface features including post molds, rock alignments, fire pits, ash lenses and charcoal lenses. Several historic artifacts were recovered and charcoal samples from 17 locations were submitted for radiometric age determination.

Walker *et al*. (1988a: 67-69) documented human remains in two locations. A stone-lined burial cist was identified in TU-20, between Deposit Areas C and D. The cist was encountered at the base of the excavation unit, capped by large limestone slabs. A complete human skeleton (Burial 1) was interred within the cist. The burial cist corresponds to the location of the "natural solution cavity" where Bath *et al*. (1984) discovered a human bone fragment in an auger test (TU-112). A subsurface pit (HF 45) was identified in Test Unit 9 (TU-9), situated southwest of Deposit Area A. Human remains (Burial 2) were present within the pit. Both the cist burial and the pit burial were left in place and the excavations were backfilled. Subsequently, in 1990 or 1991, the burials were moved.

From March to April of 1986, PHRI conducted test excavations at the Kahuku Point Archaeological Area (Walker *et al.* 1988b; see *Figure 26*). This area corresponds to Site 50-Oa-F4-14 recorded by Dye (1977) and was subjected to auger coring by Bath *et al*. (1984). The area examined by Bath *et al.* (1984) east of Kahuku Point designated as Site T-1, and Site 50-Oa-F4-14 on the east side of Kahuku Point were combined into a single site by Walker *et al*. (1998b), designated Site 50-Oa-2911. This site was subsequently designated SIHP Site 6411.

Walker *et al.* (1998b) documented eight stratigraphic exposures in the dunes at Kahuku Point and excavated 105 auger cores and 38 test units there. The cores extended from the coast up to 100 m inland. Cultural deposits were identified in 20 of the cores, all within 50 m of the coast. These deposits were noted in three discrete areas designated Areas A-C. Area A is located on the west side of Kahuku Point, Area B east of the point and Area C west of Area A (see *Figure 26*).

The test units were excavated in the three areas. Excavation yielded food remains consisting of marine shells and bones (bird, fish and mammal); stone, shell and bone artifacts; and 44 subsurface features including post molds, charcoal concentrations and fire pits. Charcoal samples collected from 21 locations were submitted for radiometric age determination. Three human burials were identified during the test unit excavations. Two burial pits, designated Burial 19, were identified in TU-2 in Area B and one burial pit was indentified in TU-24 in Area A (Burial 18). The burials were left in place and the units were backfilled.

Concurrent with the Walker *et al*. (1988b) survey at Kahuku Point, PHRI also undertook testing at Punaho'olapa Marsh (Davis *et al*. 1986; see *Figure 27*). This area was previously documented as Site 50-Oa-F4-15 by Dye (1977) and portions were tested by Bath *et al*. (1984) in Survey Area 9. During the Davis *et al*. (1986) study, the marsh was designated BPBM Site 50-Oa-2912; the site was subsequently designated SIHP Site 6412. Davis *et al*. (1986) released a preliminary report of the testing results and the full descriptive account of the work was included in the Archaeological Mitigation Report for the Kuilima Resort Expansion Project (Corbin 2003).

According to Corbin (2003:193), initial examination of the marsh area identified three large limestone sinkholes and several associated walls in the vicinity of the Bath *et al*. (1984) Survey Area 8. The sinkholes varied in size from 5.0 to 15.0 m and in depth from 2.0 to 3.0 m. The largest was partially filled with alluvium. The second sinkhole had been used as a trash dump and contained rusted metal, bottles and jars dating between the 1870s and 1890s. The floor of the third sinkhole was flooded.

Four test units were excavated at the sinkholes. Two test units were excavated within the largest sinkhole (Units 1 and 4), one was excavated in the sink used as a dump (TU-2) and one was located adjacent to the water-filled sink next to a stone wall (TU-3). According to Corbin (2003:197), "these test units appear to have been excavated into a generally heavily disturbed area, as evidenced by surface and subsurface historic artifacts, trash in subsurface layers and bulldozer tracks in the area".

Additional subsurface testing undertaken by Davis *et al.* (1986) included three backhoe trenches and 27 sediment cores obtained with a modified Livingston coring device used for sampling submerged sediments. The typical stratigraphy observed in the cores consisted of seven strata overlying limestone bedrock. Three major stratigraphic units were defined: (1) a 1.0 to 1.5 m thick organic root and rhizome mat submerged under 0.1 to 0.2 m of water, (2) an unconsolidated peat-like organic deposit 3-3.5 m thick, and (3) a 0.04 to 0.1 m thick layer of "diagenetic carbonate silt" overlying limestone bedrock (Corbin 2003: 202). Charcoal was collected from three of the cores (A1, B1 and B3).

The three backhoe trenches were excavated around the perimeter of the marsh. These excavations revealed five to nine layers of clays to peaty clay deposits and were terminated within the water table. Land snails and charcoal were present in all three of the backhoe trenches. Twelve charcoal samples were submitted for radiometric age determination, nine from the backhoe trenches and three from the cores. Two hundred and twenty pollen samples were submitted for analysis from two of the trenches and all of the cores. These samples yielded a "record of the vegetation for the past 7,000 years of for this area of the Kahuku plain of northeastern Oahu" (*ibid*.:209). Based on the testing with the marsh, Corbin states, "…prehistorically, the marsh may have supported a more open and wetter environment than at present, with loulu palms [Pritchardia] being a dominant element" (*ibid*.:210).

In 1987 Walker *et al*. (1987) prepared a Data Recovery Plan (DRP) for the Kuilima Resort, to mitigate Site 2899 at Kawela Bay and Site 2911 at Kahuku Point. These sites were subsequently assigned SIHP Sites 6410 and 6411, respectively. Three research questions were proposed to guide the data recovery work:

1. What is the nature of the intra-site spatial organization or site structure?
2. What is the social composition (age, sex and relative social status) of the site occupants? and;
3. What is the nature and sequence of site occupation?

Walker *et al*. (1987) proposed excavation of six backhoe trenches at the Kawela Bay Site (6410), with two trenches in Area A and four within Area D. A similar approach was proposed for the excavations at the Kahuku Point Site (6411). Additionally it was proposed that excavations be undertaken in a small marsh inland of Kawela Bay and at the buried Kukio Pond at Kahuku Point.

This data recovery work fieldwork commenced in November 1990 shortly after SHPD approval of the Walker *et al*. (1987) DRP and was completed in July 1991; however, analysis and reporting of the work was suspended for nearly a decade and was not completed until 2003. The data recovery findings were reported in the Corbin (2003) Archaeological Mitigation Report for the Kuilima Resort Expansion Project. According to Corbin the data recovery field work included excavation of 44 excavation units totaling 102 sq m in extent, 5 backhoe trenches and 40 auger cores (see *Figure 28*).

The excavations at the Site 6410, Kawela Bay Archaeological Area consisted of 42 excavation units (99.94 sq m), five backhoe trenches and 12 auger cores. Twenty-three of the excavation units and two of the backhoe trenches were situated within Area A. These excavations revealed a stratified subsurface cultural deposit that encompassed

an area 60 m long by 46 m wide. Fifty hearth features and 8 postholes were documented, and a large assemblage of subsistence remains and artifacts was recovered for analysis.

The remaining 19 excavation units and three trenches were excavated in Area D. These excavations indicate that Area D is c. 60 m long by 30 m wide and also characterized by stratified cultural deposits. Excavations documented 63 hearths and earth ovens (*imu*) and 80 postholes. Large quantities of subsistence remains and artifacts were recovered.

Twelve auger cores were excavated in a marshy area inland of the northern end of Kawela Bay. The area was the reported location of Waikū Pond, depicted in *Figure 8*. The coring was undertaken to identify evidence of pre-contact agricultural use of the marshy area; however, it was determined that the marsh was a sinkhole that had been filled in and compacted by contractors (Corbin 2003:88). No cultural remains were present in the cores.

Data recovery work at the Site 6411 Kahuku Point Archaeological Area included excavating 21 auger cores and two test units. The excavations were not as extensive as outlined in the DRP because shortly after the fieldwork began, Kuilima Resort Development Co. decided that the area would not be developed and all work was terminated. The excavated test units recovered substantial quantities of food remains and several stone artifacts. Ten soil features including five hearths or fire pits, four postholes and a large pit of undetermined function were documented. Marine shells, metal and glass were present in the cores.

In 1989, Jensen (1989b) prepared Phases I and II of a four-phased mitigation program for the Kawela Bay Mitigation Project. The four phases consisted of a Monitoring Plan (Phase I), a Burial Treatment Plan (Phase II), Field Monitoring (Phase III) and Data Recovery (Phase IV). This program proposed archaeological monitoring of all construction work at the Kawela Bay Archaeological Area and construction of a moat around the Punahoʻolapa Marsh. Collection of bulk soil samples for dating and pollen analysis was also proposed. The Burial Treatment Plan detailed procedures for the treatment of human remains identified during future work, along with the proposed disinterment of two burials identified at Kawela Bay by Walker *et al*. (1988a).

PHRI subsequently monitored all construction activity within the TBR property (late 1990 into 1991) as outlined in the Jensen (1989b) mitigation program. Archaeological monitoring included areas within the existing golf course, the new golf course, the sod farm area, the proposed hotel site at Kawela Bay, the ʻŌpana wells site, Borrow Area 3 located on lands owned by the Campbell Estate, a wastewater line trench along Kamehameha Highway, and a wastewater pumping station near the existing Turtle Bay Hotel.

The monitoring work was preliminarily reported in a series of 17 Status Reports prepared by Sullivan (1990, 1991), Dunn (1991) and Donohue (1991). These status reports briefly document 14 newly identified archaeological sites (Temporary Monitoring Sites [TM] 1 through 14) and ten burials (Burials 1-10). The complete descriptive findings of the monitoring work are presented in Corbin (2003).

The 14 sites identified during monitoring were assigned SIHP Site numbers by Corbin (2003; Sites 6413 thru 6426; *Table 6*). The sites include nine cultural deposits (Sites 6413, 6414, 6416-6419, 6422, 6423 and 6425), two stone walls (Sites 6424 and 6426), an enclosure (Site 6415), an alignment (Site 6420) and a pool divided into three sections by discontinuous stone walls (Site 6421). Subsurface testing was conducted at 10 of the 14 sites including 30 test units, 20 backhoe trenches, 7 shovel tests, 5 auger cores, and documentation of two exposed faces in the banks of a lake in the golf course. These sites and excavations are summarized in the following section.

In 1992 human remains were discovered in sand fill that was excavated from a dune area south of Kuilima Point. The remains were transported to the Kahuku Police Station and eventually to the Medical Examiner's office in Honolulu. Kennedy (1992) examined the sand fill and the dune area. The sand fill was screened to recover all of the skeletal material. The dune area was examined and no additional remains were observed. The recovered remains were analyzed and four individuals were identified, consisting of an adult female and three sub-adults of indeterminate sex. These remains were assigned SIHP Site No. 4488 and were transferred to SHPD for curation. The burials were subsequently designated as Burials 11-14.

In 1996, additional human remains were discovered in the Site 4488 area (Carson *et al*. 1996, 1999). SHPD collected an adult scapula and facial bones, and a sub-adult tibia epiphysis from the area. The area was excavated and sand from the area was screened to recovering additional skeletal remains; in addition wood fragments and square nails were recovered. The wood and nails were inferred to be the remnants of a coffin. The skeletal remains were designated Burial A. A second set of remains was identified 3 m from Burial A, consisting of disarticulated adult long bones (Burial B). The skeletal remains were turned over to SHPD for curation and collectively were designated Burial 17.

In 2001, Cultural Surveys Hawai'i conducted archaeological monitoring of modifications to seven existing golf course holes, construction of two new holes and of a new driving range in the central portion of the project area (Borthwick *et al*. 2001). No surface or subsurface archaeological sites were identified.

Summary of Previously Identified Sites

Studies discussed above document 18 SIHP sites within the TBR property (Sites 4488 and 6410-6426). Site locations are illustrated in *Figures 25-28* and are summarized in *Table 6*. Bath *et al*. (1984) assigned temporary site designations to several additional identified sites that were not addressed in subsequent studies (Sites T-2 through T-5). The remains of two historic sites, the OR&L railroad grade and Kahuku Army Airfield, are present within the project area, but were not explicitly treated as historic properties by any previous study.

To date, three sites have been preserved: Kahuku Point Archaeological Area (Site 6411), Punaho'olapa Marsh (Site 6412) and Site T-5 documented by Bath *et al*. (1984) that is included within the boundary of 6412. Fifteen sites were mitigated through data recovery excavation or burial disinterment and relocation (Sites 4488, 6410, 6413-6420, 6422, 6423, 6423, Kukio Pond and Bath *et al*. 1984 Site T-7). The current disposition of the remaining sites (5791 railroad grade, the airfield, 6421, 6424, 6426, and T-2, T-3, and T-4) is unclear. It is proposed that the disposition of these sites can be determined during the SAIS fieldwork. The previously identified sites are summarily described below.

Site 4488 is located inland of Kuilima Point. Human remains of at least eight individuals were discovered in 1992 and 1996 during sand mining operations (Kennedy 1992; Carson *et al*. 1996, 1999). These remains were designated as Burials 11-14 and 17. Following analysis the remains were temporarily curated by SHPD until they were reinterred on the TBR property. The location of the reinterment site is shown on *Figure 25*.

A portion of the OR&L railroad grade extended through the TBR property. The alignment of the railroad is depicted on current tax maps (see *Figures 2 and 3*) and on several historic maps (see *Figures 13-16*). None of the previous investigations documented this historic transportation route or assigned the railroad grade an SIHP site designation. The 1946 tsunami destroyed the railroad and it was abandoned in 1954 (Haun and Henry 2001b).

A portion of the railroad grade west of the project area in the Land of Kaunala and was assigned SIHP Site 5791 by Haun and Henry (2001b:15). A 525-meter long section of the railroad grade was recorded, along with several bridge foundations. Another section of the railroad grade in the vicinity of Ewa Beach was documented as SIHP Site 9714 and that segment of the OR&L mainline railroad grade was enrolled on the NRHP on December 1, 1975 (NRHP n.d.).

Formerly, a c. 3,950 m segment of the railroad grade spanned the TBR property, extending from inland of Kawela Bay across Kahuku Plain in a northeasterly direction for c. 2,120 m and then to the east-southeast for an additional 1,830 m where it exited the property. The railroad continued east to Kahuku Mill. The SAIS fieldwork will attempt to locate any extant remnants of the railroad grade.

Table 6. Summary of Previously Identified Sites in Project Area

SIHP Site No.	Bishop Museum Site No.	Other Site No. /Name	Site Type	McAllister (1933)	Dye (1977)	Bath et al. (1984)	Neller (1984)	Walker et al. (1988a)	Walker et al. (1988b)	Davis et al. (1986)	Kennedy (1992)	Kennedy (1996)	Sullivan (1990, 1991), Dunn (1991), Donohue (1991)	Haun and Henry (2001)	Corbin (2003)	Excavations: Auger Tests	Excavations: Test Units	Excavations: Backhoe Trenches	Excavations: Exposure Examinations	Excavations: Shovel Test Pits	Current Status
4488	-	-	Cultural deposit with burials									X									Burials removed as reintered
5791/9714	-	-	Railroad Grade											X							To be determined
6410	50-Oa-2899	-	Cultural deposit with burials			X		X							X	179	78	5			Mitigated through Data Recovery; Burials removed and reintered
6411	50-OA-F4-14 50-OA-2911	T-1	Cultural deposit with burials		X	X	X		X						X	145	41	1	11		Preserved
6412	50-OA-F4-15 50-OA-2912	-	Cultural deposit in Marsh with 3 sinkholes		X	X				X						35	4	3	1		Preserved
6413	-	TM-1	Cultural deposit										X					1			Mitigated through Data Recovery
6414	-	TM-2	Cultural deposit										X		X		4	1			Mitigated through Data Recovery
6415	-	TM-3	Enclosure										X		X		1				Mitigated through Data Recovery
6416	-	TM-4	Cultural deposit										X		X			11			Mitigated through Data Recovery
6417	-	TM-5	Cultural deposit										X		X		5		2		Mitigated through Data Recovery
6418	-	TM-6	Cultural deposit										X		X			1		7	Mitigated through Data Recovery
6419	-	TM-7	Cultural deposit										X		X			1			Mitigated through Data Recovery
6420	-	TM-8	Alignment										X		X	5	1				Mitigated through Data Recovery
6421	-	TM-9	3 pools with walls										X		X						To be determined
6422	-	TM-10	Cultural deposit										X		X		4	1			Mitigated through Data Recovery
6423	-	TM-11	Cultural deposit with burials										X		X		15	1			Mitigated through Data Recovery; Burials removed and reintered
6424	-	TM-12	Stone wall										X		X						To be determined
6425	-	TM-13	Cultural deposit										X		X						Mitigated through Data Recovery
6426	-	TM-14	Stone wall										X		X						To be determined
-	-	Kahuku Air Base																			To be determined
		262	Kukio Pond	X					X												Mitigated through Data Recovery
		T-2	Stone wall			X															To be determined
		T-3	Cattle enclosure			X															To be determined
		T-4	Military structure			X															To be determined
		T-5	Stone wall			X															Preserved
-		T-7	Gray sand layer in dune (determined to be historic)		X	X										9			7		Mitigated through excavation
Additional excavations conducted in Non-site locations						X										71					
			Totals													**444**	**153**	**29**	**21**	**7**	

Site 6410 is a cultural deposit designated as the Kawela Bay Archaeological Area, located in the east portion of the TBR property. This site has been subjected to extensive subsurface excavation (Bath *et al*. 1984; Walker *et al.* 1988a; Corbin 2003). Excavations consisted of 179 auger cores, 78 excavation units and five backhoe trenches (see *Figure 28*). These excavations documented four concentrations of cultural deposits designated as Areas A-D.

Area A excavations typically identified a single cultural layer that varied in thickness from 0.15 to 0.58 m (Walker *et al*. 1988a); however, data recovery excavations by Corbin (2003) in this area documented as many as three cultural layers (Layers II, III and IV). These cultural deposits are overlain by a disturbed sand deposit (0.03 to 0.28 m thick) and are underlain by pre-cultural sand layers. Layer II averaged 0.18 m in thickness, Layer III averaged 0.11 m and Layer IV averaged 0.2 m. Large quantities of subsistence debris, artifacts and numerous subsurface features were identified in these excavations.

Area B excavations documented a single prehistoric cultural deposit that varied in thickness from 0.1 to 0.25 m (Walker *et al*. 1988a). One to two sand layers typically overlie the cultural layer, with the upper deposit containing historic debris. Marine shells, artifacts and charcoal were recovered from the prehistoric cultural deposit.

Area C excavations documented a single cultural layer that varied in thickness from 0.15 to 0.55 m (Walker *et al*. 1988a). Recent fill and a beach sand deposit overlies the cultural deposit, which is characterized by fire pits, ash lenses, marine shells, stone and shell tools, modified mammal bones and fire-altered rock.

Area D excavations encountered a discontinuous 0.15 to 0.45 m thick cultural deposit with fire pits and ash lenses, marine shells, shell and stones tools, charcoal and modified bone (Walker *et al*. 1988a). Subsequent data recovery in this area by Corbin (2003) revealed two cultural layers: the upper cultural layer (Layer II) varied in thickness from 0.08 to 0.45 m and contained numerous fire pits, hearths, postholes, marine shells and charcoal, while the lower cultural deposit (Layer III) varied in thickness from 0.07 to 0.35 m and contained hearth, postholes, shells and charcoal. Both cultural layers were overlain by a disturbed sand deposit with modern debris (Layer I) and were underlain by multiple layers of pre-cultural sand.

Eight LCAs are present in the Kawela Bay area (see *Figures 11 and 28*). Several of the LCAs are located in close proximity to Areas A-D, but none correlate exactly to the any of the cultural deposits documented.

Historic documentary research indicates that Waikū Pond once existed in the vicinity of Site 6410 south of Area C (see *Figures 8 and 28*). It was proposed in the Walker *et al*. (1987) data recovery plan that coring be undertaken in the "marshy area" labeled on *Figure 28*, which was thought to correspond to the former location of Waikū Pond. Twelve cores were excavated in the "marshy area", none of which yielded cultural remains or pond deposits. The core samples were interpreted to indicate that the "marshy area" represented a sinkhole filled and compacted by contractors.

Site 6410 has been subjected to extensive survey and data recovery excavations. No human burials were found during the excavations in Areas A-D; however, seven burials have been identified at Site 6410 during excavations adjacent to these areas (Bath *et al*. 1984; Walker *et al*. 1988a; Sullivan 1991). These burials were excavated and reinterred in the reinterment site adjacent to Kamehameha Highway. These burials are discussed in more detail in the following section. The data recovery at the site was considered sufficient to mitigate adverse effects from development and the site has subsequently been altered by resort-related construction.

Site 6411 is the Kahuku Point Archaeological Area located to the east, west and south of Kahuku Point. Extensive archaeological inventory survey and data recovery excavations were undertaken in this area (Dye 1977; Bath *et al*. 1984; Neller 1984; Walker *et al*. 1988b; Corbin 2003). Three concentrations of cultural deposits (Areas A-C) were identified at the site, potentially representing remnants of a single habitation area impacted by wind erosion and damage by unrestricted sand vehicle activity.

Area A excavations identified a 0.15 to 0.55 m thick cultural deposit in an area 230 m long by 30-75 m wide (Walker *et al*. 1988b). Large concentrations of midden material and artifacts were present in the central portion of Area A. This deposit is located in the dunes to the west of Kahuku Point.

Area B is located east of Kahuku Point and covers an area 180 m long by 45-90 m wide. A discontinuous cultural deposit that varied in thickness from 0.05 to 0.3 m, characterized by subsurface features, artifacts and food remains, was documented. Area B appears to correspond to LCA 2678:2 (see *Figure 26*)

Area C is located to the south of Area A, in an area 90 m long by 25 m wide. Excavations documented a cultural deposit 0.1 to 0.25 m thick, characterized by midden debris, artifacts and subsurface features. Area C appears to correspond to LCA 2928:2 (see *Figure 26*).

Limited data recovery work was conducted at 6411 before it was determined that the area was to be preserved. The auger cores identified no intact cultural deposits; disturbance was inferred from historic and/or modern debris in a subsurface context. However, two test units excavated in the south portion of the site documented a disturbed surface layer overlying a prehistoric cultural deposit with subsurface features, artifacts and marine shells.

Site 6411 was subjected to extensive survey excavations, but with limited data recovery. Four burials consisting of seven individuals were identified at Site 6411. Two burials were exhumed by either SHPD or the Honolulu police and were interred at the reinterment site (Neller 1984, 1989). The two remaining burials, noted by Walker *et al*. (1988b) were left following their identification and the units were backfilled. These are discussed in more detail in a following section. The Site 6411 was preserved as a park area shortly after the data recovery at the site was suspended.

Site 6412 encompasses Punahoʻolapa Marsh, the large freshwater marsh area located in the east portion of the TBR property (see *Figure 27*). Dye (1977), Bath *et al.* (1984), Davis *et al*. (1988) and Corbin (2003) examined the marsh and its perimeter. A total of 35 auger cores, four test units, three backhoe trenches and the examination of one exposed soil profile have been documented within and adjacent to the marsh. A complex of sinkholes was noted within the marsh itself. The majority of the subsurface tests were located in the wet marshy area, yielding no cultural remains. However, these excavations documented pre-contact floral biota through pollen analysis (Corbin 2003). The presence of possible marsh deposit in excavations conducted outside the current boundary of Punahoʻolapa Marsh suggest that the wetlands was likely once much larger. Punahoʻolapa Marsh has been preserved because it is a wetland. The T-5 rock wall (discussed below), noted by Bath *et al*. (1984) is located within the preserve.

Site 6413 is a surface and subsurface historic and prehistoric cultural deposit located along the east-central edge of the TBR property, found within the TBR sod farm and greenhouse nursery (see *Figure 25*). Prehistoric and historic surface artifacts were collected (Corbin 2003). Subsurface testing consisted of excavating one backhoe trench to document a subsurface profile of two subsurface features, consisting of a hearth and posthole. Charcoal, shells, coral and fire-cracked rock were collected from the features but not analyzed. Site documentation and testing were considered sufficient to mitigate data loss from resort-related construction. The site was subsequently destroyed.

Site 6414 is a subsurface cultural deposit located near the east-central edge of the TBR property, on the west side of Site 6413. This site was first documented in a TBR equipment yard as a subsurface cultural layer exposed in profile in a mechanically excavated pit for a fuel tank (Corbin 2003). The pit was expanded into a trench. Four 1.0 by 1.0 m test units were excavated to the southwest to determine the areal extent of the deposit (*Figure 29*). Excavation documented 8 hearths, 3 pits, 4 postholes, marine shells, debitage, charcoal and a variety of historic debris. Charcoal from the trench was submitted for radiometric age determination. Site documentation and testing were considered sufficient to mitigate data loss from resort-related construction. The site was subsequently destroyed.

Site 6415 is a small enclosure located near the west-central edge of the Kahuku Air Base, on the northern periphery of Punahoʻolapa Marsh. The structure is built of coral cobbles and small boulders and is 2.96 m long, 2.29 m wide by 0.47 m high (*Figure 30;* Corbin 2003). A test unit was excavated in the center of the enclosure; only wire and metal were recovered. After documenting the site, it was cleared for destruction. According to Corbin (*ibid*.:230):

> The function of the enclosure is unknown. The enclosure may predate the construction of the Kahuku Air Base, having survived the construction because of its proximity to the edge of Punahoʻolapa Marsh. The Air Corps appears to have excavated a drainage ditch running parallel to the edge of the marsh; the site is on the marsh side of this ditch, making it fairly inaccessible.

Site 6416 is a subsurface cultural deposit located west of Punahoʻolapa Marsh in the central portion of the TBR property. The site was documented during excavation of a sewer line #2 trench (Corbin 2003). Eleven trenches were excavated in order to determine the extent of the cultural deposit (*Figure 31*). A total of 103 feet of trench was profiled to document four hearths, a possible earth oven (*imu*), a dog burial, a historic or modern pit and a pit of undetermined function. Charcoal from the site was submitted for radiometric age determination. Artifacts include modified bone fragments (medium-sized mammal, artiodactyl, *Bos*) and a possible urchin abrader. Site documentation and testing were considered sufficient to mitigate data loss from resort-related construction. The site was subsequently destroyed.

Site 6417 is a subsurface cultural deposit located on the east edge of the TBR property on the eastern periphery of Punahoʻolapa Marsh and west of the TBR sod farm. The site was initially encountered during construction of a golf course lake (*Figure 32*) and its areal extent was determined through test excavations of two backhoe trenches, five test units and profiling two exposures along the lake cutbank. A series of six concrete pads located north of the lake were interpreted as barrack foundations. Test excavations documented six fire pits and possible subsurface floor characterized by flat coral stones, marine shells, coral, basalt flakes, charcoal, and historic and modern debris (Corbin 2003). Several basalt adze fragments, a basalt flake and piece of slate were collected from the surface of the site. Several fragments of charcoal were submitted for radiometric age determination. Site documentation and testing were considered sufficient to mitigate data loss from resort-related construction. The site was subsequently destroyed.

Site 6418 is a subsurface cultural deposit located at the east end of the TBR property, on the east side of Punahóolapa Marsh and west of Site 6417. A concentration of charcoal was noted in a pit during the removal of a coconut tree (*Figure 33*). The site was extensively impacted by "earthmoving equipment associated with the Kahuku Army Air Corp Base" (Corbin 2003:262-264). Site testing consisted of excavation of a backhoe trench that did not encounter cultural remains. The location of the backhoe trench was not depicted on the site map. Site documentation and testing were considered sufficient to mitigate data loss from resort-related construction. The site was subsequently destroyed.

Site 6419 is a subsurface cultural deposit located along the shoreline between Kuilima Point and Kahuku Point. The site was initially encountered during sand mining activity on the south side of a beach berm within Survey Area 5 (Corbin 2003). Testing consisted of excavating a backhoe trench and seven shovel tests, which indicated that portions of dune had been highly disturbed (Corbin 2003; *Figure 34*). Site documentation and testing were considered sufficient to mitigate data loss from resort-related construction. The site was subsequently destroyed.

Site 6420 is an oval alignment of coral and basalt boulders located along the central bay front mid-way between Kahuku and Kuilima Points. The site was initially identified in 1990 during monitoring activities (Corbin 2003). The alignment is 3.5 m long by 2.87 m wide, with the interior measuring 0.45 m in depth below the surrounding ground surface (*Figure 35*). Site testing consisted of excavating a 1.0 by 1.0 m test unit and five auger cores. Charcoal from a possible *imu* was recovered from the test unit and one of the cores, along with a modern penny and several recent nails from the test unit. The site was inferred to be modern. Site documentation and testing were considered sufficient to mitigate data loss from resort-related construction. The site was subsequently destroyed.

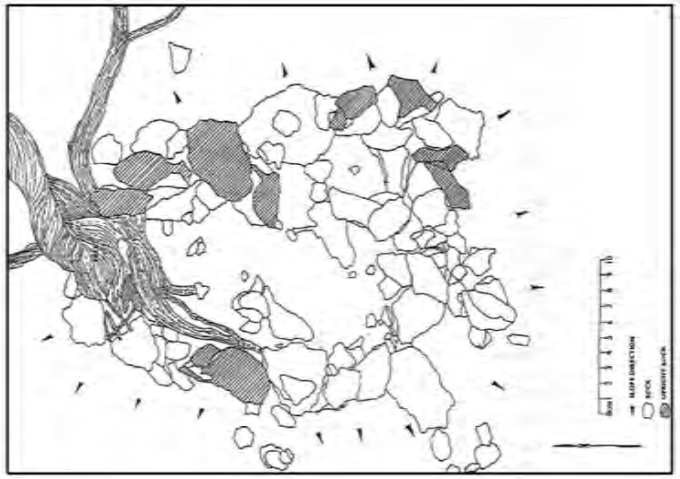


Figure 30. Site 6415 Plan Map (from Corbin 2003:231

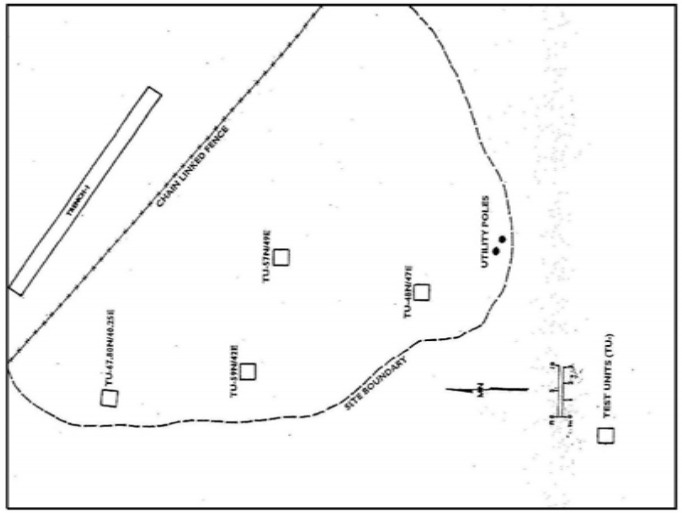


Figure 29. Site 6414 Plan Map (from Corbin 2003:222

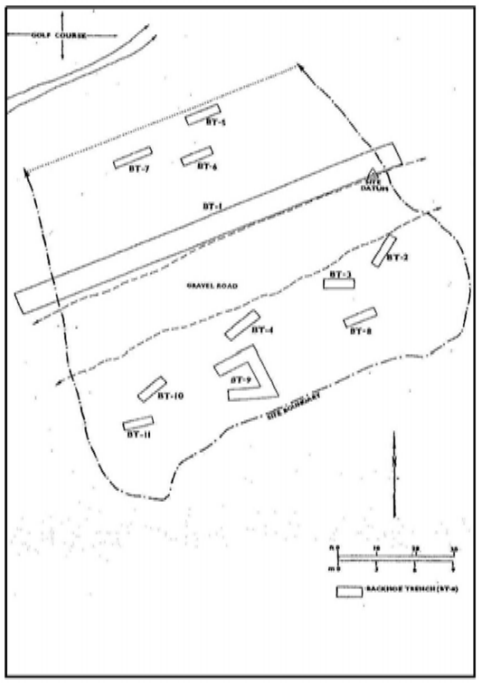


Figure 31. Site 6416 Plan Map (from Corbin 2003:234

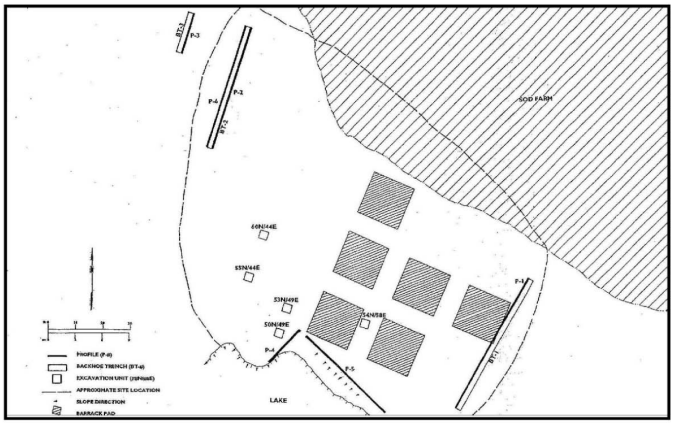


Figure 32. Site 6417 Plan Map (from Corbin 2003:249)

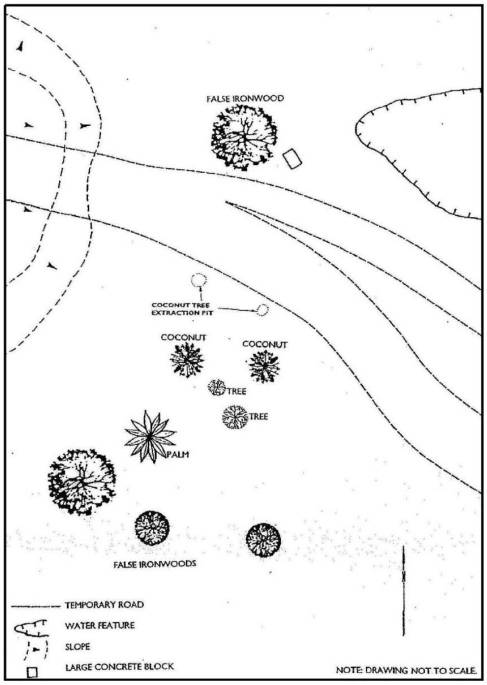


Figure 33. Site 6419 Plan Map (from Corbin 2003:266)

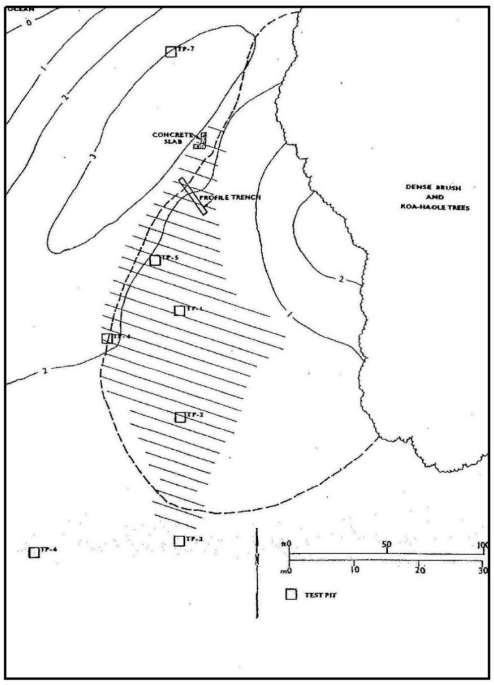


Figure 34. Site 6418 Plan Map (from Corbin 2003:263)

Site 6421 is a pool divided into three sections located on the southeast edge of the Kahuku Army Airfield in an area designated as wetlands along the east boundary of the TBR property. The US Army Corp of Engineers identified the site for PHRI to document (Corbin 2003). The pool is located in an area 10.8 m long by 10.8 m wide. Pool depth varies from 0.45 to 3.0 m (*Figure 36*). Basalt boulders are stacked to form a retaining wall on the east-central edge and aligned discontinuously around the pool perimeter and across the pool to divide the central pool from the south pool. A metal pipe and hose extend into the south pool. No testing was undertaken, but the site was interpreted as possibly historic. The current condition of the site is unknown.

Site 6422 is a subsurface cultural deposit located on the east-central boundary of the TBR property on the north side of the OR&L Railroad grade within the O'ahu Construction Company's yard (*Figure 37*). The site was identified during excavation of a waterline trench. Site testing consisted of excavating a backhoe trench and four test units to determine the areal extent of the deposit. The backhoe trench (BT-1) was excavated on the west side and parallel to the west fork of Marconi Road and extended north beyond the boundaries of the site into Site 6423. A hearth was documented and excavated in the trench wall. Cultural remains from the hearth fill consisted of marine shells, burned coral and charcoal. A charcoal sample was submitted for radiometric age determination. A basalt adze fragment was noted on the ground surface near the site and collected from near TU-4, but its location was not mapped. The east, west and south areal extent of the site was not determined. Site documentation and testing were considered sufficient to mitigate data loss from resort-related construction. The site was subsequently destroyed.

Site 6423 is a subsurface cultural deposit located on the east-central boundary of the TBR property at the north end of the waterline trench (BT-1) that originated at Site 6422, on the west side of Marconi Road. Testing consisted of excavation of an additional backhoe trench (BT-2) and 15 test units (see *Figure 37*). Excavations documented 11 subsurface features consisting of hearths, fire pits, a pit and possible postholes. A human burial (Burial 8) was identified in the wall of BT-1 and a second human burial (Burial 7) was encountered in Test Unit-12. The burials were disinterred and reinterred at the TBR burial reinterment site. Cultural material collected during testing consisted of marine shells, basalt and volcanic glass flakes, groundstone, a game stone ('*ulu maika*), pieces of coral, fire-altered rocks, crab exoskeleton fragments, urchin spines, burned small mammal bones and charcoal. Several fragments of charcoal were submitted for radiometric age determination. A railroad spike, a shell button and metal, glass and ceramic fragments were also recovered. Site documentation and testing were considered sufficient to mitigate data loss from resort-related construction. The site was subsequently destroyed.

Site 6424 is a surface feature located at the southwest corner of the Kahuku Army Airfield and was initially documented during monitoring in 1991. The site consists of a short section of wall 2.36 m long by 1.4 m wide, represented by aligned coral boulders and interpreted as a possible *ahupua'a* boundary wall between Kahuku and Punalau (Corbin 2003; *Figure 38*). The site map depicts a concrete block, a coated copper wire, an ash deposit and a fragment of melted bottle glass that are not mentioned in the site description. The status of this site is unknown.

Site 6425 is a subsurface charcoal deposit exposed in a cutbank on the north side of Kamehameha Highway along the southeast boundary of the TBR property and was initially document during monitoring in 1991. The charcoal deposit was 2.0 m long and 0.45 m thick (Corbin 2003). The context of the exposure suggested that the deposit was impacted during construction of the highway. No subsurface testing was undertaken. The site is presumed destroyed.

Site 6426 is a rock wall located south of the OR&L railroad grade (Site 5791) on the western perimeter of Punahóolapa Marsh in the central portion of the TBR property and was initially documented in 1991 (Corbin 2003). The wall was constructed of stacked coral limestone boulders and is 40 m long by 0.7 m wide and 0.85 m high. A post and remnant of a wire fence are located adjacent to the north end of the wall. No cultural remains were observed in association with the wall and its function was not determined. The current condition of the site is unknown.

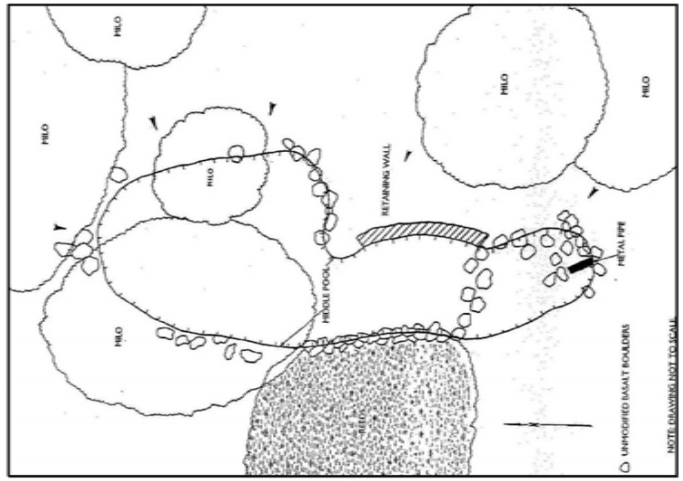


Figure 36. Site 6421 Plan Map (from Corbin 2003:272)

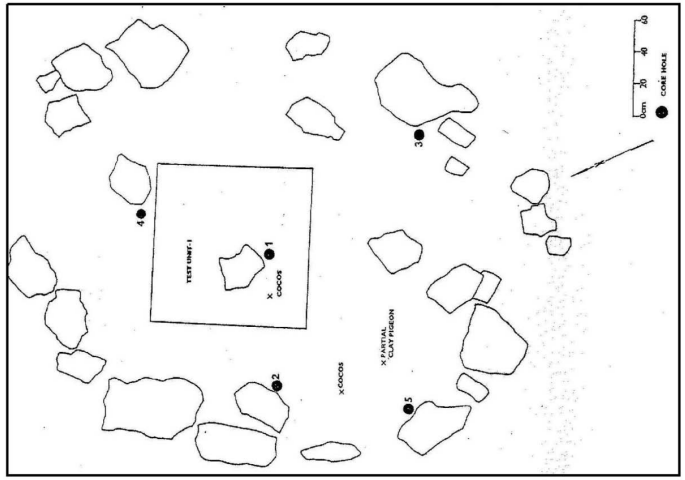


Figure 35. Site 6420 Plan Map (from Corbin 2003:269)

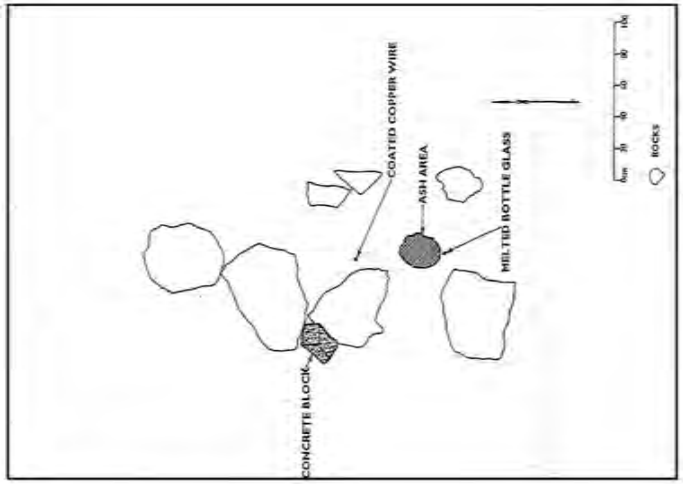


Figure 38. Site 6424 Plan Map (from Corbin 2003:304)

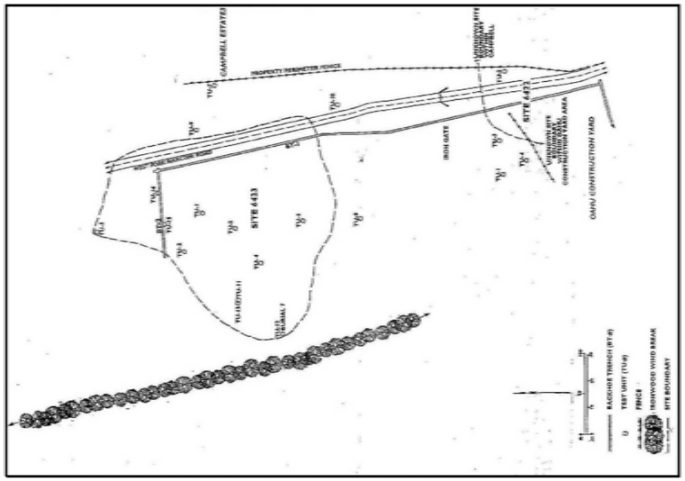


Figure 37. Site 6422 and 6423 Plan Map (from Corbin 2003:274)

Other sites were identified on the TBR property during earlier studies that were not assigned SIHP site designations during subsequent studies (Bath *et al.* 1984; see *Figure 25*). These include two rock walls, an enclosure, and a military structure. One wall (Site T-2) is located on the western periphery of Punahóolapa Marsh in Survey Area 8; the other (Site T-5) is located in Punahoʻolapa Marsh. A cattle enclosure (Site T-3) is located near the Site T-2 wall on the west side of Punahoʻolapa Marsh, also in Survey Area 8. A military structure (Site T-4) is located near the east-central boundary of the TBR property in Survey Area 13. The current status of these four sites is unknown. The wall designated Site T-5 will be preserved within the Punahoʻolapa Marsh wetlands.

Kahuku Army Airfield has been noted by a number of researchers within the project area, but it has not been assigned an SIHP site designation or fully recorded. Small portions of the airfield have been documented (Bath *et al*. 1984; Corbin 2003), but not in a comprehensive fashion. A series of concrete foundations interpreted as barrack foundations in Survey Area 10, a buried asphalt surface interpreted as a runway apron in Survey Area 12 and the Site T-4 concrete military structure were summarily recorded (Bath *et al*. 1984). A second structure similar to Site T-4 was noted but not documented (*ibid*.). Corbin (2003:249) mapped and noted six barracks foundations during documentation of Site 6417 (see *Figure 32*). Although much of the airfield has been impacted by resort development, it is unclear if any remnants of the Kahuku Army Airfield are extant. The status of the airfield is unknown.

Summary of Project Area Burials

Various archaeological projects for the TBR property resulted in the identification of 25 human burials, designated as Burials 1 through 19. These burials are summarized in *Table 7* and their locations are presented in *Figure 39*. All the burials were identified during subsurface testing (Bath *et al.* 1984; Neller 1984, 1989; Walker *et al*. 1988a, 1988b; Sullivan 1990; Kennedy 1992; Carson *et al*. 1996, 1999). Most burials consist of a single set of human remains, however, Burials 11-14 and 17 contained a total of eight individuals and Burials 15 and 19 contained five individuals. Kalima (1993) reported the osteological analyses of Burials 3-6 from Site 6410 and Burial 8 from Site 6423. These analyses resulted in the identification of additional individuals that were subsequently designated as Burials 9 and 10. Burials are known from four locations on the property.

The greatest concentration of burials was associated with the area inland of Kuilima Point, where eight individuals (Burials 11-14 and 17) were buried in the dunes at Site 4488. These burials were initially encountered during sand mining operations (Kennedy 1992; Carson *et al*. 1996, 1999). Seven individuals were identified near the shoreline of Kawela Bay in association with Site 6410. Each burial contained the remains of a single individual, identified during data recovery excavations. Burial 1 was initially documented in 1984 (Bath *et al*. 1984; Walker *et al*. 1988a), Burial 2 was identified a few years later (Walker *et al*. 1988a), and Burials 3-6 and 9 were identified a few years after that (Sullivan 1990).

Seven individuals from four burials were also identified at Site 6411 near the shoreline on either side of Kahuku Point. Five burials were located in the sand dunes east of the Point (Burials 15 and 19) and two were located in dunes to the west (Burials 16 and 18). Burial 15 was exhumed by SHPD after its discovery in 1984 by recreational sand vehicle operators who were using the area. Neller (1984) identified three individuals from the location designated as Burial 15. Two individuals were identified during excavation at the location designated as Burial 19 (Walker *et al*. 1988b). The Honolulu Police exhumed Burial 16 after its discovery in 1986; the remains were turned over to SHPD and examined by Neller (1989). Burial 18 was encountered during subsurface testing (Walker *et al*. 1988b).

The fourth concentration of burials is located east of Punahoʻolapa Marsh (Site 6423), where Burials 7, 8 and 10 each contain the remains of a single individual. These remains were encountered during archaeological monitoring of resort-related construction activity (Sullivan 1991).

Table 7. Summary of Burials Previously Identified within Project Area

Burial Number	Site Number	Location	Number of Burials	Researchers	Description	Final Disposition of Remains
1	6410	TU-20	1	Bath et al. (1984), Walker et al. (1988a), Jensen (1989), Maly and Rosendahl (1992), Kalima (1993)	Adult female burial in wooden coffin within stone-lined cyst noted 1st by Bath et al. (1984), then Walker et al. (1988a). Burial disinterred following guidelines in (1989b) mitigation program. Osteological analysis by conducted by Kalima (1993). Burial reinterred at Reinterment Site as specified in Maly and Rosendahl (1992) Burial Treatment Plan (BTP).	Reinterred
2	6410	TU-9	1	Walker et al. (1988a), Jensen (1989), Maly and Rosendahl (1992), Kalima (1993)	Adult male burial in flexed position noted in pit feature (HF-45) by Walker *et al.* (1988a). Burial disinterred as part of Jensen (1989b) mitigation program. Osteological analysis by Kalima (1993), Burial reinterred following Maly and Rosendahl (1992) BTP.	Reinterred
3, 4, 5, 6, 9	6410	Inland of Area C	5	Sullivan (1991), Jensen (1989), Maly and Rosendahl (1992), Kalima (1993)	Human remains noted during monitoring of grading for Hotel H-2. Two clusters of two burials found 15 m apart. Burial 3 is a juvenile, Burial 4 is a infant, Burials 5 and 6 are adults. Burials disinterred following guidelines in Jensen (1989b) mitigation plan. During osteological analysis of Burials 5 and 6 by Kalima (1993), single humerous of third individual was noted, designated as Burial 9. Burial reinterred following Maly and Rosendahl (1992) BTP.	Reinterred
7	6423	BT-1, TUs 11 and 13	1	Sullivan (1991), Jensen (1989b), Maly and Rosendahl (1992), Kalima (1993)	Human remains noted during monitoring at Site 6423 area, found within a natural sinkhole feature used as a burial pit (HF-12). Cranium and infracranial skeletal remains interpreted as those of female adult from 25 to 30 years of age. Burials disinterred following guidelines in Jensen (1989b) mitigation plan and analysis conducted by Kalima (1993). Burial reinterred following Maly and Rosendahl (1992) BTP.	Reinterred
8, 10	6423	TU-14	2	Sullivan (1991), Jensen (1989b), Maly and Rosendahl (1992), Kalima (1993)	Human remains noted during monitoring at Site 6423 area, beneath resort access road and west fork of Marconi Road. Remains were partially articulated and are those of adult female. Burials disinterred following guidelines in Jensen (1989b) mitigation plan and osteological analysis conducted by Kalima (1993). During analysis, fragmentary remains of an additonal sub-adult were found and designated as Burial 10. Both sets of remains reinterred following Maly and Rosendahl (1992) BTP.	Reinterred
11-14, 17	4488	Inland of Kuilima Point	8	Kennedy (1992), Maly and Rosendahl (1992), Carson *et al.* (1996, 1999)	Burials 11-14 consist of 4 disturbed burials (3 sub-adults, 1 adult female) removed from dune south of Kulima Point (Kennedy 1992). Disturbed remains of 3+ adults and 1 bone from sub-adult noted by Carson *et al.* (1996, 1999) in same area and designated as Burial 17. Wood and nails suggesting a coffin were found in associated with one set of the Burial 17 remains. Burials 11-14 reinterred following Maly and Rosendahl (1992) BTP. Burial 17 curated with SHPD in 1996 and subsequently reinterred	Reinterred
15, 19	6411	East Kahuku Point Burial Area	5	Neller (1984), Walker *et al.* (1988b), Maly and Rosendahl (1992)	Burial 15 noted in dunes to east of Kahuku Point that were exhumed and examined by SHPD (Neller (1984) and determined to be two complete skeletons and one partial skeleton. Walker *et al.* (1988b) identified two burials (Burial 19) in pits in TU-2 in Area B. Burial 19 was re-buried in original location.	Reinterred (Burial 15), Left *in situ* (Burial 19)
16, 18	6411	West Kahuku Point Burial Area	2	Neller (1989), Walker *et al.* (1988b), Maly and Rosendahl (1992)	Burial 16 noted in dunes to west of Kahuku Point and exhumed by Honolulu Police. Remains were subsequently examined by SHPD (Neller (1989). Burial 18 identified by Walker *et al.* (1988b) in TU-24 in Area A. Burial 18 was re-buried in its original location.	Reinterred (Burial 16), Left *in situ* (Burial 18)
		Total	**25**			

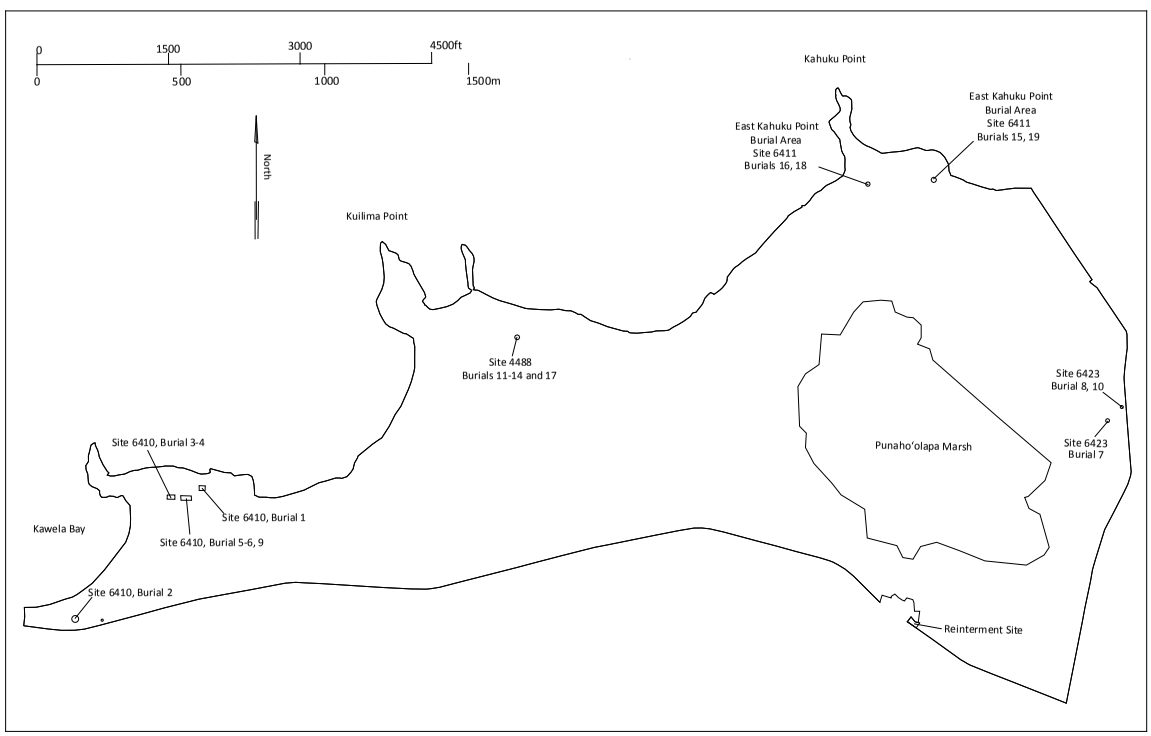


Figure 39. Location of Burials within Project Area

The majority of the burials identified on the TBR property are probably native Hawaiians interred prior to Contact or during the early post-Contact period. The exceptions are Burials 1 and 17, which contained remnants of wooden coffins, indicating the interment took place sometime after c. 1820.

A Burial Treatment Plan (BTP) was prepared for the human remains on the TBR property. Maly and Rosendahl (1992) prepared a BTP for Burials 1-10 recovered by PHRI archaeologists, for Burials 11-14 recovered by Kennedy (1992) and for Burials 15-16 recovered from the Kahuku Point area by Neller (1984, 1989). The remains of four individuals designated Burial 17, reported by Carson *et al.* (1996, 1999), were curated by SHPD and subsequently reinterred. Excavations that encountered the two remaining burials (Burials 18 and 19) were terminated on identification of the remains (Walker *et al*. 1988b). The three individuals designated Burials 18 and 19 were left in place and the excavation units were backfilled.

Project Area Chronology

Ninety-four charcoal samples from nine sites have been previously submitted for radiometric age determinations. *Table 8* lists the radiocarbon analysis results by site and *Table 9* is a graph with the age determinations ordered chronologically. The graph excludes all of the results that predate A.D. 600, since these are not considered to be determinations of cultural occupation. Six modern results were obtained which are not included in this analysis. *Figure 40* shows the mapped locations of deposits containing cultural material from AD 800 to 1800.

Nine age range determinations resulted in ranges that span 5760 to 54 B.C. These age determinations predate the arrival of Polynesian settlers, but could be pertinent to the timing of the Holocene emergence of the Kahuku Plain. The earliest age range determination (5760-5480 B.C.) was obtained from a sample excavated along Kawela Bay (Site 6410 Area A). Five other early age range determinations, spanning 5509-45 B.C., were obtained from Punahoʻolapa Marsh (Site 6412), two spanning 3865-845 B.C. were obtained from the southern periphery of the Marsh (Survey Area 11), and one spanning 210-165 B.C. was obtained from Kahuku Point (Site 6411 Area B). Two additional results, A.D. 2 to 601, obtained from Site 6422 on the eastern periphery of Punahoʻolapa Marsh, and A.D. 179 to 687 from Site 6423 in the same area, are probably too early to reflect cultural activity.

Of the 77 age range determinations that fall within the timeframes associated with Polynesian cultural occupation and later, 23 (30%) are from the Kawela Bay Archaeological Area (Site 6410). Twenty-five (32%) are from the Kahuku Point Archaeological Area (Site 6411). Twenty-nine (38%) are from Punahoʻolapa Marsh (Site 6412) and its environs (Sites 6414, 6416, 6417, 6422, and 6423). The earliest cultural deposits (*i.e.* prior to c. A.D. 1000) are to be found on the periphery of the Marsh. These early age ranges support the inference that the wetland was a highly desirable locale for initial settlement. The earliest cultural age range determinations were recovered from Site 6412 where a sample obtained from the east trench spans A.D. 645 to 979 and a sample from the north trench spans A.D. 785 to 1160 (see *Figure 27*). A second early cluster was obtained within and east of the Marsh from Site 6423. Age ranges from Site 6423 span A.D. 793 to 1105.

The A.D. 1000 to 1200-age ranges show continued use of the area east of Punahoʻolapa Marsh, along with settlements in the sand dunes east and west of Kahuku Point and around Kawela Bay. Settlement in these areas intensified in the period between A.D. 1200 and 1400. The earliest cultural deposits sampled along Turtle Bay post-date A.D. 1200. Sites dating to the period between A.D. 1400 to 1600 have been documented on the west and southwest of Punahoʻolapa Marsh, as well as southwest of Kahuku Point. Use of the area east of Punahoʻolapa Marsh, Kawela Bay and Kahuku Point continued as a population focal point into the A.D. 1600 to 1800s.

The central portion of the TBR property was developed in 1971, prior to state requirements for archaeological inventory and mitigation. Nearly 200 acres of the property were developed by the time of the first archaeological inventory survey undertaken by the Bishop Museum in 1977, and therefore almost no sites are known from this area. The single exception is Site 6416 in the approximate center of the property.

Table 8. Summary of Radiocarbon Dates from Previous Testing within Project Area

Site	Provenience	Layer/ Feature	Depth (cm)	C-14 Age in Years BP (one sigma)	C-13/C-12 Ratio	C-13 Adjusted C-14 Ages Years BP	Calendric Age Range	Researcher	Beta Analytic's Lab No.
6410	TU-158	II	12-68	less than 150	n/d	180+/-60	AD 1630-1950	Bath et al. (1984)	10633
6410	Area A - TU-25	II	28-45	70+/-60	-15.02 o/oo	230+/-60	AD 1505-1675 AD 1710-1805	Walker et al. (1988a)	16860
6410	Area B - TU-3	II	14-40	510+/-60	-24.95 o/oo	520+/-60	AD 1330-1480	Walker et al. (1988a)	16857
6410	Area C - TU-33	I	20-31	370+/-80	-25.50 o/oo	360+/-80	AD 1400-1660	Walker et al. (1988a)	15857
6410	Area C - TU-16	III	87-97	170+/-60	-20.23 o/oo	250+/-60	AD 1495-1800	Walker et al. (1988a)	16853
6410	Area C - TU-32	I	29-43	110+/-50	-26.92 o/oo	80+/-50	AD 1665-1940	Walker et al. (1988a)	16858
6410	Area C - TU-13	III	46-66	110+/-60	-26.72 o/oo	80+/-60	AD 1665-1940	Walker et al. (1988a)	15859
6410	Area D - TU-34	I	0-56	310+/-80	-20.75 o/oo	380+/-80	AD 1395-1660	Walker et al. (1988a)	15855
6410	Area D - TU-31	I	0-47	330+/-60	-23.18 o/oo	360+/-60	AD 1415-1645	Walker et al. (1988a)	15856
6410	TU-26	III	18-41	410+/-70	-26.61 o/oo	380+/-70	AD 1410-1635	Walker et al. (1988a)	15861
6410	TU-6	II	18-25	250+/-60	-26.91 o/oo	220+/-60	AD 1510-1680	Walker et al. (1988a)	16854
6410	TU-4	II	13-40	180+/-50	-25.06 o/oo	180+/-50	AD 1630-1950	Walker et al. (1988a)	16856
6410	TU-8	III	Lower	170+/-60	-25.79 o/oo	160+/-60	AD 1645-1950	Walker et al. (1988a)	15858
6410	Area A - 54N/58E	IIa, HF-2	60-70	280-240 230-70 40-0	-24.4 o/oo	n/d	AD 1650-1950	Corbin (2003)	171517
6410	Area A - 56N/45E	Ib, HF-4	n/d	Post 0 BP	-24.4 o/oo	n/d	AD 1650-1950	Corbin (2003)	171518
6410	Area A - 54N/58E	III/2, HF-6	n/d	900-850 810-750	-25.2 o/oo	n/d	AD 1030-1240	Corbin (2003)	171519
6410	Area A - 56N/76E	IV/5	n/d	7660-7480	-25.8 o/oo	n/d	5760-5480 BC	Corbin (2003)	171520
6410	Area D - 40N/38E	IV, HF-18	68-69	490-310	-20.9 o/oo	n/d	AD 1440-1660	Corbin (2003)	171521
6410	Area D - 46N/38E	IV	72-82	700-670	-24.9 o/oo	n/d	AD 1210-1290	Corbin (2003)	171522
6410	Area D - 50N/42E	IV/2, HF-66	79-88	630-600 560-520	-25.9 o/oo	n/d	AD 1300-1450	Corbin (2003)	171523
6410	Area D - N46/E40	V	75	530-500	-24.2 o/oo	n/d	AD 1410-1480	Corbin (2003)	171524
6410	Area D - N44/E40	III/IV/V, HF-106	71-101	510-450	-26.5 o/oo	n/d	AD 1430-1530 AD 1560-1630	Corbin (2003)	171525
6410	Area D - N44/E40	V, HF-110	75-89	630-600 560-500	-27.6 o/oo	n/d	AD 1290-1520 AD 1590-1620	Corbin (2003)	171526
6410	Area D - N48/E38	V	68-108	550-460	-24.1 o/oo	n/d	AD 1300-1650	Corbin (2003)	171527
6410	Area D - N48/E42	V, HF-78	49-63	80 +/- 50	-25.9 o/oo	n/d	Modern	Corbin (2003)	171528
6411	Area A - TU-34	II	42-62	130 +/-60	n/d	110+/- 60	AD 1655-1950	Bath et al. (1984)	10536
6411	Area A - TU-17	II	100-108	220+/-70	-24.75 o/oo	220+/-70	AD 1510-1950	Walker et al. (1988b)	16375
6411	Area A - TU-17	III	105-114	190+/-60	-14.04 o/oo	360+/-60	AD 1415-1645	Walker et al. (1988b)	16848
6411	Area A - TU-17	III	114-130	130+/-70	-23.60 o/oo	150+/-70	AD 1645-1950	Walker et al. (1988b)	16373
6411	Area A - TU-17	IV	130-135	500+/-100	-25.25 o/oo	490+/-100	AD 1315-1520	Walker et al. (1988b)	16849
6411	Area A - TU-17	IV	135-145	710+/-60	-18.92 o/oo	810+/-60	AD 1400-1525	Walker et al. (1988b)	16372
6411	Area A - TU-19	IV	22-40	100.3 +/- 0.07%	-21.25 o/oo	40+/-50	AD 1065-1285	Walker et al. (1988b)	16367
6411	Area A - TU-19	VIII	45-65	460+/-70	-27.11 o/oo	420+/-70	AD 1670-1715 AD 1800-1930	Walker et al. (1988b)	16731
6411	Area A - TU-23	IIA	60-88	110+/-70	-20.00 o/oo	190+/-70	AD 1620-1890 AD 1910-1950	Walker et al. (1988b)	16376
6411	Area A - TU-24	HF-14	67-105	270+/-60	-26.06 o/oo	260+/-60	AD 1490-1670 AD 1725-1790	Walker et al. (1988b)	16846
6411	Area A - TU-28	Ivb	99-118	50+/-70	-17.78 o/oo	160+/-70	AD 1645-1950	Walker et al. (1988b)	16850
6411	Area A - FP-3	HF-18	0-10	180+/-70	-24.66 o/oo	190+/-70	AD 1620-1890 AD 1910-1950	Walker et al. (1988b)	16366
6411	Area B - TU-149	IV	54-59	2070 +/-50	n/d	1990+/- 50	210-165 BC	Bath et al. (1984)	10537
6411	Area B - TU-2	II	23-25	640+/-70	-25.78 o/oo	630+/-70	AD 1260-1405	Walker et al. (1988b)	16378
6411	Area B - TU-5	Ia	0-8	760+/-100	-26.40 o/oo	740+/-100	AD 1070-1390	Walker et al. (1988b)	16377
6411	Area B - TU-10	II	18-50	300+/-50	-25.80 o/oo	290+/-50	AD 1435-1665	Walker et al. (1988b)	16365
6411	Area B - TU-12	I	0-6	350+/-50	-25.08 o/oo	350+/-50	AD 1420-1650	Walker et al. (1988b)	16369
6411	Area B - TU-14	I	0-9	550+/-70	-23.60 o/oo	570+/-70	AD 1305-1420	Walker et al. (1988b)	16374
6411	Area C - TU-27	VIII	112-132	420+/-70	-27.90 o/oo	370+/-70	AD 1415-1640	Walker et al. (1988b)	16379
6411	TU-2	II, HF-10	42-60	370 +/-70	-23.7	390 +/-70	AD 1411-1652	Corbin (2003)	44943
6411	TU-1	III, HF-3	16-21	112.7 +/-0.7%	-26.5	113.1+/-0.7%	Modern	Corbin (2003)	44948
6411	TU-1	IV, HF-3	21-31	107.3+/-0.7%	-26.3	107.5+/-0.7%	Modern	Corbin (2003)	44949
6411	TU-1	IV, HF-3	n/d	110.0+/-0.7%	-26.1	110.2+/-0.7%	Modern	Corbin (2003)	44950
6411	TU-1	I	10-16	430+/-60	-24.3	440+/-60	AD 1402-1526 AD 1556-1631	Corbin (2003)	44951
6411	TU-1	II, HF-2	30-38	670+/-130	-25.8	660+/-130	AD 1060-1086 AD 1122-1138 AD 1156-1470	Corbin (2003)	44953
6411	TU-1	II	5-16	340+/-60	-26.2	320+/-60	AD 1442-1668 AD 1782-1796	Corbin (2003)	44955
6411	TU-2	I	25-48	130+/-60	-27.6	90+/-60	AD 1665-1784 AD 1789-1955	Corbin (2003)	44956
6411	TU-2	I	15-25	101.1+/-0.7%	-24.3	101.0+/-0.7%	Modern	Corbin (2003)	44958
6411	TU-2	II, HF-8	36-95	70+/-70	-24.5	80+/-70	AD 1662-1955	Corbin (2003)	44959
6411	TU-2	II, HF-9	38-84	110+/-70	-26.3	90+/-70	AD 1659-1955	Corbin (2003)	44960
6412	Auger core A4	IV	n/d	100+/-80	-26.74 o/oo	70+/-80	AD 1659-1955	Davis et al. (1986), Corbin (2003)	16569
6412	South trench	I	n/d	170+/-60	-17.33 o/oo	280+/-60	AD 1446-1679 AD 1740-1752 AD 1756-1804 AD 1935-1947	Davis et al. (1986), Corbin (2003)	19371
6412	East Trench	IIb	n/d	640+/-70	-22.40 o/oo	680+/-70	AD 1220-1410	Davis et al. (1986), Corbin (2003)	19373

Table 8. Summary of Radiocarbon Dates from Previous Testing within Project Area (cont).

Site	Provenience	Layer/ Feature	Depth (cm)	C-14 Age in Years BP (one sigma)	C-13/C-12 Ratio	C-13 Adjusted C-14 Ages Years BP	Calendric Age Range	Researcher	Beta Analytic's Lab No.
6412	Auger core B1a	IV	n/d	1120+/-70	-29.99 o/oo	1040+/-70	AD 883-1160	Davis et al. (1986), Corbin (2003)	16571
6412	East Trench	III	n/d	1250 +/-80	-24.76 o/oo	1250 +/-80	AD 645-979	Davis et al. (1986), Corbin (2003)	16568
6412	South trench	II	n/d	2240+/-90	-25.47 o/oo	2230+/-90	410-45 BC	Davis et al. (1986), Corbin (2003)	16566
6412	Auger core B3a	V	n/d	3650+/-70	-25.67 o/oo	3640+/-70	2200-1875 BC 1842-1811 BC 1800-1777 BC	Davis et al. (1986), Corbin (2003)	16572
6412	East Trench	IV	n/d	3790+/-60	-25.20 o/oo	3790+/-60	2458-2032 BC	Davis et al. (1986), Corbin (2003)	19374
6412	East Trench	V	n/d	3950+/-60	-26.81 o/oo	3920+/-60	2573-2513 BC 2502-2267 BC 2261-2203 BC	Davis et al. (1986), Corbin (2003)	19375
6412	East Trench	IX	n/d	6320+/-130	-25.75 o/oo	6310+/-130	5509-5500 BC 5484-4940 BC 4868-4861 BC	Davis et al. (1986), Corbin (2003)	16573
6414	Trench 1	II	n/d	60+/-80	-19.8	140+/-80	AD 1640-1955	Sullivan (1990), Corbin (2003)	n/d
6414	Trench 1	II	n/d	370+/-130	-27.2	330+/-130	AD 1322-1340 AD 1390-1950	Sullivan (1990), Corbin (2003)	n/d
6414	Trench 1	II	n/d	550+/-100	-23.1	580+/-100	AD 1260-1470	Sullivan (1990), Corbin (2003)	n/d
6414	Trench 1	II	n/d	460+/-100	-26.1	450+/-100	AD 1290-1650	Sullivan (1990), Corbin (2003)	n/d
6414	Trench 1	II	n/d	770+/-100	-24.9	770+/-100	AD 1030-1400	Sullivan (1990), Corbin (2003)	n/d
6416	TR 1	II, HF-5	90-100	400+/-90	-27.3	360+/-90	AD 1410-1670 AD 1750-1796 AD 1945-1954	Sullivan (1990), Corbin (2003)	42154
6416	TR-2	II, HF-6	5-15	110+/-80	-25.5	100+/-80	AD 1650-1955	Sullivan (1990), Corbin (2003)	42155
6416	TR-9	I, HF-8	23-32	290+/-70	-20.5	360+/-70	AD 1420-1660	Sullivan (1990), Corbin (2003)	42156
6417	Profile 4	V, HF-1	n/d	1060+/-70	-22.1	1100+/-70	AD 920-1045	Sullivan (1990), Corbin (2003)	38668
6417	Profile 5	IVa	n/d	1200+/-130	-27.3	1170+/-130	AD 890-1105 AD 825-873 AD 793-815	Sullivan (1990), Corbin (2003)	38669
6417	BT-1	Iva, HF-6	n/d	600+/-100	-26.2	580+/-100	AD 1350-1470	Sullivan (1990), Corbin (2003)	38670
6417	Profile 4	Iva, HF-1	n/d	100+/-80	-21.9	150+/-80	AD 1527-1556 AD 1630-1955	Sullivan (1990), Corbin (2003)	38713
6422	Profile 4	IIIa, b, HF-1	55-74	180+/-80	-20.3	250+/-80	AD 1452-1891 AD 1908-1950	Sullivan (1990), Corbin (2003)	39987
6422	Trench	E Face, W. wall, IIIa, b	50-60	1056.4+/-1.8%	-25.4	105.4+/-1.8%	Modern	Sullivan (1990), Corbin (2003)	40129
6422	Trench	IIb	20-30	-	-21.0	1740+/-130	AD 2-601	Sullivan (1990), Corbin (2003)	44937
6423	TU-2	III, IV, HF-7	12-35	320+/-80	-25.1	320+/-80	AD 1433-1679 AD 1710-1752 AD 1756-1804 AD 1936-1947	Sullivan (1990), Corbin (2003)	40132
6423	Trench 1	III, IV, HF-9	10-20	620+/-130	-25.6	610+/-130	AD 1165-1167 AD 1187-1516 AD 1599-1616	Sullivan (1990), Corbin (2003)	39993
6423	Trench 2	III, HF-11	02-42	250+/-60	-25.4	240+/-60	AD 1489-1603 AD 1609-1693 AD 1726-1813 AD 1852-1859	Sullivan (1990), Corbin (2003)	39994
6423	Trench 2	IIb	43-53	790+/-100	-26.0	770+/-100	AD 1028-1334 AD 1336-1401	Sullivan (1990), Corbin (2003)	44938
6423	TU-5	IIb	53-63	250+/-70	-24.4	260+/-70	Ad 1466-1693 AD 1776-1812 AD 1853-1859 AD 1919-1949	Sullivan (1990), Corbin (2003)	44939
6423	TU-5	IIb	63-73	520+/-80	-24.6	520+/-80	AD 1295-1492 AD 1603-1609	Sullivan (1990), Corbin (2003)	44940
6423	TU-5	VIII	73-83	350+/-80	-24.3	360+/-80	AD 1415-1668 AD 1782-1796	Sullivan (1990), Corbin (2003)	44941
6423	TU-5	IV	42-46	430+/-70	-27.1	390+/-70	AD 1411-1652	Sullivan (1990), Corbin (2003)	44942
6423	TU-12	V, HF-12	89-94	1570+/-130	-25.0	1570+/-130	AD 179-189 AD 214-687	Sullivan (1990), Corbin (2003)	44944
6423	TU-13	V, HF-12	94-104	300+/-130	-26.0	290+/-130	AD 1405-1954	Sullivan (1990), Corbin (2003)	44945
6423	TU-13	V, HF-12	104-114	380+/-70	-24.4	1130+/-110	AD 663-1071 AD 1079-1131 AD1136-1158	Sullivan (1990), Corbin (2003)	44946
6423	TU-13	V, HF-12	114-124	1120+/-110	-24.4	1130+/-110	AD 663-1071	Sullivan (1990), Corbin (2003)	44947
Survey Area 11	TU-142	IV	84-94	3090+/- 130	n/d	2990+/-130	1575-845 BC	Bath et al. (1984)	10534
Survey Area 11	TU-33	III	120-215	4840+-130	n/d	4750+/- 130	3865-3165 BC	Bath et al. (1984)	10535

Table 9. Project Radiocarbon Age Determinations Ordered Chronologically

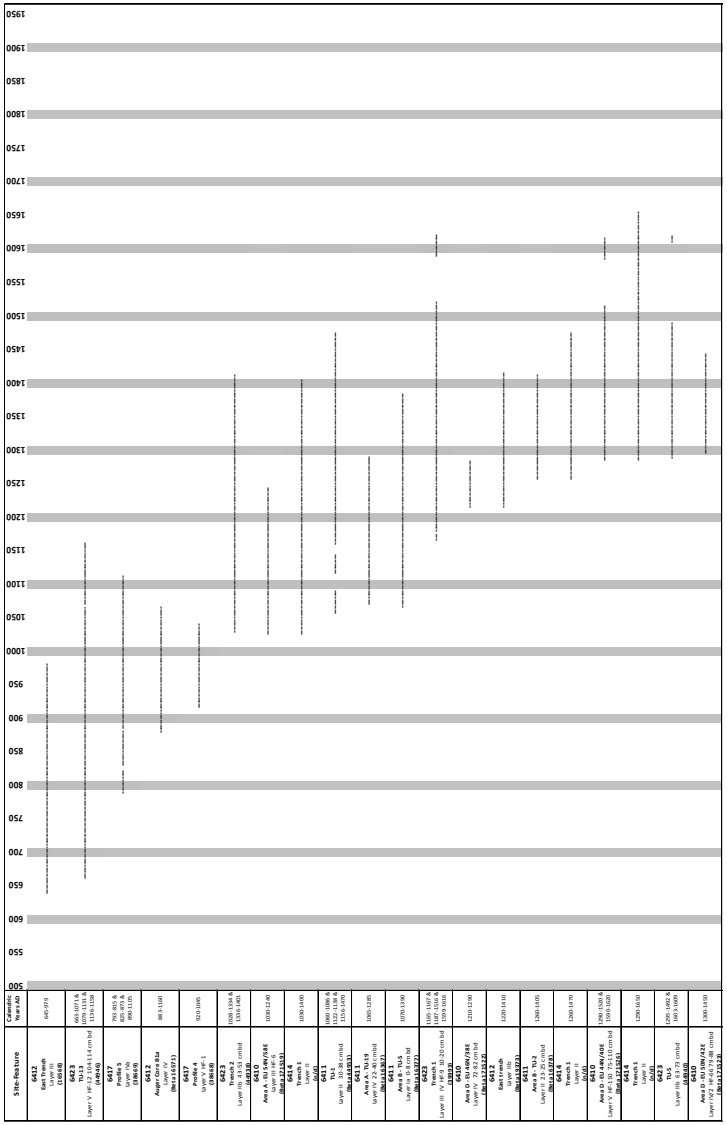


Table 9. Project Radiocarbon Age Determinations Ordered Chronologically (cont.)

Site-Feature	Calendric Years AD
6410 **Area D - EU 46N/38E** Layer V 68-108 cm bd **(Beta 171527)**	1300-1650
6411 **Area B - TU-14** Layer I 0-9 c mbd **(Beta 163724)**	1305-1420
6411 **Area A - TU-17** Layer IV 130-135 cm bd **(Beta 168419)**	1315-1520
6414 **Trench 1** Layer II **(n/d)**	1322-1340 & 1390-1950
6410 **Area B - TU-3** Layer II 14-40 cm bd **(Beta 158157)**	1330-1480
6417 **HF-1** Layer IVa HF-6 **(3917 0)**	1350-1470
6410 **Area D - TU-34** Layer I 0-56 c mbd **(Beta 158153)**	1395-1660
6411 **Area A - TU-17** Layer IV 135-145 cm bd **(Beta 168720)**	1400-1525
6410 **Area C - TU-33** Layer I 20-31 cm bd **(Beta 158157)**	1400-1660
6411 **TU-1** Layer I 10-16 cm bd **(Beta 140511)**	1402-1526 & 1556-1631
6423 **TU-13** Layer V HF-12 94-104 cm bd **(4194 0)**	1405-1954
6410 **Area D - EU 46N/40E** Layer V 75 c mbd **(Beta 171524)**	1410-1480
6410 **TU-26** Layer III 18-41 cm bd **(Beta 158611)**	1410-1635
6416 **Tr 1** Layer II HF-5 90-100 **(42154)**	1410-1670 & 1750-1796 & 1945-1954
6411 **TU-2** Layer II HF-10 42-60 cm bd **(Beta 140413)**	1411-1652
6412 **East trench** Layer III **(Beta 160568)**	1411-1652
6423 **TU-5** Layer IV 42-46 cm bd **(4194 2)**	1411-1652
6411 **Area C - TU-27** Layer VIII 112-132 cm bd **(Beta 168278)**	1415-1640
6410 **Area D - TU-31** Layer I 0-47 c mbd **(Beta 158156)**	1415-1645
6411 **Area A - TU-17** Layer III 105-114 cm bd **(Beta 168418)**	1415-1645
6423 **TU-5** Layer VII 73-83 cm bd **(4194 1)**	1415-1668 & 1782-1796

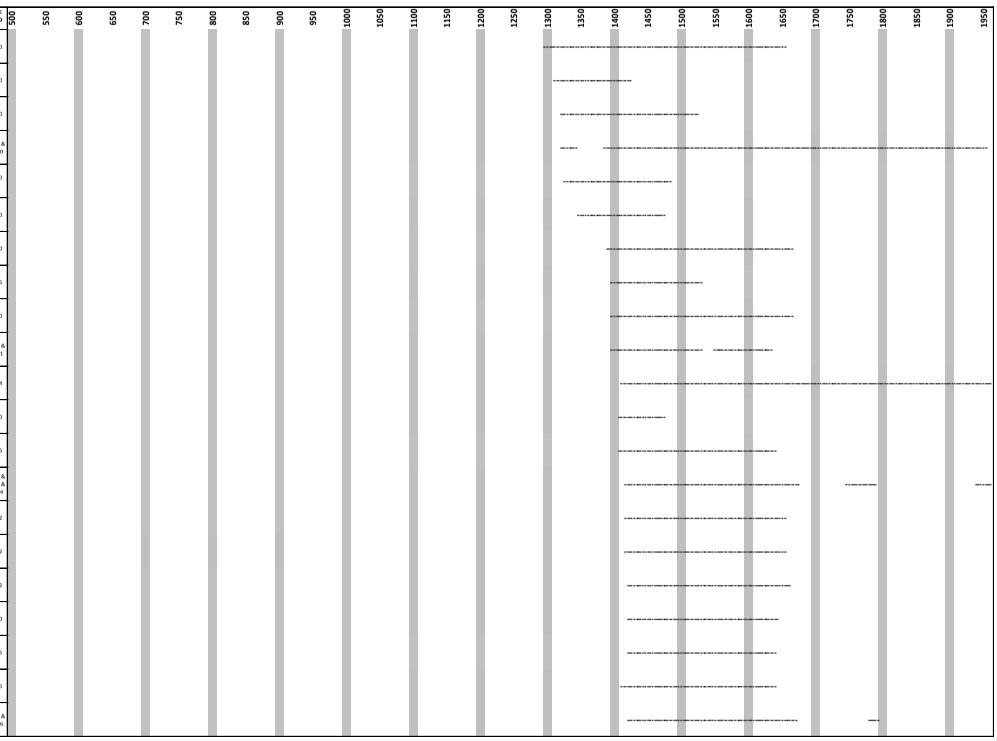


Table 9. Project Radiocarbon Age Determinations Ordered Chronologically (cont.)

Site-Feature	Calendric Years AD
6411 **Area B - TU-12** Layer I 0-6 cm bd **(Beta 163639)**	1420-1650
6416 **Tr 9** Layer I HF-8 23-32 **(42156)**	1420-1660
6410 **Area D - EU 44N/40E** Layer III /IV/V HF-106 71-101 cm bd	1410-1530 & 1560-1630
6423 **TU-2** Layer III IV HF-7 12-35 cm bd **(4191 2)**	1413-1679 & 1710-1752 & 1776-1804 & 1936-1947
6411 **Area B - TU-10** Layer II 18-50 c mbd **(Beta 163631)**	1435-1665
6410 **Area D - EU 40N/38E** Layer IV HF-18 68-89 c mbd **(Beta 171521)**	1440-1660
6411 **TU-1** Layer II 5-16 cm bd **(Beta 144951)**	1442-1668 & 1782-1796
6412 **South trench** Layer I **(Beta 19371)**	1446-1679 & 1740-1752 & 1776-1804 & 1935-1947
6422 **Profile 4** Layer IIIa, b HF-1 55-74 cm bd **(19987)**	1452-1891 & 1908-1950
6423 **TU-5** layer IIIb 53-63 cm bd **(4193 9)**	1466-1693 & 1776-1812 & 1853-1859 & 1919-1948
6423 **Trench 2** Layer III HF-11 2-42 cm bd **(19994)**	1489-1603 & 1609-1693 & 1726-1813 & 1852-1859
6411 **Area A - TU-24** HF-14 67-105 c mbd **(Beta 168461)**	1490-1670 & 1725-1790
6410 **Area C - TU-16** layer II 87-97 cmbd **(Beta 168531)**	1495-1800
6410 **Area A - TU-25** layer I 28-45 c mbd **(Beta 168601)**	1505-1675 & 1710-1805
6410 **TU-6** layer I 118-25 c mbd **(Beta 168541)**	1510-1680
6411 **Area A - TU-17** Layer II 105-118 cm bd **(Beta 163751)**	1510-1950
6417 **Profile 4** Layer IVb HF-1	1527-1556 & 1630-1955
(3971 3)	
6411 **Area A - TU-23** layer IIa 60-88 cm bd **(Beta 163761)**	1620-1890 & 1910-1950
6411 **Area A - PP-3** HF-18 0-10 cm bd **(Beta 163661)**	1620-1890 & 1910-1950

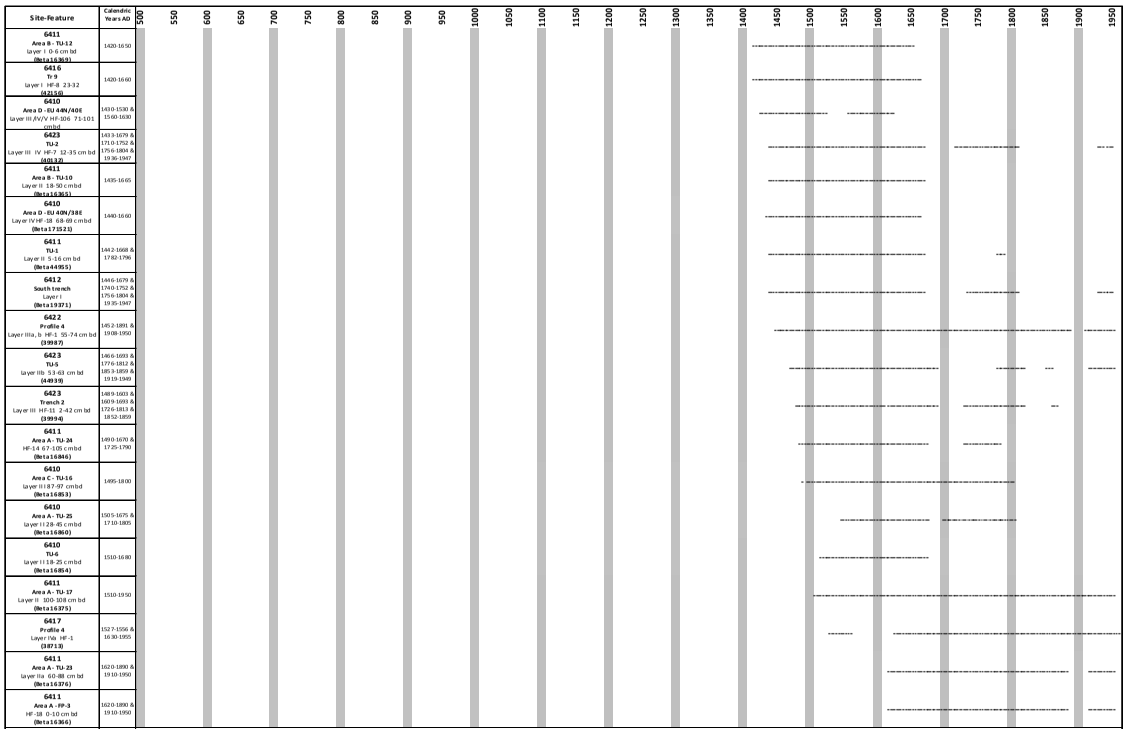
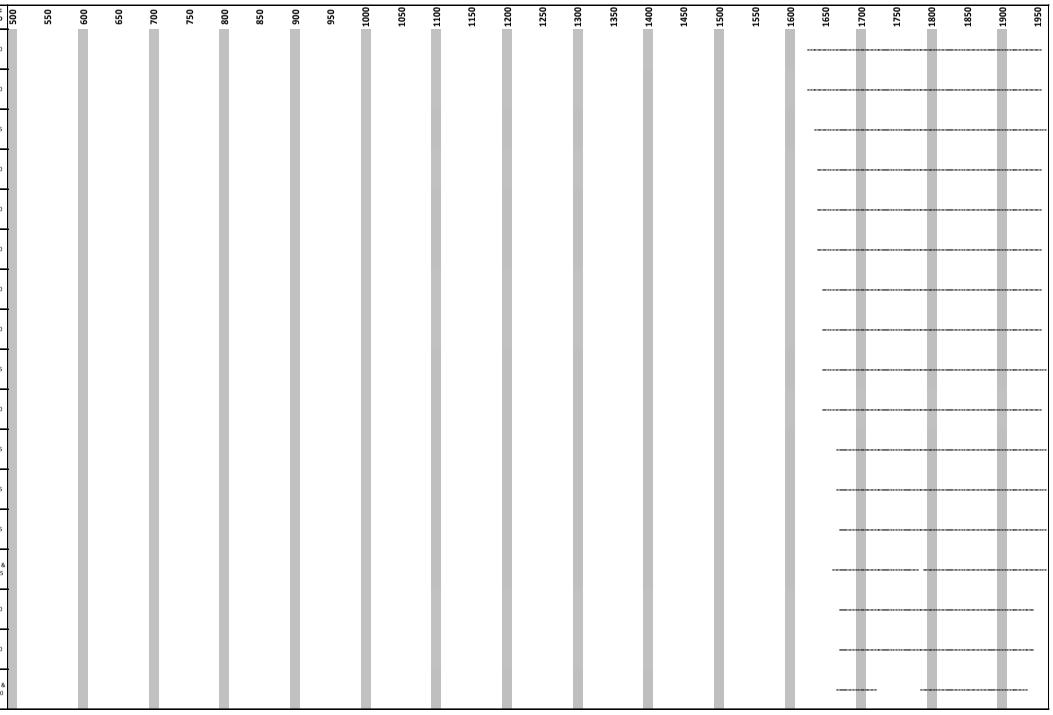


Table 9. Project Radiocarbon Age Determinations Ordered Chronologically (cont.)

Site-Feature	Calendric Years AD
6410 TU-158 Layer II- 12-68 cm bd **(Beta 10633)**	1630-1950
6410 **TU-4** Layer II 13-40 cm bd **(Beta 16856)**	1630-1950
6414 **Trench 1** Layer II **(n/d)**	1640-1955
6410 **TU-8** Layer III **(Beta 16858)**	1645-1950
6411 **Area A - TU-17** Layer III 114-130 cm bd **(Beta 16373)**	1645-1950
6411 **Area A - TU-28** Layer IVb 99-118 cm bd **(Beta 16850)**	1645-1950
6410 **Area A - EU 54N/58E** Layer IIa HF-2 60-70 cm bd **(Beta 175517)**	1650-1950
6410 **Area A - EU 56N/45E** Layer IIb HF-4 **(Beta 175518)**	1650-1950
6416 **Tr 2** Layer II HF-6 5-15 **(42155)**	1650-1955
6411 **Area A - TU-34** Layer II 42-62 cm bd **(Beta 10536)**	1655-1950
6411 **TU-2** Layer II HF-9 38-84 cm bd **(Beta 44960)**	1659-1955
6412 **Auger Core A4** Layer IV **(Beta 16569)**	1659-1955
6411 **TU-2** Layer II HF-8 36-95 cm bd **(Beta 44959)**	1662-1955
6411 **TU-2** Layer I 25-48 cm bd **(Beta 44956)**	1665-1784 & 1799-1955
6410 **Area C - TU-32** Layer I 29-43 cm bd **(Beta 16858)**	1665-1940
6410 **Area C - TU-13** Layer III 46-66 cm bd **(Beta 15859)**	1665-1940
6411 **Area A - TU-19** Layer VIII 45-65 cm bd **(Beta 16731)**	1670-1715 & 1800-1930



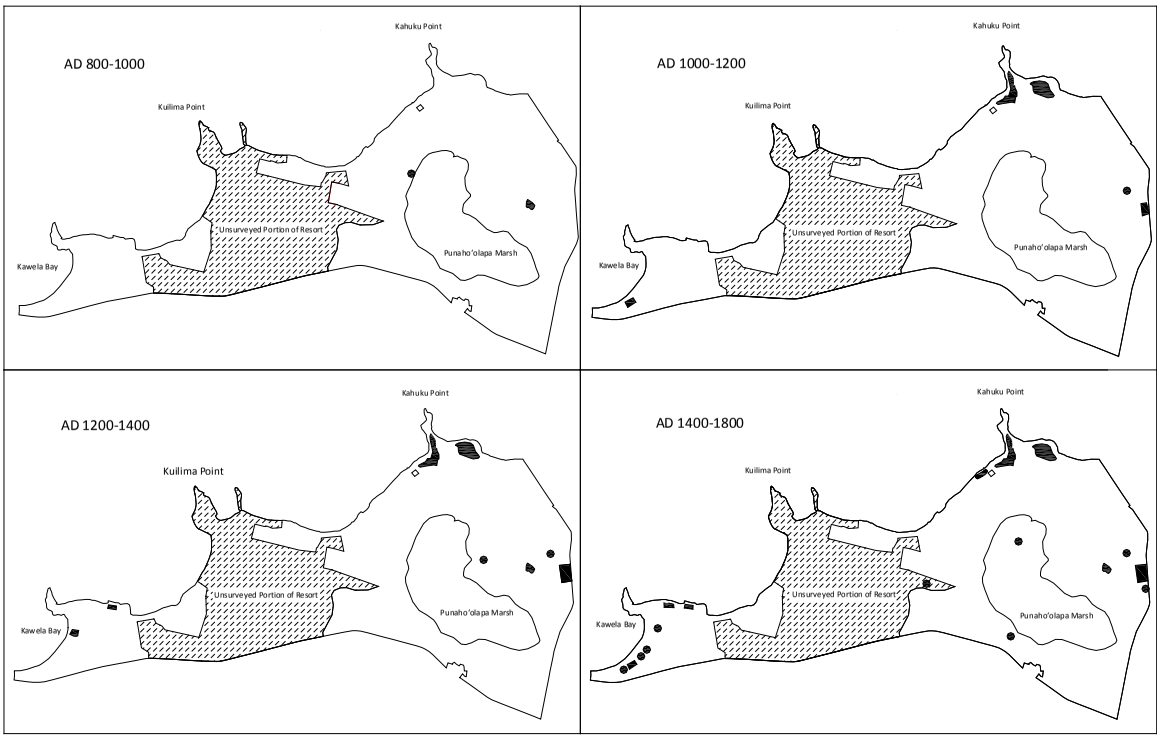


Figure 40. Pre-1800 Chronology of Occupation within Project Area

This developed portion of the property includes portions of the Turtle Bay beachfront, Kuilima Point and the west end of Kaihalulu Beach. The absence of data in this portion of the property should not be used to infer the absence of prehistoric use. Rather, the absence of data reflects the limits of archaeological data, combined with more than a century of agricultural use and subsequent resort development.

Figure 41 presents the distribution of deposits that post-date A.D. 1800, along with other evidence of the historic use of the TBR property. These historic elements consist of Land Commission Awards, the Kahuku Ranch facilities, areas planted in sugarcane, the former location of the OR&L railroad grade and the Kahuku Army Airfield. As indicated by this figure, nearly the entire property was affected by various historic activities and facilities.

SYNTHESIS AND EXPECTED SITE TYPES

Archaeological and historical background research indicates that in late prehistory the Kahuku Point vicinity was well populated and extensively cultivated. There were permanent residences scattered along the coast. Larger settlements were present in areas such as Kahuku and Kawela Bay where sheltered ocean access was available. Temporary habitation, probably associated with agricultural activity and natural resource exploitation, occurred in inland overhangs, caves, and walled shelters. Fishponds were present in sheltered areas and salt was collected from depressions along the shore. Fishing shrines and rock formations of legendary, and probably ritual significance were scattered along the coast.

Heiau were sited on prominent topographic features overlooking the coast. Sand dunes and cliff face caves were used for burial. Agricultural use included cultivation of taro in pond fields wherever topographically suitable locations could be provided with sufficient freshwater. The abundance of fresh water around Punaho‘olapa Marsh provided Ideal conditions for wet taro cultivation with minimal labor investment compared to pond field development of stream drainages. Dryland gardens were present around the coastal residences and on the lower volcanic slopes. Upland areas were also cultivated. Food remains from archaeological excavations include dog, pig, birds, and a wide variety of fish and marine invertebrates, documenting technologies for fishing, collecting, hunting, and animal husbandry. Radiocarbon dates for the area indicate settlement by at least the A.D. 1000s to 1200s with the most intensive use occurring after A.D. 1400.

Observations of Vancouver and early 1800s missionary censuses suggest depopulation affected the region shortly after European contact as postulated by Nakamura (1981). Some depopulation undoubtedly occurred as a result of introduced diseases following the onset of more frequent visits by whalers and missionaries in the early 1800s. However, the disparity in the initial descriptions of a flourishing well-cultivated settlement at Kahuku from Captain Cook’s expedition in 1779 and those from Vancouver’s fifteen years later in 1794 of a much diminished state of cultivation and population probably predates the onset of disease-inducted population decline. Captain King, who reported the observations during Vancouver’s expedition, conjectured that the decline was the result of internal warfare. Another explanation might be that the region was struck by a tsunami. While this would have resulted in a dramatic decline in cultivation of the coastal plain, the effects would rapidly diminish, allowing the area to return to a high level of settlement and cultivation as indicated by mid-Nineteen Century land claim testimony.

More than 100 LCA claims were awarded in the mid-1800s in the area spanning the region from Kawela to Kahuku. Thirty-five LCA claims with at least 24 house lots were awarded in the project area. The LCA testimonies refer to numerous lo‘i and cultivated plots of bananas, sweet potatoes, *wauke*, sugar cane, bitter melon, *noni* and an orange tree. Other named plants are *hala* groves and *koa* trees for canoes. A brackish spring and a fishery also are mentioned in the testimonies.

Charles Hopkins purchased 8,000 acres at Kahuku in 1850-1851 from Kamehameha III and established the Kahuku Ranch. Forests were cleared for pasture for free-ranging herds of sheep and cattle, which soon plagued the small Hawaiian farms that were scattered throughout the area, eventually displacing many of the farmers.

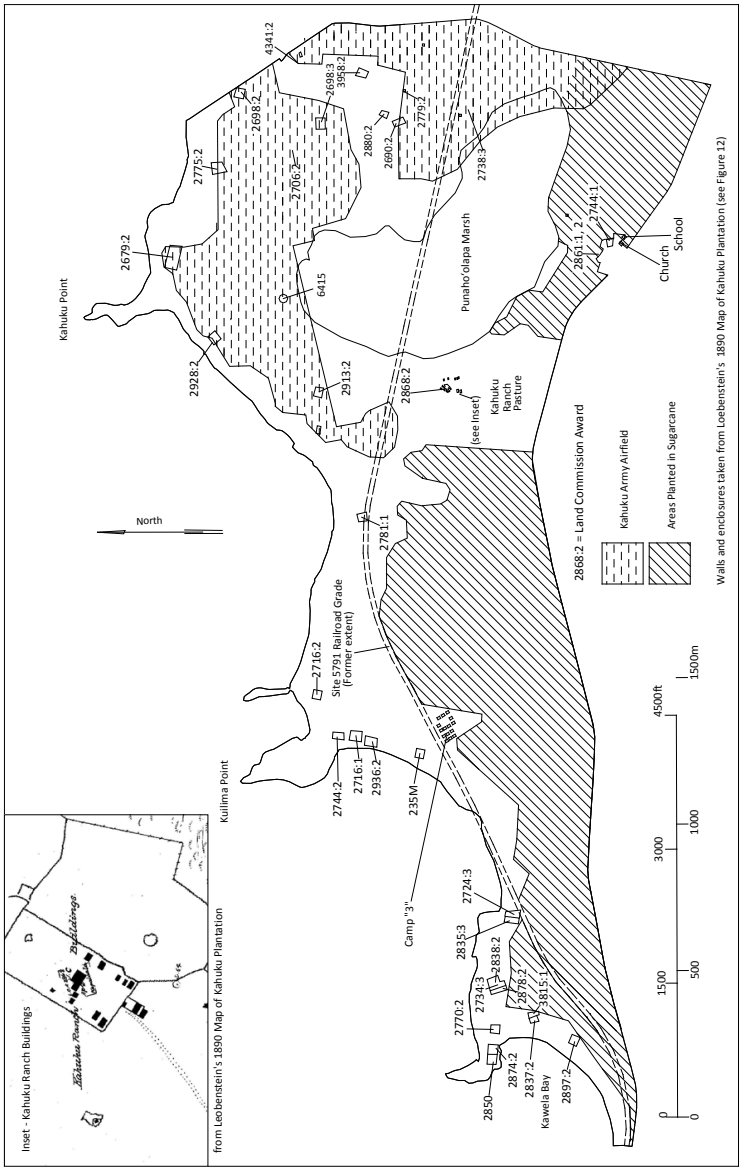


Figure 41. Post-1800 Use of Project Area

By 1856 a carriage road had been completed between Honolulu and Kahuku. The ranch changed ownership several times during the 1860s and 1870s. By 1873 the ranch consisted of 15,000 acres including the lands of Kaunala, Pahipahiʻāula, ʻŌpana 1 and 2, Kawela, Hanakaʻoe, Ōiʻo, Ulupehupehu, Punalau, Kahuku, Mālaekahana, Keana, and part of Lāʻie. In 1874, the ranch was sold to Julius Richardson, who then sold it to James Campbell in 1876 by which time it encompassed nearly 25,000 acres with 3,000 head of cattle and herds of sheep and horses. In 1889, most of the ranch was leased Benjamin Franklin Dillingham who chartered OR&L in the same year. Dillingham then subleased the lands to James Castle who chartered Kahuku Plantation Company in 1890.

The Kahuku Plantation began commercial production of sugarcane relying on water from springs, streams and rain for irrigation, but this was soon considered insufficient and artesian wells were drilled to augment the irrigation water supply. The first sugarcane crop from 2,800 cultivated acres was harvested in 1892. By 1899, the OR&L railroad line extended from Honolulu to Kahuku to get the cane to market. By the early 1900s there were stations at Kawela and Kahuku Ranch. Marconi Station was located just east of the property at Punamanō Marsh. By 1935, 4,490 acres were cultivated in sugarcane and the plantation employed over 1,100 workers. A plantation camp was established on the TBR property to house plantation workers by at least 1932.

In addition to sugarcane, pineapples were also cultivated beginning in the 1930s at Kahuku Plantation and on lands leased by the OR&L Railroad Company including small tracts leased to Japanese farmers. When the farmers' leases expired Kahuku Plantation leased large tracts of land to the California Packing Corporation (CPC), driving out the smaller farmers. The CPC became Del Monte Corporation in 1967.

The U.S. Army established Kahuku Army Airfield in 1942. The airfield encompassed runways, taxiways, revetments, bunkers, emplacements, barracks and support facilities. The facility served as an auxiliary field used for flight training and costal defense. Use of the airfield was short-lived and military use ended shortly after the end of World War II (September, 1945). The April 1946 tsunami devastated much of the facility shortly after the Army abandoned it. Subsequent use of the airfield runways included civilian aircraft and auto racing.

Sugarcane cultivation continued until 1971 when the Turtle Bay Resort and golf course were constructed. Some inland portions of the property continued to be used for vegetable faming until the late 1980s. Private beach cottages lined the east shores of Kawela Bay until 1990 when the area was cleared and preliminary construction for a hotel began, but was abandoned in 1991.

Based on previous archaeological research and historical documentary evidence, expected prehistoric to early historic remains in the project area include subsurface cultural deposits and a variety of subsurface features including fire pits, post molds for residential structures, and burials. Some cultural deposits will predate A.D. 1400, but most features will date between A.D. 1400 and 1800. Expected historic remains dating to the 1800s to 1900s include the OR&L railroad, plantation infrastructure (camps, roads, irrigation ditches, etc.) and walls marking property boundaries and serving to control livestock. Military-related remains dating from World War II will include runways, revetments, defensive fortifications and a variety of support facilities.

RESEARCH DESIGN

Professional archaeologists who meet or exceed the State of Hawaiʻi and U.S. Secretary of the Interior's qualifications will supervise the proposed SAIS work. Alan Haun, Ph.D. will function as the Principal Investigator for the SAIS project. Haun has conducted work in Hawaiʻi since 1978. Prior to founding Haun & Associates in 1999, he was the Senior Archaeologist for PHRI for 15 years. During his tenure with PHRI, Haun oversaw archaeological testing, data recovery and monitoring fieldwork on the TBR property between 1986 and 1990. As the firm's Principal Archaeologist, Dr. Haun will be directly involved with all aspects of project performance.

Other staff will include Haun & Associates' laboratory director and curation specialist Dianne Berrigan, M.A., project supervisors Juliana Kailihiwa, B.A. and Solomon Kailihiwa III, B.A. and Jack Dave Henry, B.S. who is responsible for fieldwork, AutoCAD drafting and preparation of technical reports. Henry also worked in a supervisory capacity during the PHRI data recovery and monitoring work in 1990-1991. The SAIS fieldwork would be completed within approximately two months following DLNR-SHPD approval of the SAIS plan.

The proposed primary fieldwork effort will consist of subsurface testing that will build on the extensive previous archaeological work that has been conducted on the property. Areas proposed for further testing and described below were previously cleared for development, with the stipulation that a professional archaeologist would monitor construction. This provision was based on the results of extensive archaeological subsurface testing and data recovery work conducted between 1977 and 1991, and on the extensive prior disturbance to the property by more than a century of sugarcane cultivation, the construction and operation of Kahuku Air Airfield, and the post-1971 development of resort facilities.

Despite prior archaeological clearance, TBR has elected to take a proactive approach to ensure the protection of cultural resources within the proposed expansion lands as part of the SEIS process. Toward that end a combined program of extensive systematic and discretionary archaeological test excavations, both mechanical and manual, are proposed for all areas within the resort property where substantial construction-related excavations are planned.

Figure 42 depicts the extent of proposed test excavation areas, labeled Test Areas A-G, on an aerial photograph of the TBR property. The majority of areas excluded from testing are already developed with golf courses and other resort facilities. Most of the proposed test areas are densely vegetated with *koa haole*, ironwood, Christmas berry and *hau*. Two forested areas, a proposed hotel site at Kawela Bay and a proposed golf clubhouse site in the central coastal portion of the property overlooking Kaihalulu Beach were graded to bedrock and filled during construction activity in 1990-1991. These areas are considered to lack any potential for significant intact subsurface cultural remains.

Figure 43 is an overlay of the proposed test excavation areas on the updated TBR master plan preferred alternative map. The combined test area extent is 173.2 acres. Test areas are located where future development is planned. No additional testing is proposed for parks and other open spaces where development impacts are anticipated to be minimal, primarily consisting of landscaping that would have very shallow, less than 1 ft (30 cm) deep impact. All ground disturbing activity in the open space areas would be subject to archaeological monitoring done in accordance with a new Monitoring Plan prepared for SHPD review and approval.

Portions of the proposed test areas were sampled during the PHRI survey in 1984 (Bath *et al*. 1984) and during the subsequent intensive survey and testing projects at Kahuku Point and Kawela Bay (Walker *et al*. 1988a, 1988b); however, testing generally was limited to widely spaced small diameter (10-15 cm) auger tests. Data recovery excavations at sites identified during monitoring (Corbin 2003) were conducted in the vicinity of SAIS Test Areas D and E. Several burials were inadvertently discovered in SAIS Test Area C (Kennedy 1992; Carson *et al*. 1996, 1999).

Figure 42. Aerial View of Project Area showing Proposed Test Excavation Areas

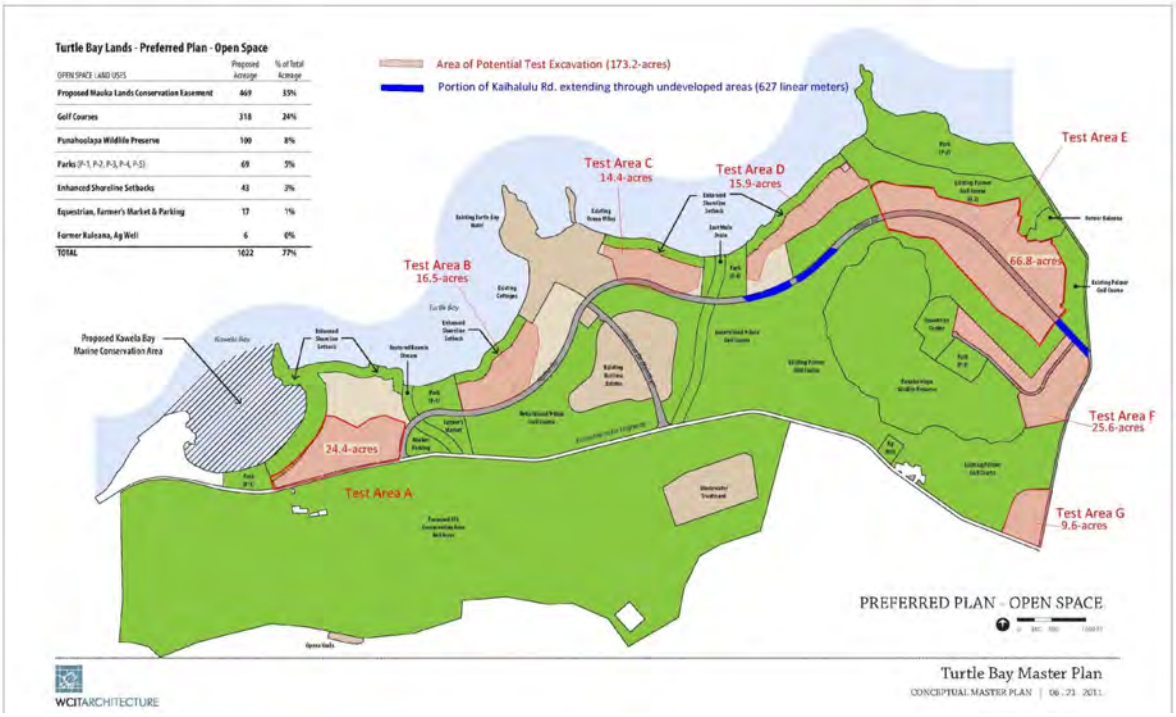


Figure 43. Potential Test Excavation Areas and Turtle Bay Lands - Preferred Plan - Open Space Lands

Previous archaeological studies for the TBR property have established the higher potential for encountering subsurface cultural remains including burials in mapped Jaucus Sand and Pearl Harbor Clay deposits (*Figure 44*). It is proposed that these two soil types will be subject to higher intensity testing. Lower intensity testing is proposed for the various clay and loam soil types elsewhere on the TBR property.

Backhoe-excavated trenches will be systematically placed along a series of uniformly spaced transects. A test trench density of two 5 m (16 ft) long trenches per acre for high-intensity testing and one trench per acre for low-intensity testing is proposed (*Figure 45*). *Figures 46 through 59* (at end of Consultation section) depict the proposed test areas. There are two figures for each area. The first shows the distribution of soil types and depicts previous test excavations within, or adjacent to each test area. The results of prior testing are presented in a tabular inset that shows one or more typical stratigraphic profiles for each area derived from the previous testing data. Stratigraphic information includes layer designation, layer thickness, Munsell color, sediment texture and soil type. The second figure for each test area depicts historic land use and the proposed placement of systematic test trenches. Also shown are proposed discretionarily placed trenches designed to sample areas missed by the systematically placed trenches, where subsurface deposits could potentially be present based on documented past land use or previous archaeological work.

Low density testing, consisting of 35 trenches, is proposed for the 24.4 acres of Waialua/Mokulei Clay soils at Kawela Bay (Test Area A; see *Figures 46-47*) and the residential housing area (Test Area G, 9.6 ac; see *Figures 58-59*). Five additional discretionary trenches will be placed along the northwest margin of Test Area A where Jaucus Sand deposits are present.

The remaining test areas consist of Jaucus Sand and Pearl Harbor Clay soils, where high-intensity testing will consist of a test trench density of 2 trenches per acre (139.2 ac = 279 trenches). The systematic sampling strategy would yield excavation and examination of a total of 314 trenches including both high and low density test areas.

Additional trenches for discretionary placement will be used for:

- Specific areas that might be missed by the systematic transect trenching such as LCAs (see *Figures 49 and 55*);
- The location of former plantation worker housing (Camp 3; see *Figure 49*);
- Areas were subsurface cultural remains were documented by previous archaeological studies (see *Figures 51 and 53*);
- Segments of the proposed Kaihalulu Drive outside the potential test excavation areas that are undeveloped (see *Figure 43*); and
- Defining the extent of subsurface cultural deposits identified in the systematic trenches.

Prior archaeological excavations in and adjacent to **Test Area A** reached a maximum depth of 1.15 m below surface with no cultural layers identified (see *Figure 47*). The prior testing identified two to three non-cultural sand layers in the seaward portion of Area A and three non-cultural sandy clay and clay loam layers in the inland portion. Evidence of plowing was observed in the eastern portion of the area where the test excavations reached the water table. The plow zone is a 0.35 m thick clay loam underlain by two layers of sand. Five discretionary trenches will be excavated along the northwest margin of this low density test area due to the presence of sand deposits (see *Figure 48*). Two of these discretionary trenches will test areas adjacent to LCA parcels.

No cultural layers were observed in prior excavations conducted adjacent to the west side of **Test Area B**. These excavations extended to a maximum depth of 2.1 m below surface exposing 3-4 layers of sand (see *Figure 48*). At least two discretionary trenches will be excavated in the eastern portion of the area where an LCA parcel (LCA 235M) and Kahuku Plantation Camp 3 were formerly located (see *Figure 49*).

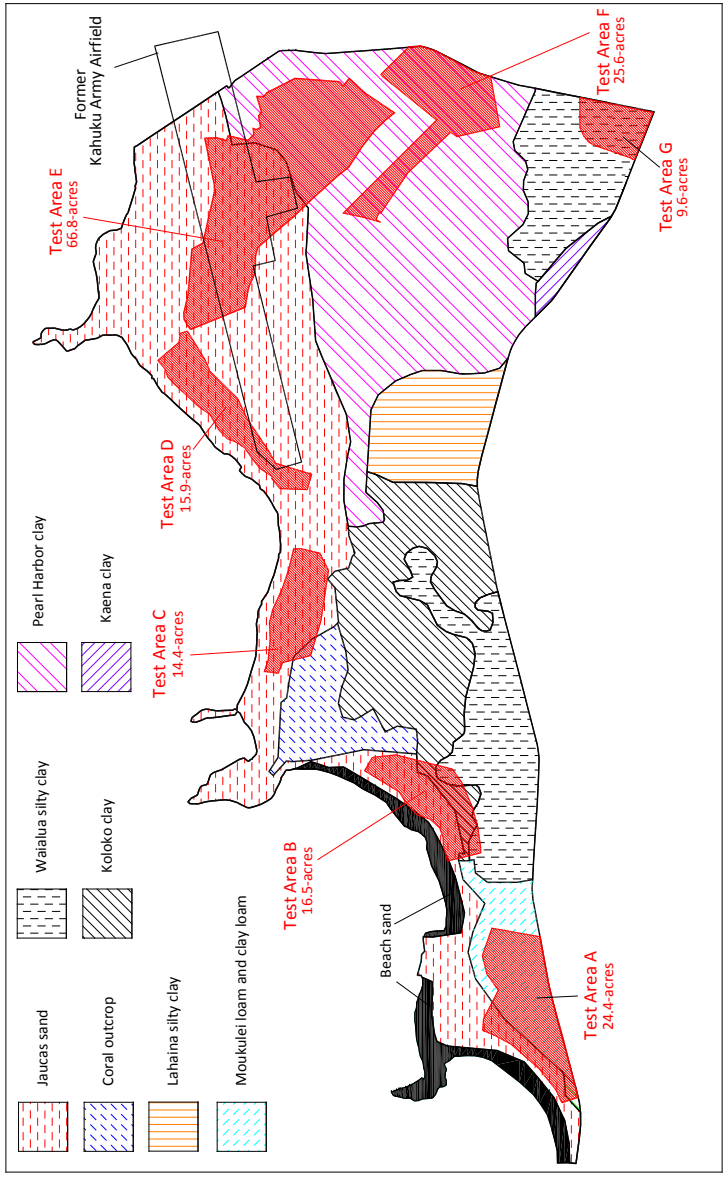


Figure 44. Potential Test Excavation Areas and Distribution of Soils within Project Area

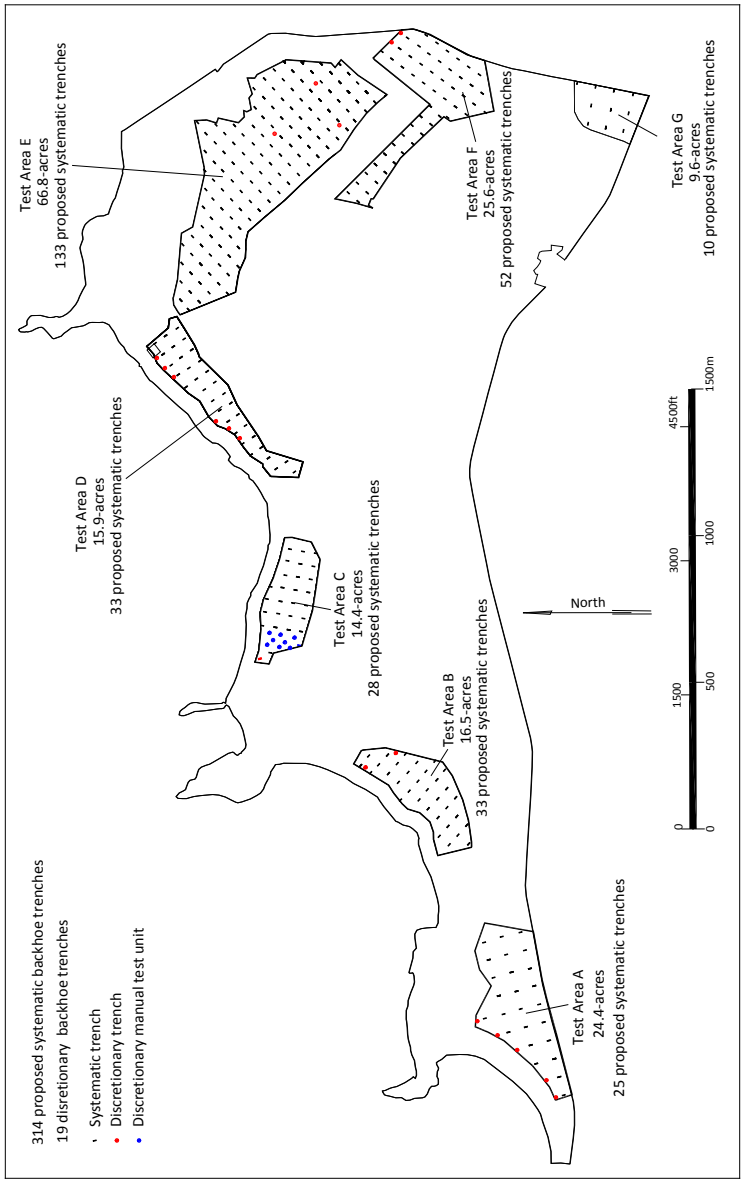


Figure 45. Proposed Test Areas and Trench Locations

Previous excavations in **Test Area C** documented three sand layers extending to a depth of 2.1 m below surface (see Figure 50). These sand deposits were highly disturbed with mixed prehistoric and modern debris. Site 4488, where several burials were recovered, is located in the western portion of this test area. Eight or more test units will be excavated in the vicinity of the site (see Figure 41). These test units will be excavated manually until the stratigraphy in this area is well documented and the potential for encountering additional burials is evaluated. Manually excavated fill will be screened with 1/8th-inch mesh to recover cultural remains. If no burials are identified, then mechanical excavation of the surrounding systematically-placed trenches will proceed. If a burial is identified all work in the immediate vicinity will cease and the procedures discussed below will be followed. A discretionary trench will also be excavated at the west end of Area C.

Previous excavations within and adjacent to **Test Area D** documented multiple (2-6) sand layers extending to a maximum depth of 1.6 m below surface (see *Figure 52*). An intact cultural deposit was indentified at the northeast end of the area (Site 6411, Area C), consisting of black loamy sand that varied in depth from 1.16 to 1.41 m. The central portion of Area D contains highly disturbed sand deposits with at least some cultural material, although Corbin (2003) does not indicate which layer(s) contained cultural material. The southwest portion of Test Area D was characterized by two non-cultural sand layers. At least three discretionary trenches will be excavated in the eastern and central portions of the Test Area to further examine the previously identified cultural deposits (see *Figure 53*).

Previous excavation in and adjacent to **Test Area E** attained a maximum depth of 3.6 m below surface. Most of the test excavations reached bedrock. An intact cultural layer was identified in the southeast portion of the area (Site 6414; see *Figure 54*). This deposit consists of dark brown silty clay loam that varies in depth from 0.59 to 0.89 m. Remnant wetland deposits are present at the northwest and west ends of the area, where soils were impacted by airfield construction at the northern end. Relatively shallow Pearl Harbor Clay deposits border Area D to the east, west and south. At least three discretionary trenches will be excavated in this Test Area in the locations of three former LCA parcels (LCA 2698:3, 2880:2, and 3958:2; see *Figure 55*). Additional discretionary trenches may be excavated in the vicinity of Sites 6414 and 6417 if the systematically placed trenches near these sites do not encounter cultural material.

Prior excavations adjacent to **Test Area F** extended to a maximum depth of 4.93 m below surface. Most of these excavations extended to bedrock or the water table. Stratified cultural deposits were identified in excavations adjacent to the northeast end of the area (Site 6422; see *Figure 56*). The upper cultural deposit consists of a very dark grayish brown silty clay loam that is 0.12 to 0.31 m in depth. It is directly underlain by a brown silty clay loam cultural layer that is 0.31 to 0.42 m in depth. At least two discretionary trenches will be excavated next to the reported location of these deposits (see *Figure 57).* Remnant wetland deposits associated with Punaho'olapa Marsh are located west of the area and non-cultural Pearl Harbor Clay is present to the north and northwest.

No previous excavations were conducted in or near **Test Area G**; the closest test excavations consist of two cores located more than 100 m to the northwest (see *Figures 58* and *59*). These cores extended to a depth of 3.6 m and identified multiple layers of loam, clay and silt with an intervening peat layer. No cultural deposits were present.

When cultural deposits are encountered mechanical excavation will be suspended and further excavation will be conducted manually with shovels or trowels, as appropriate, to determine the horizontal extent of the deposit in the trench. Additional mechanically and manually excavated trenches would surround the trench where cultural deposits are exposed, halfway between the trench where the deposit is identified and the next systematic trench on all four sides. Additional trenches or manually excavated test pits will be used to fully define the horizontal extent of any subsurface cultural deposit.

In areas where previous archeological studies have identified remnant cultural deposits and subsurface features (post molds, fire pits and burials), and for subsurface deposit extent determination testing, a combination of mechanical and manual excavation techniques would be employed. Mechanized equipment will be used to remove non-cultural deposits overlying intact cultural deposits, followed by manual excavation methods to

determine the vertical extent of the cultural deposit. Fill from manually excavated cultural deposits and will be screened with 1/8th-inch mesh to recover cultural remains. After the cultural deposit is excavated within the trench additional mechanical excavation will be used to reach the water table or bedrock to determine if deeper cultural deposits are present.

Extensive vegetation clearing of test trench transects will be required prior to backhoe trench excavation. This can best be accomplished by using a mechanical flail attachment on an excavator. Use of this device reduces the vegetation to mulch that is broadcast over the ground surface eliminating the need for collection and removal. Trench excavations will be carefully monitored in the event that human remains or cultural deposits are encountered. Trenches will be excavated deeply enough (usually to the water table or limestone bedrock) to ensure that all buried cultural deposits are observed. Trench dimensions will be compliant with appropriate Occupational Safety and Health Administration (OSHA) standards.

Upon completion of each backhoe trench excavation, a representative trench face will be manually scraped to aid in recording the stratigraphy. The face will then be profiled and described using Munsell soil colors and U.S. Soil Conservation Service terminology and the GPS coordinates of all profiles will be recorded. Artifacts, food remains and charcoal samples will be collected from the trench walls as appropriate and the GPS coordinates of all collections will be documented. The completed trench will be photographed and immediately backfilled.

Another fieldwork task will consist of the relocation and potential documentation of specific sites previously identified on the TBR property. As discussed in a preceding section, the current disposition of seven sites needs to be determined. These consist of sites that were assigned SIHP site designations and those that have not (see *Table 6*). The SIHP sites consist of the Site 5791 OR&L railroad grade, the Site 6421 walled pool, and the Sites 6424 and 6426 rock walls. Sites with no SIHP site designation consist of remnants of the Kahuku Army Airfield, including the Site T-4 military structure, the Site T-2 wall and the Site T-3 cattle enclosure. The reported locations of these sites will be examined and if any are extant, they will be fully documented.

Site documentation will consist of preparation of scaled plan maps, photographic documentation, preparation of standardized site and feature forms, and evaluation of site condition and physical integrity. The location of any surface or subsurface sites or features identified during the SAIS will be determined with the aid of a hand-held Magellan Mobile Mapper Global Positioning System (GPS) device using the NAD 83 datum. The accuracy of this GPS device for a single point is less than one meter. Sites identified during the survey will be marked and their locations plotted on a scaled project area map. If any burials or subsurface features are identified that require in-place preservation, their locations will be plotted by a licensed land surveyor.

SHPD staff will be periodically briefed on the SAIS fieldwork findings and status. The agency and TBR management will be notified immediately in the case of any unusual or highly significant findings. If human remains are identified during the fieldwork, all work in the vicinity of the find will cease and the proper authorities, including DLNR-SHPD and TBR, will be contacted immediately. No further work including screening of fill, cleaning or excavating the remains, or other investigation in the immediate vicinity will take place until agency consultation is completed, except measures necessary to protect the remains from the elements and other disturbance. Following initial agency consultation and approval, the remains will be reburied or otherwise protected to ensure the safety and security of the remains until appropriate treatment is determined. All remains will be treated as "previously identified" in accordance with HAR §13-13-300-31(b). Appropriate treatment will be determined through the preparation of a Burial Treatment Plan for review and approval by the DLNR-SHPD and the Oʻahu Island Burial Council (OIBC).

Following completion of fieldwork, analysis of all recovered remains and data will use standard archaeological methods. All recovered artifacts will be analyzed to determine morphological type, condition/degree of completion and material. Metric measurements will include weight, length, width, and thickness. Standard typological classifications will be used for all artifacts. Food remains will be identified to the Family level, or to the Genus/species level, when possible. Quantitative analysis will include a determination of total weight and total number of fragments (TNF) per taxon. If suitable charcoal samples are recovered that have the potential to

contribute to the extensive chronology that has been developed for the project area, they will be submitted to Beta Analytic, Inc. for analysis.

The resulting data will be presented in a draft SAIS Report in conformance with regulatory agency requirements for archaeological inventory survey reports contained in HAR §13-13-276-5. The draft report will include significance assessments and specific recommendations for any further archaeological work.

CONSULTATION

This SAIS Plan will be prepared in consultation with DLNR-SHPD and the Office of Hawaiian Affairs (OHA). The consultation will ensure that the work complies with applicable laws, regulations and rules. This consultation also will ensure that the Plan reflects a mutually acceptable scope of work for the SAIS fieldwork prior to implementation. Consultation with the OIBC is planned to provide an informational briefing regarding the SAIS work, to solicit input regarding the study, and to identify additional interested parties.

The consultation process, which is an ongoing process that will continue concurrently with the SAIS tasks, also will require input from interested organizations and individuals, including the local community, Hawaiian cultural organizations, recognized lineal and cultural descendants, and individuals knowledgeable about the TBR property cultural resources and land use history. This interested party consultation is part of the ongoing Cultural Impact Assessment (CIA) work currently in preparation by Pacific Legacy, Inc. for the TBR property and is being conducted in accordance with HAR §13-13-284-(c)-(3) and §13-13-276-5-(g). Results of the consultation process will be incorporated into the SAIS Report.

Consultation already has included TBR management meetings with the Kahuku Burial Committee, composed of families who have a connection to TBR lands and who have expressed a desire to take an active role in caring for ancestral remains on the property. Consultation also has included TBR management meetings with OHA and with the Koʻolauloa and Koʻolaupoko Hawaiian Civic Clubs. TBR management has invited cultural practitioners, *kūpuna*, and knowledgeable individuals to be part of a cultural advisory council to share their *manaʻo* on the cultural issues and opportunities associated with TBR.

Public notices seeking to identify interested parties, including lineal and cultural descendants, have been published in Honolulu Star-Advertiser (May 5, 2011) and the monthly OHA newsletter *Ka Wai Ola* (June 2011; APPENDIX A). Two responses to the notices were received, including one individual who owns a *kuleana* parcel within the TBR property.

Profile	Layer	Depth (cm)	Color	Texture	Soil Type
1	I	0-75	Pale brown	Very fine sand	Jaucus sand
	II	75-140	Light grey	Very fine sand	
2	I	0-90	Reddish brown to dark reddish brown	Sandy clay loam	Mokulei loam and Clay loam
	II	90-100	Yellowish red	Sandy clay loam	
	III	100-115	Yellowish red	Sandy clay	
3	I	0-35	Dark brown to dark reddish brown	Clay loam - Plow zone	Mokulei loam and clay loam
	II	35-80	Yellowish red	Calcareous sand	
	III	80-90	Very pale brown	Calcareous sand	

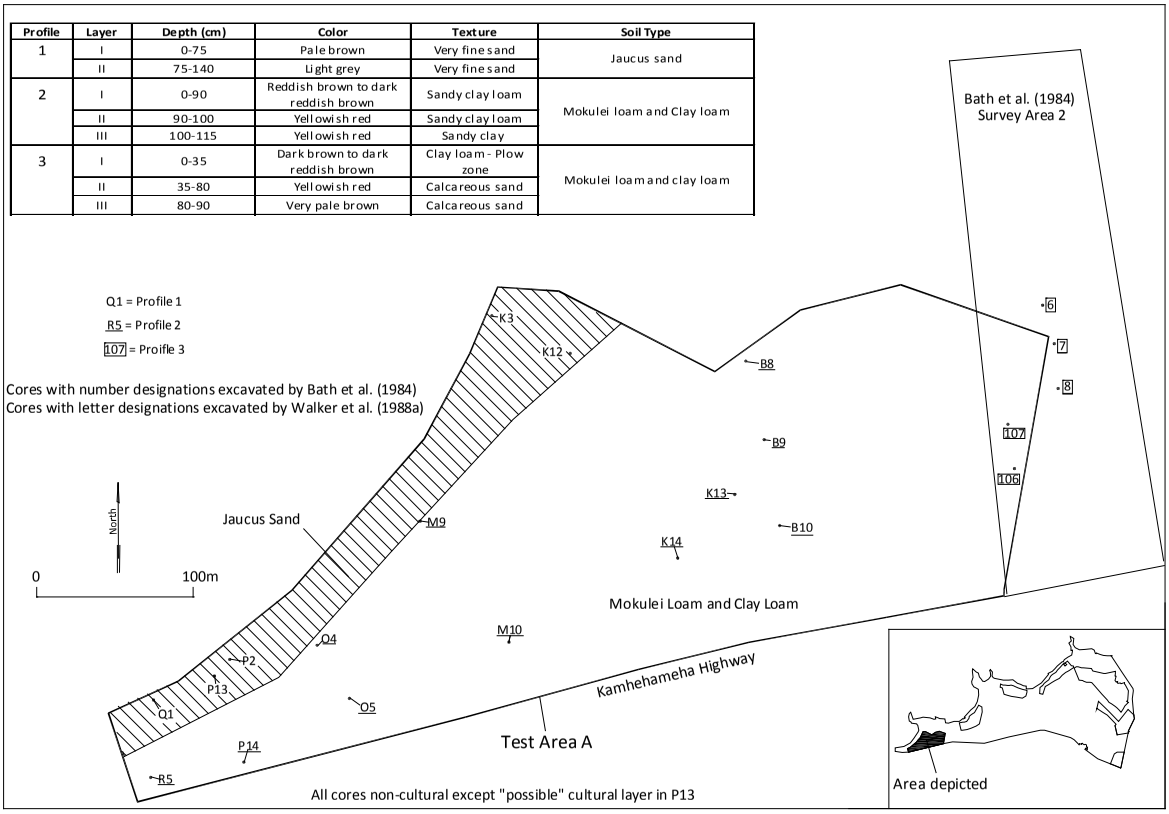


Figure 46. Test Area A, Soil Types and Previous Testing Results

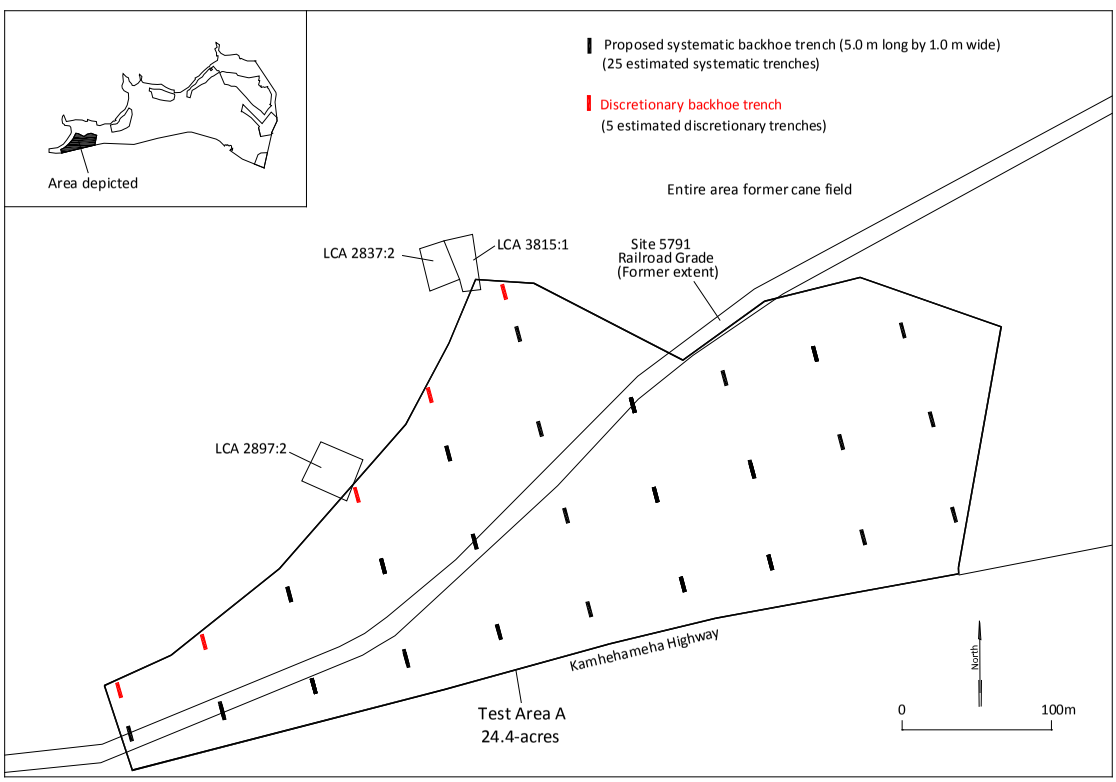
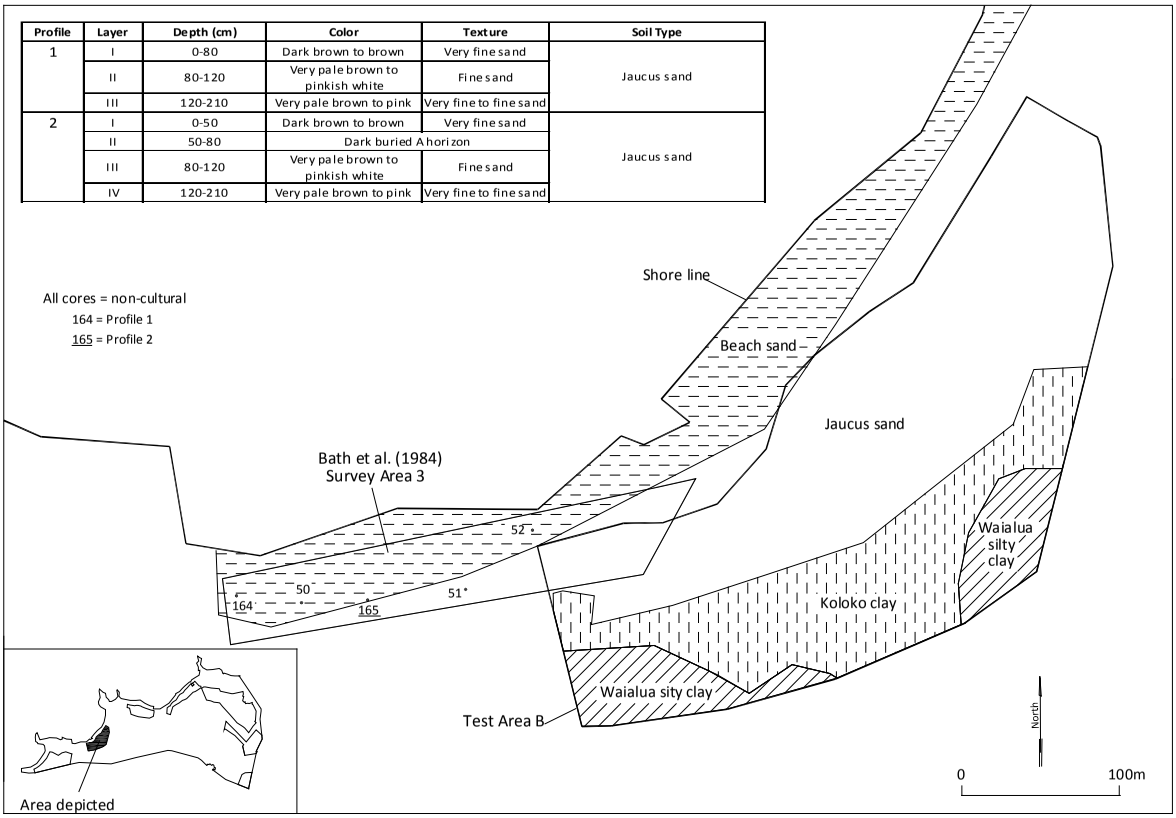


Figure 47. Test Area A, Proposed Trench Locations and Historic Land Use



Profile	Layer	Depth (cm)	Color	Texture	Soil Type
1	I	0-80	Dark brown to brown	Very fine sand	Jaucus sand
	II	80-120	Very pale brown to pinkish white	Fine sand	
	III	120-210	Very pale brown to pink	Very fine to fine sand	
2	I	0-50	Dark brown to brown	Very fine sand	Jaucus sand
	II	50-80	Dark buried A horizon		
	III	80-120	Very pale brown to pinkish white	Fine sand	
	IV	120-210	Very pale brown to pink	Very fine to fine sand	

Figure 48. Test Area B, Soil Types and Previous Testing Results

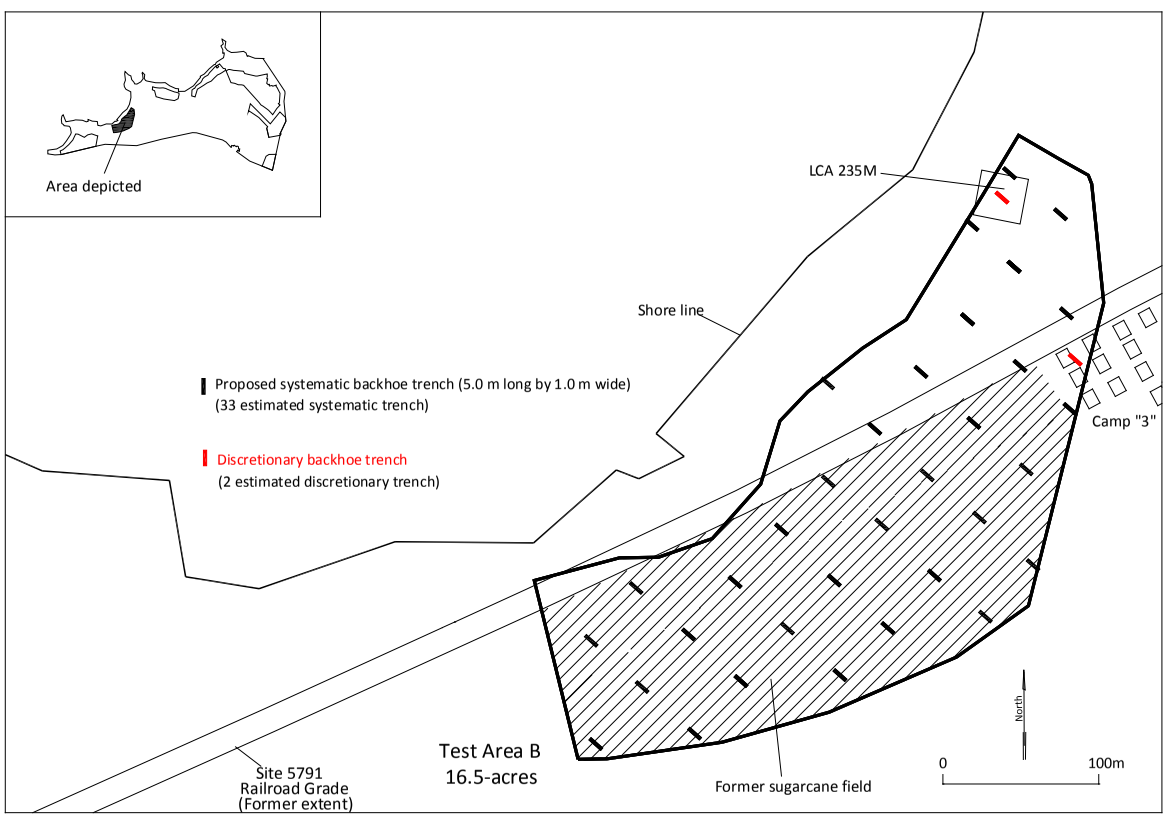
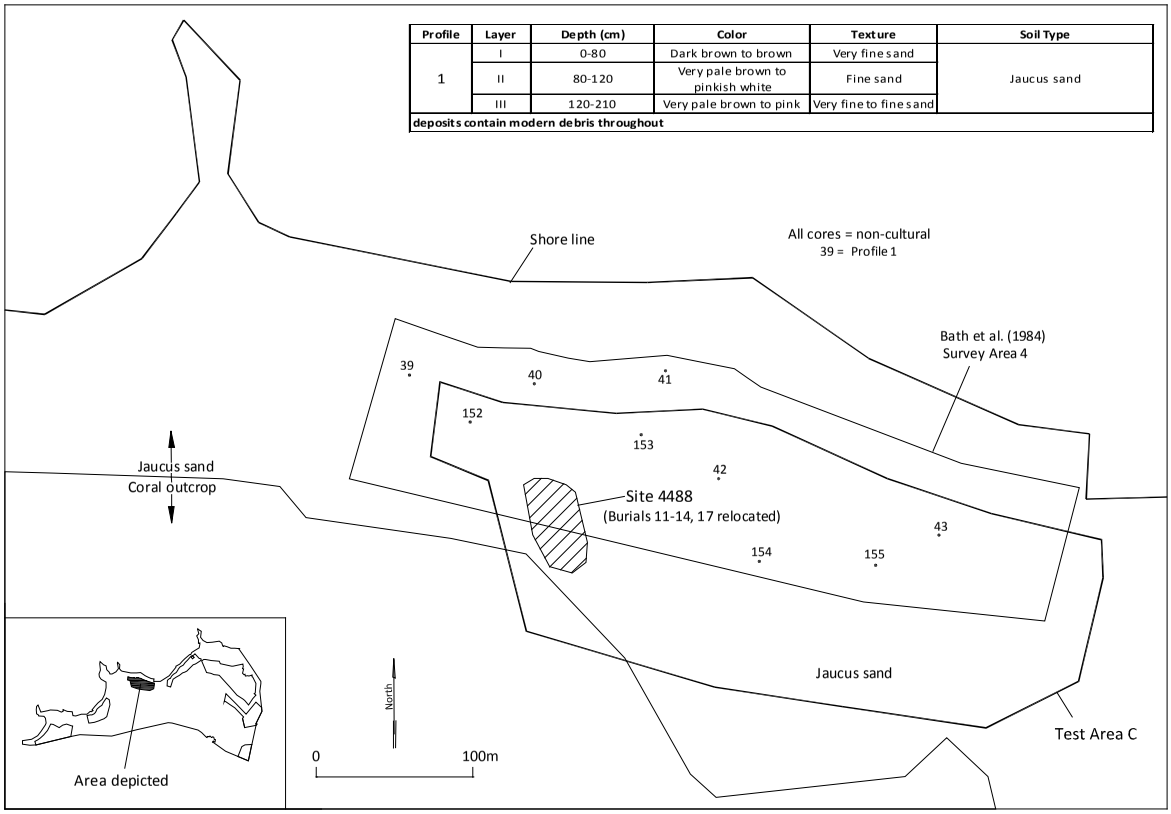


Figure 49. Test Area B, Proposed Trench Locations and Historic Land Use



Profile	Layer	Depth (cm)	Color	Texture	Soil Type
1	I	0-80	Dark brown to brown	Very fine sand	Jaucus sand
	II	80-120	Very pale brown to pinkish white	Fine sand	
	III	120-210	Very pale brown to pink	Very fine to fine sand	
deposits contain modern debris throughout					

Figure 50. Test Area C, Soil Types and Previous Testing Results

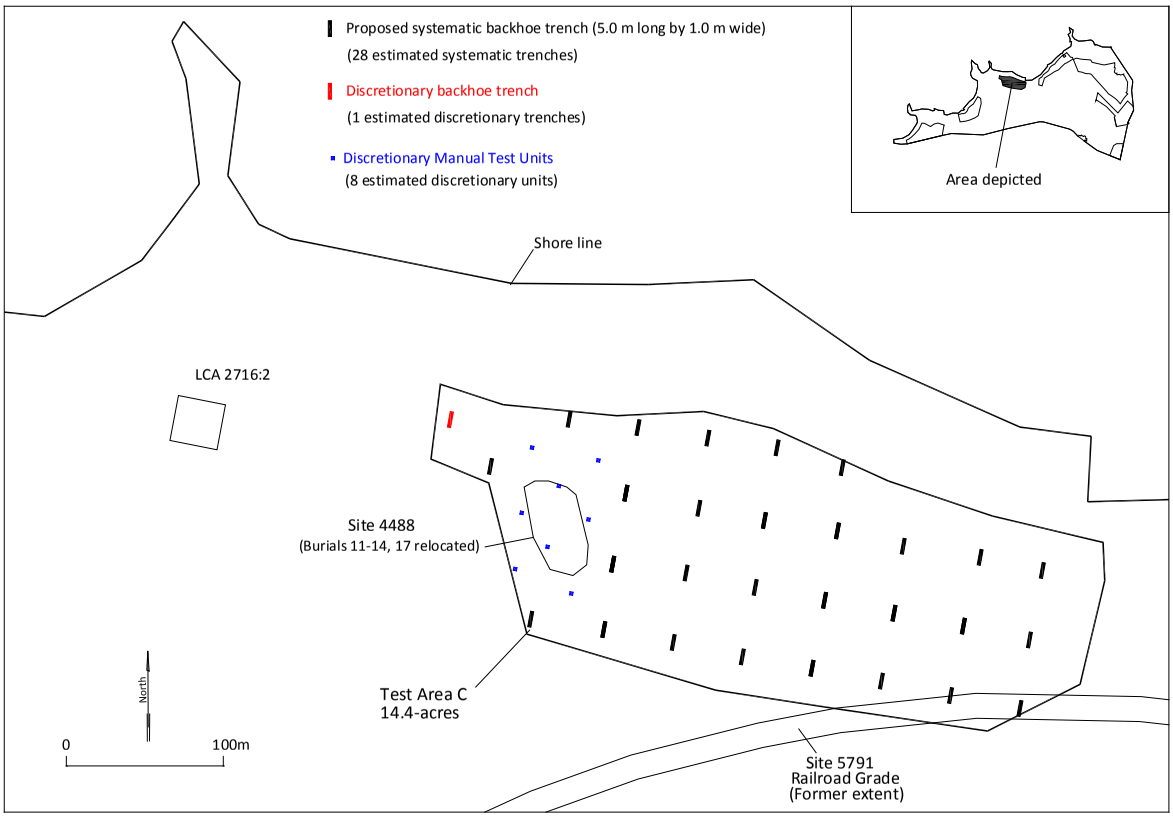


Figure 51. Test Area C, Proposed Trench Locations and Historic Land Use

Profile	Layer	Depth (cm)	Color	Texture	Soil Type
1	I	n/d	n/d	Aoelian sand	Jaucus sand
	II	n/d	n/d	n/d	
	III	n/d	Grayish black	n/d	
	IV	100	n/d	Sterile beach sand	
2	I	n/d	Light brown	Sand	Jaucus sand
	II	250	White	Sand	
3	I	0-30	Very pale brown	Sand	Jaucus sand
	II	30-44	Brown to dark brown	Loamy sand	
	III	44-78	Very pale brown	Very fine sand	
	IV	78-116	Yellowish brown	Loamy sand	
	V*	**116-141**	**Black**	**Loamy sand**	
	VI	141-160	Very pale brown	Very fine sand	
*** = Cultural layer**					
4	I	n/d	Very dark brown	Loamy fine sand	Jaucus sand
	II	n/d	Light brownish gray	Course sand	
	III	n/d	Pale brown	Course sand	
	IV	n/d	Pale brown	Very fine sand	
	V	n/d	Grayish brown	Very fine sand	
	VI	n/d	Pale brown	Very fine sand	
	VII	n/d	Grayish brown	Very fine sand	
	VIII	n/d	Brown	Very fine sand	
	IX	n/d	Very dark grayish brown	Very fine sand	
	X	n/d	Very pale brown	Very fine sand	
	XI	n/d	Very pale brown	Very fine sand	
Highly disturbed deposit					

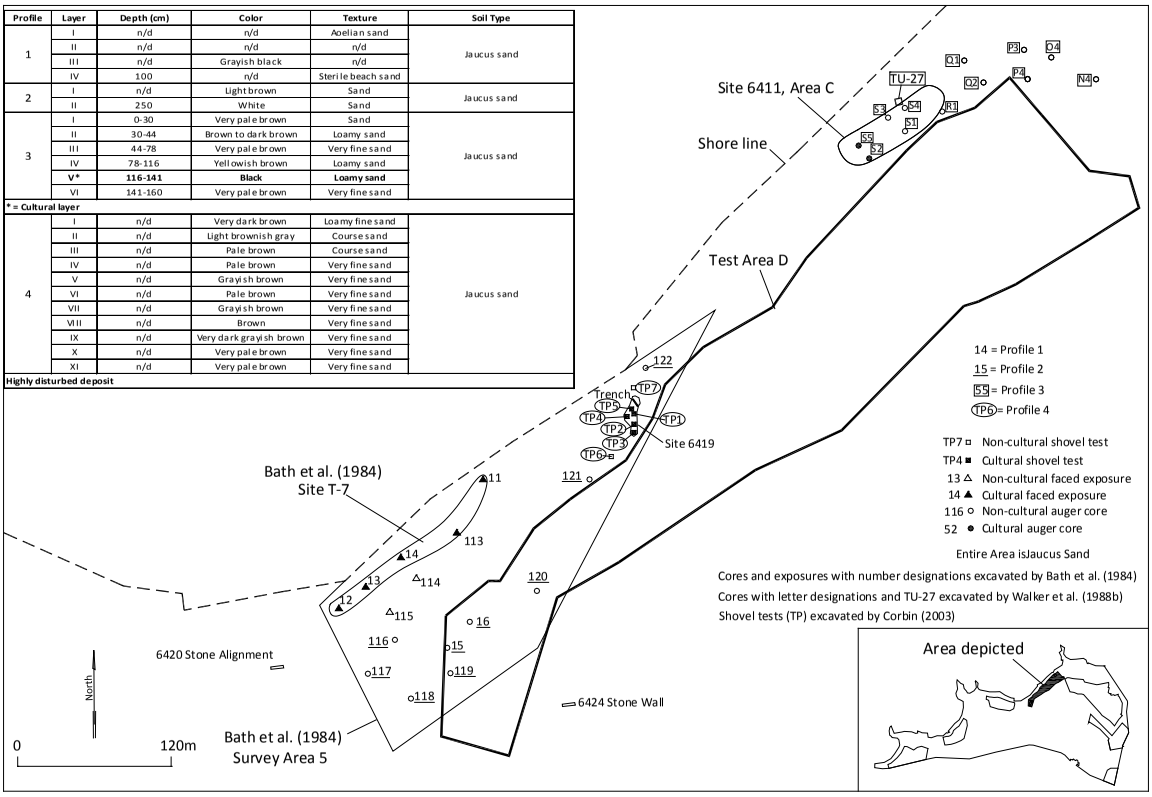


Figure 52. Test Area D, Soil Types and Previous Testing Results

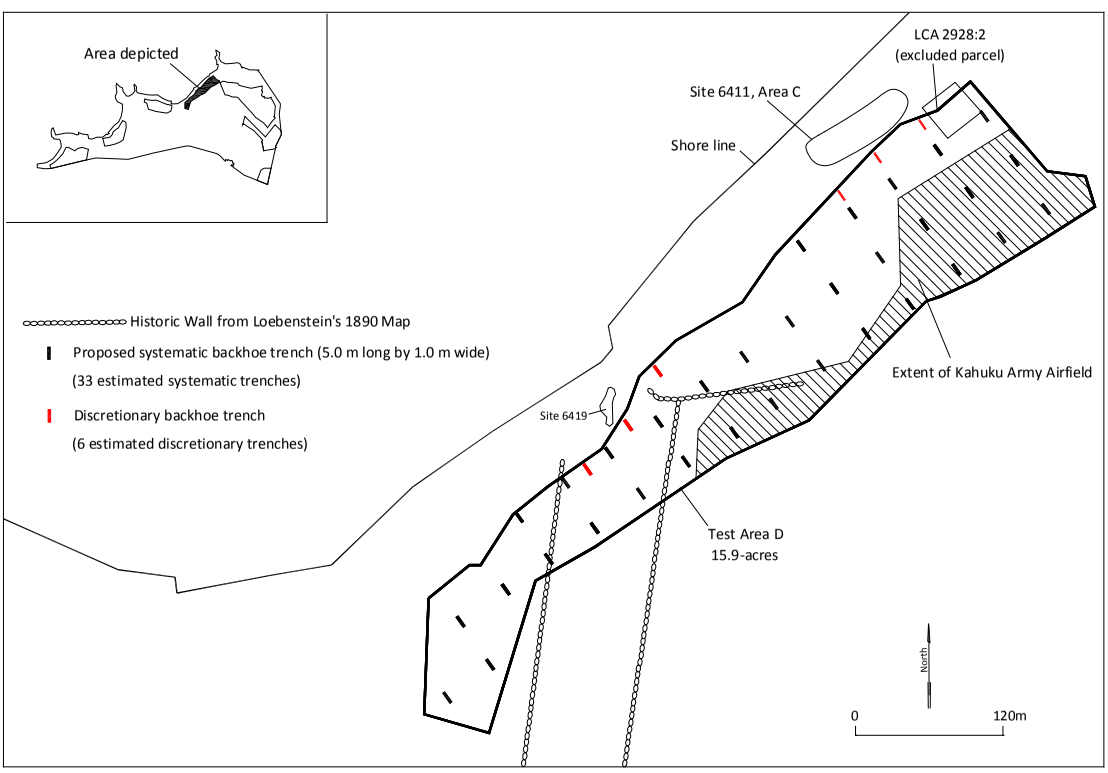
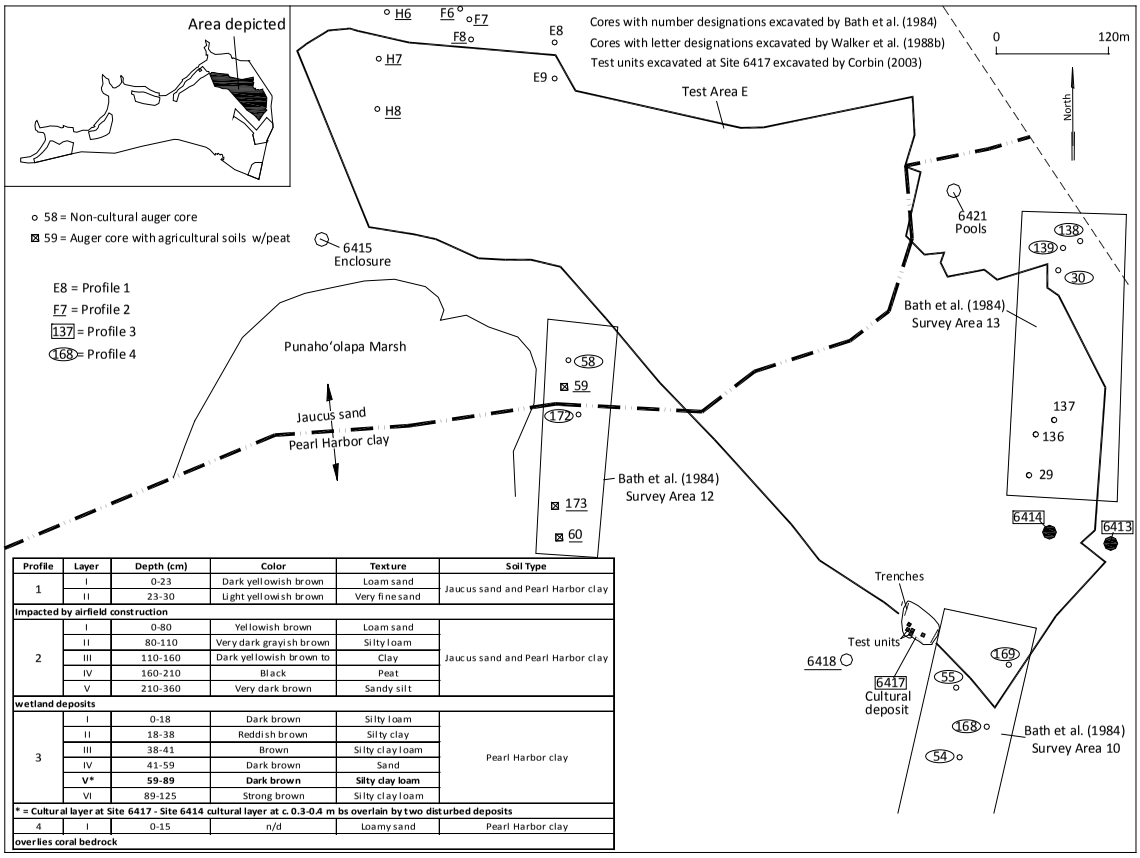


Figure 53. Test Area D, Proposed Trench Locations and Historic Land Use



Profile	Layer	Depth (cm)	Color	Texture	Soil Type
1	I	0-23	Dark yellowish brown	Loam sand	Jaucus sand and Pearl Harbor clay
	II	23-30	Light yellowish brown	Very fine sand	
Impacted by airfield construction					
2	I	0-80	Yellowish brown	Loam sand	Jaucus sand and Pearl Harbor clay
	II	80-110	Very dark grayish brown	Silty loam	
	III	110-160	Dark yellowish brown to	Clay	
	IV	160-210	Black	Peat	
	V	210-360	Very dark brown	Sandy silt	
wetland deposits					
3	I	0-18	Dark brown	Silty loam	Pearl Harbor clay
	II	18-38	Reddish brown	Silty clay	
	III	38-41	Brown	Silty clay loam	
	IV	41-59	Dark brown	Sand	
	V*	**59-89**	**Dark brown**	**Silty clay loam**	
	VI	89-125	Strong brown	Silty clay loam	
*** = Cultural layer at Site 6417 - Site 6414 cultural layer at c. 0.3-0.4 m bs overlain by two disturbed deposits**					
4	I	0-15	n/d	Loamy sand	Pearl Harbor clay
overlies coral bedrock					

Figure 54. Test Area E, Soil Types and Previous Testing Results

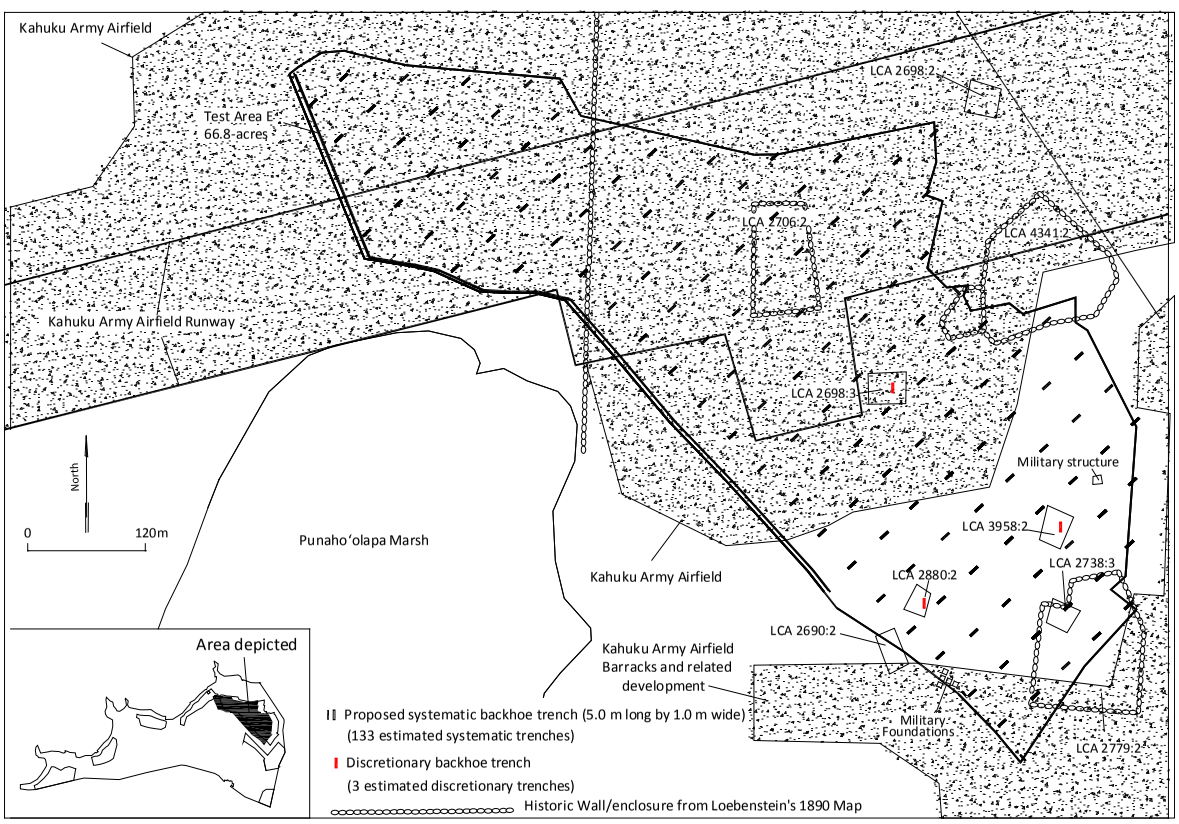
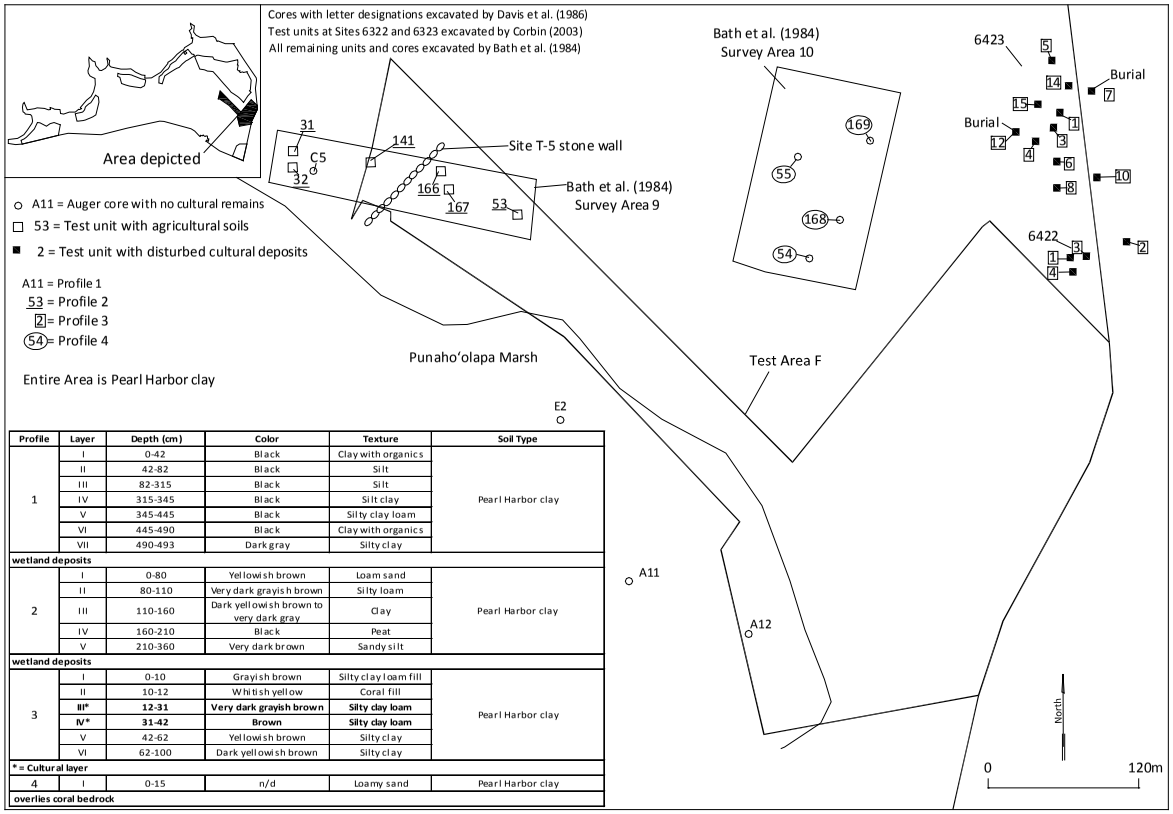


Figure 55. Test Area E, Proposed Trench Locations and Historic Land Use



Profile	Layer	Depth (cm)	Color	Texture	Soil Type
1	I	0-42	Black	Clay with organics	Pearl Harbor clay
	II	42-82	Black	Silt	
	III	82-315	Black	Silt	
	IV	315-345	Black	Silt clay	
	V	345-445	Black	Silty clay loam	
	VI	445-490	Black	Clay with organics	
	VII	490-493	Dark gray	Silty clay	
wetland deposits					
2	I	0-80	Yellowish brown	Loam sand	Pearl Harbor clay
	II	80-110	Very dark grayish brown	Silty loam	
	III	110-160	Dark yellowish brown to very dark gray	Clay	
	IV	160-210	Black	Peat	
	V	210-360	Very dark brown	Sandy silt	
wetland deposits					
3	I	0-10	Grayish brown	Silty clay loam fill	Pearl Harbor clay
	II	10-12	Whitish yellow	Coral fill	
	III*	**12-31**	**Very dark grayish brown**	**Silty clay loam**	
	IV*	**31-42**	**Brown**	**Silty clay loam**	
	V	42-62	Yellowish brown	Silty clay	
	VI	62-100	Dark yellowish brown	Silty clay	
*** = Cultural layer**					
4	I	0-15	n/d	Loamy sand	Pearl Harbor clay
overlies coral bedrock					

Figure 56. Test Area F, Soil Types and Previous Testing Results

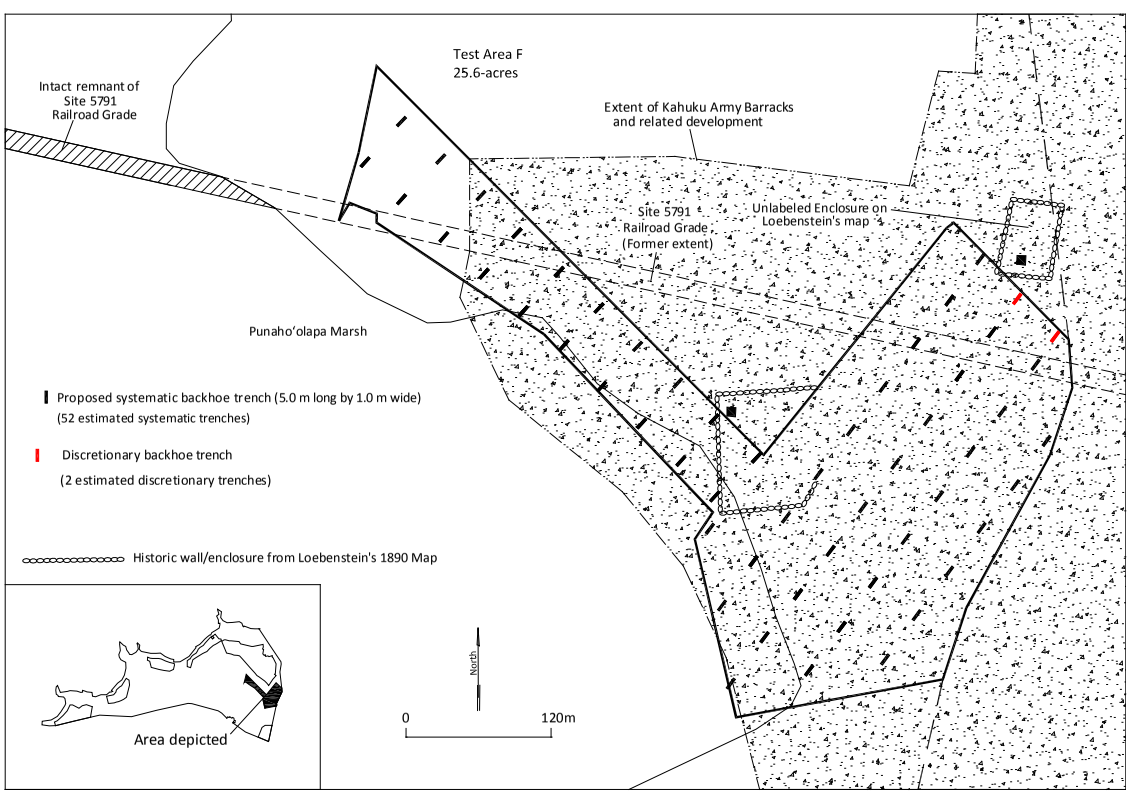
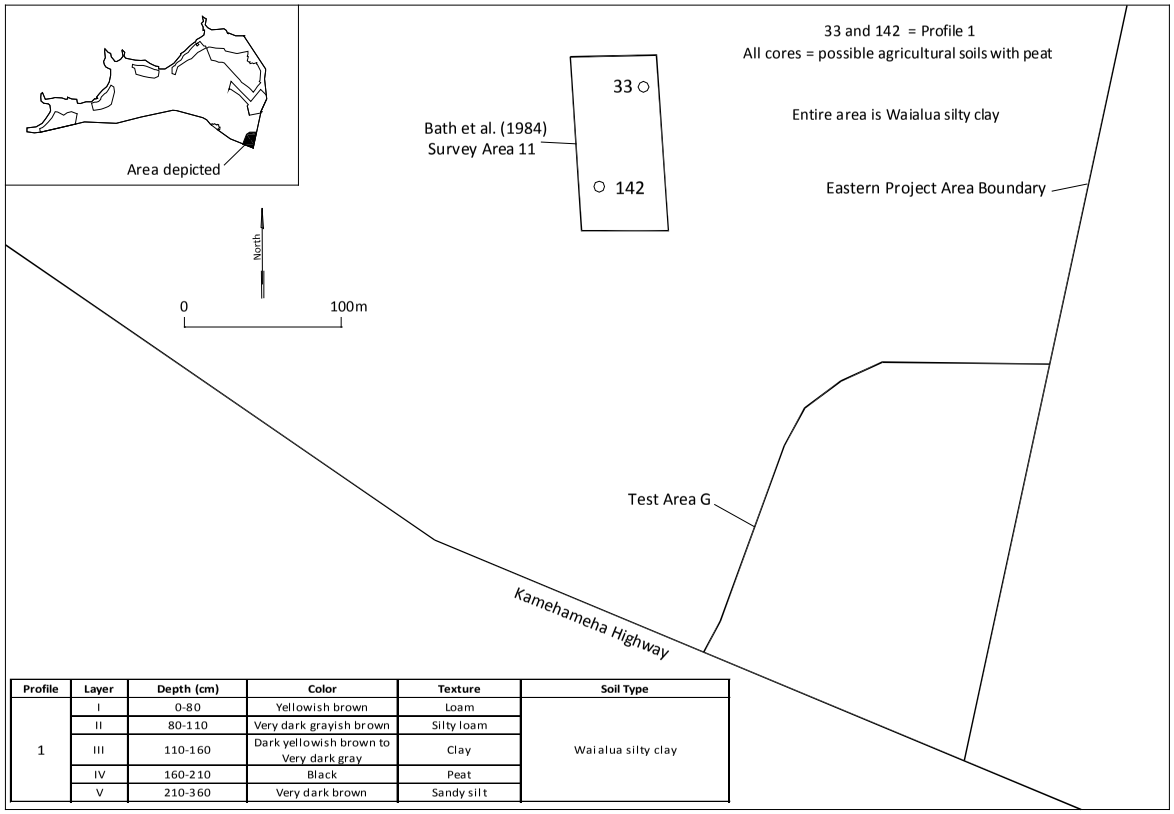


Figure 57. Test Area F, Proposed Trench Locations and Historic Land Use



Profile	Layer	Depth (cm)	Color	Texture	Soil Type
1	I	0-80	Yellowish brown	Loam	Waialua silty clay
	II	80-110	Very dark grayish brown	Silty loam	
	III	110-160	Dark yellowish brown to Very dark gray	Clay	
	IV	160-210	Black	Peat	
	V	210-360	Very dark brown	Sandy silt	

Figure 58. Test Area G, Soil Types and Previous Testing Results

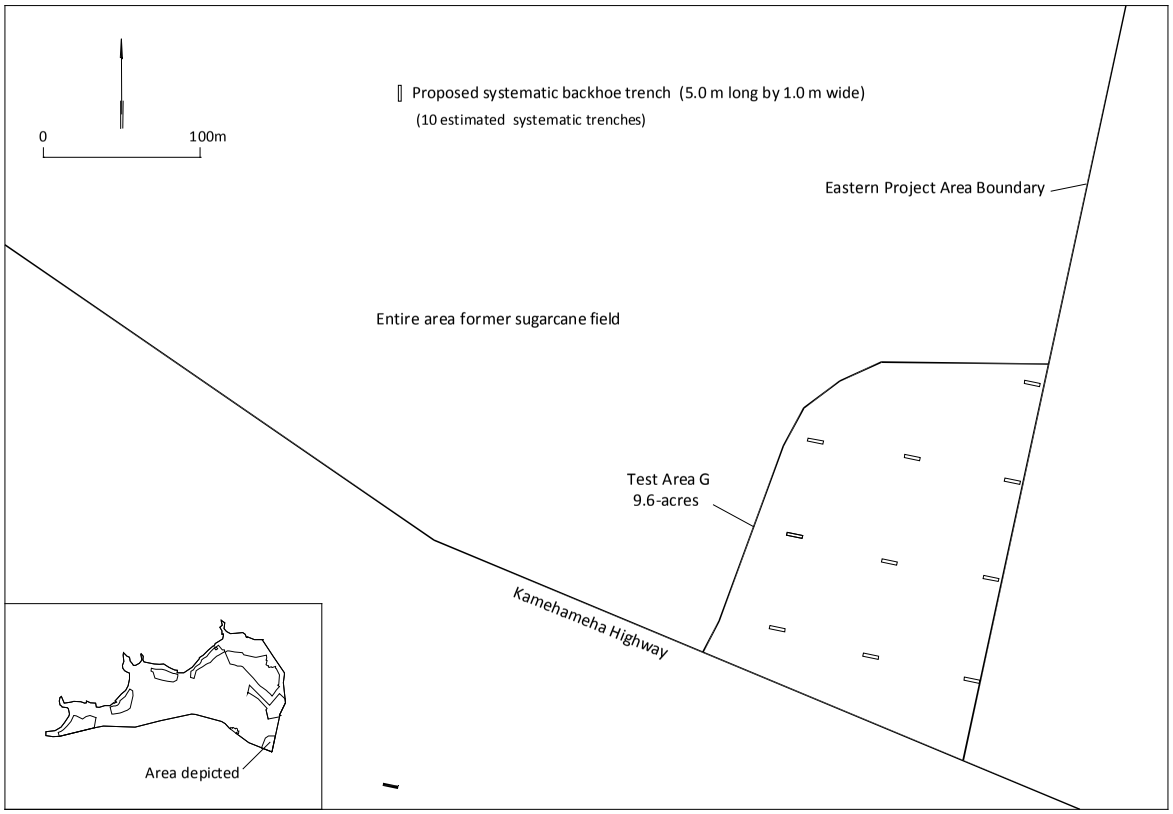


Figure 59. Test Area G, Proposed Trench Locations and Historic Land Use

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APPENDIX A – PUBLIC NOTICES

Public Notice | Public Notice | Public Notice | Legal Notices | Legal Notices | Legal Notices

Public Notice

NOTICE IS HEREBY GIVEN that Turtle Bay Resort LLC (TBR) is preparing a Supplemental Environmental Impact Statement for its revised Master Plan which covers approximately 840 acres within the Ahupua'a of Kahuku, Punalau, Ulupehupehu, 'O'io, Hanaka'oe, Kawela, and 'Opana within the Ko'olauloa District, Island of O'ahu (Project Area TMKs: [1] 5-6-003:041, 044; 5-7-001; 013, 016, 020, 022, 031, 033; 5-7-006:001, 002).

A total of 19 burials representing a minimum of 24 individuals were discovered from 1984 to 1996 within the project site; three burials were left in situ and the remaining burials were disinterred and reinterred within the burial preservation site within the former location of Land Commission Award 2744:1. In 1992, a Burial Treatment Plan was prepared (Maly 1992) for these burials.

The current project area consists of approximately 840 acres and includes the makai portions of seven ahupua'a: Kahuku, Punalau, Ulupehupehu, 'O'io, Hanaka'oe, Kawela and 'Opana. The subject property extends east from roughly the midpoint of Kawela Bay to Marconi Road. The existing resort consists of the 443-unit Turtle Bay Hotel, which opened in 1972, as the Ku'ilima Hotel, augmented by the 57-unit Ocean Villas Condominiums, two 18-hole golf courses, and the 368 multi-family unit Ku'ilima estates.

Hawaiian legends tell the story that the land of Kahuku from the shore to the middle of Waiale'e was once a floating island blown around by the trade winds. During ancient times, the area was known for many cultural resources, but in particular, it was known for its rich fishing resources including olua and moi as there are fishing koa (altars), names reflect types of shores and reefs, including modern day use of salt collection. Over 80 land commission awards were awarded from 1846-1855 covering the seven Ahupua'a and most of these awards were for cultivation and habitation. The following is a list of LCA awarded for the project area; 2679:2 to Umeume; 2690:2 to Luiki; 2698:1-3 to Waanui; 2706:2 to Koloaia; 2716:2 to Hoolae; 2724:3 to Paku; 2734:3 to Paukoa; 2738:3 to Palu; 2744:1 to Pakanaka; 2770:2 to Makaino; 2774 awardee unknown; 2775:2 to Malailoa; 2779 to Makilo; 2781:1 to Manukaokeo; 2784:2 to Moo; 2835:3 to Kaheleloa; 2837:2 to Kamakai; 2861:1 to Kaohele; 2868 to Kapaiaala; 2878:2 to Kekua; 2880:2 to Luiki; 2897:2 to Kookoo; 2913:2 to Kekua; 2928:2 to Kauihawale; 2936:2 to Kauaihikai; 2938 awardee unknown; 3815:1 to Pailalau; 3958:2 to Nauluhao; 4341 to Kaukaha.

From 1850 to 1880, the project area was used for large-scale cattle ranching operations known as Kahuku Ranch. In 1876, James Campbell purchased Kahuku Ranch. Campbell leased much of the land for sugar and railroad operations. During World War II in 1942, the United States took control of much of the land for the Kahuku Army Airfield and other military uses. Finally in 1972, Ku'ilima Hotel was built and the current use remains resort.

All persons having information about family or individuals that may be found in unmarked burial sites or would like to share information about any traditional and customary practices that they may be exercising on the project sites should respond within thirty (30) days of this notice to Dawn N.S. Chang, Ku'iwalu, Pauahi Tower 1003 Bishop Street, Suite 750 Honolulu, Hawai'i 96813 (808-539-3580).
(SA303890 5/11, 5/18/11)

CULTURAL IMPACT ASSESSMENT NOTICE

Kōloa Ahupua'a

Information requested by SCS of cultural resources or ongoing cultural activities on or near this parcel near the Omao Bridge, Koloa Ahupua'a, Kōloa District, Kaua'i Island, Hawai'i (TMK: (4) 2-7-002:001; 2-7-007:001; and 2-5-001:008).

Please respond within 30 days to SCS at (808) 597-1182.

PUBLIC NOTICE

Turtle Bay Resort LLC

NOTICE IS HEREBY GIVEN that Turtle Bay Resort LLC (TBR) is preparing a Supplemental Environmental Impact Statement for its revised Master Plan which covers approximately 840 acres within the Ahupua'a of Kahuku, Punalau, Ulupehupehu, 'O'io, Hanaka'oe, Kawela, and 'Opana within the Ko'olauloa District, Island of O'ahu (Project Area TMKs: [1] 5-6-003:041, 044; 5-7-001; 013, 016, 020, 022, 031, 033; 5-7-006:001, 002).

A total of 19 burials representing a minimum of 24 individuals were discovered from 1984 to 1996 within the project site; three burials were left in situ and the remaining burials were disinterred and reinterred within the burial preservation site within the former location of Land Commission Award 2744:1. In 1992, a Burial Treatment Plan was prepared (Maly 1992) for these burials.

The current project area consists of approximately 840 acres and includes the makai portions of seven ahupua'a: Kahuku, Punalau, Ulupehupehu, 'O'io, Hanaka'oe, Kawela, and 'Opana. The subject property extends east from roughly the midpoint of Kawela Bay to Marconi Road. The existing resort consists of the 443-unit Turtle Bay Hotel, which opened in 1972, as the Ku'ilima Hotel, augmented by the 57-unit Ocean Villas Condominiums, two 18-hole golf courses, and the 368-multifamily-unit Ku'ilima estates.

Hawaiian legends tell the story that the land of Kahuku from the shore to the middle of Waiale'e was once a floating island blown around by the trade winds. During ancient times, the area was known for many cultural resources, but in particular, it was known for its rich fishing resources including olua and moi as there are fishing koa (altars), names reflect types of shores and reefs, including modern day use of salt collection. Over 80 land commission awards were awarded from 1846-1855 covering the seven Ahupua'a and most of these awards were for cultivation and habitation. The following is a list of LCA awarded for the project area; 2679:2 to Umeume; 2690:2 to Luiki; 2698:1-3 to Waanui; 2706:2 to Koloaia; 2716:2 to Hoolae; 2724:3 to Paku; 2734:3 to Paukoa; 2738:3 to Palu; 2744:1 to Pakanaka; 2770:2 to Makaino; 2774 awardee unknown; 2775:2 to Malailoa; 2779 to Makilo; 2781:1 to Manukaokeo; 2784:2 to Moo; 2835:3 to Kaheleloa; 2837:2 to Kamakai; 2861:1 to Kaohele; 2868 to Kapaiaala; 2878:2 to Kekua; 2880:2 to Luiki; 2897:2 to Kookoo; 2913:2 to Kekua; 2928:2 to Kauihawale; 2936:2 to Kauaihikai; 2938 awardee unknown; 3815:1 to Pailalau; 3958:2 to Nauluhao; 4341 to Kaukaha.

From 1850 to 1880, the project area was used for large-scale cattle ranching operations known as Kahuku Ranch. In 1876, James Campbell purchased Kahuku Ranch. Campbell leased much of the land for sugar and railroad operations. During World War II in 1942, the United States took control of much of the land for the Kahuku Army Airfield and other military uses. Finally in 1972, Ku'ilima Hotel was built and the current use remains resort.

All persons having information about family or individuals that may be found in unmarked burial sites or would like to share information about any traditional and customary practices that they may be exercising on the project sites should respond within thirty (30) days of this notice to Dawn N.S. Chang, Ku'iwalu, Pauahi Tower 1003 Bishop Street, Suite 750 Honolulu, Hawai'i 96813 (808) 539-3580. ■

H

APPENDIX H:

SOCIO-ECONOMIC IMPACT ANALYSIS

Socio-Economic Impact Assessment

Turtle Bay Resort Development

City and County of Honolulu, Hawai‘i

Final Report: August 16, 2012

Prepared by

Belt Collins Hawaii LLC

Prepared for

Lee Sichter LLC

Turtle Bay Resort LLC

EXECUTIVE SUMMARY

Proposed Action and Alternatives

This socio-economic impact assessment deals with the resort expansion proposed for Turtle Bay Resort by Turtle Bay Resort LLC. The expansion would add up to 625 hotel units, 590 resort residential and 160 community affordable housing units over time. The expansion is much smaller than the development proposed in the 1980s and currently permitted under 1986 approvals. That larger development is considered in this report as the Full Build-Out Alternative. Other alternatives studied include a Resort Residential Alternative (without any hotel units), a Conservation Partner Alternative (with development restricted to the center of the resort lands, and the feasibility of the alternative supported by funding from a hypothetical outside partner), and a No Action Alternative.

The development alternatives would be built as warranted by market demand. TBR estimates that the Proposed Action could be built and absorbed by 2025. The Full Build-Out Alternative would take much longer, with absorption estimated through 2053. The Resort Residential Alternative is estimated to be absorbed by 2025, and the Conservation Partner Alternative by 2022.

Approach

The report deals with impacts on-site at the resort, in the surrounding region, defined as the combined Ko‘olau Loa and North Shore Sustainable Communities Plan areas, and, for fiscal impacts, in the City and County of Honolulu and in the State of Hawai‘i. Impacts are estimated on the basis of Census data, current and anticipated trends in the region, data from the resort and other, comparable resorts in Hawai‘i, and economic models developed and refined by the State’s Department of Business, Economic Development and Tourism. Regional trends and impacts are estimated using forecasts by the City and County Department of Planning and Permitting and assumptions based on current conditions at the resort and in the region.

Existing Conditions

The Turtle Bay Resort currently stands as the only master planned resort community and one of the major economic drivers on the northern side of O‘ahu. The surrounding Ko‘olau Loa/North Shore (KNS) region has a population of more than 34,000 residents. Its economic base is no longer agriculture, but now anchored by visitor-oriented industries The seven mile coastline to the west of the resort is recognized as the premier destination for surfing and surf competition in the world. Its surf breaks, beaches, marine life, and Hale’iwa town are major visitor attractions. Hale‘iwa town has prospered significantly with increased visitor traffic resulting in new commercial development. On the east side of the resort, small towns dot the coastline. Lā‘ie the largest and most developed community stands out as distinctive with the Hawai‘i Temple of the

Church of Jesus Christ of Latter-day Saints, a church-based university, and the Polynesian Cultural Center (PCC), a visitor attraction that supports the Brigham Young University – Hawaii (BYUH) university campus. The entire region is characterized as "country" but is a series of rural residential communities with visitor industry businesses and pockets of agricultural production.

As is typical in a coastal area offering opportunities for surfing, sightseeing and water sports, the local housing supply includes many homes held for vacation use, as second homes or as rentals. Affordable primary homes are limited in number. Each winter, visiting surfers and the surf industry also create demand for housing in the region, competing with island residents for rental housing.

Regional unemployment rates are somewhat higher than the island average. With many residents commuting outside their home districts, average commute times are longer than the island average indicating a need for more jobs in the area. (In Lāʻie, however, the average commute was short, only 17.9 minutes in 2010 due to employment opportunities from the Polynesian Cultural Center and BYUH.) The region's share of persons living below the federal poverty level was slightly above the island level, according to data from 2006 through 2010.

Traffic congestion along Kamehameha Highway has been of concern to residents for many years. The road is narrow and has been occasionally closed due to rock falls or high surf. During the winter season there is a sharp increase in surf activity -- along with visits by Honolulu residents and tourists -- and resulting congestion.

Many residents' reactions to further development at Turtle Bay are generally based on both their perceptions of how it may affect their lifestyle and of challenges already facing the region: traffic, job and population growth, adequate human and health services. For some, new development is valuable as a source of jobs, both at the resort and throughout the region. Others are wary of an increase in the number of tourists or new residents in the region. All are concerned about how to manage traffic congestion effectively.

The data reviewed for the current socio-economic impact analysis indicates that local job sources fail to meet the current employment needs of many KNS residents, forcing many either to commute long distances or to leave the region to find work. Major themes of the regional socio-economic analysis provided in the 1985 Kuilima EIS (lack of employment opportunities and distance from existing employment centers) prepared 27 years ago remain valid today.

Trends Affecting the KNS Region

The island's population is expected to increase slowly in the coming decades. The O`ahu General Plan directs most new housing development to Honolulu and Leeward Oʻahu. Little change in population is expected for the region surrounding Turtle Bay. New development could occur at Lāʻie, where a proposal for an enlarged Lāʻie Inn has gained City Council approval, and plans have been put forward for expansion of Brigham Young University – Hawaii. Concept plans include renovation and expansion of BYUH, the PCC, and new residential areas to support these expansions.

Other development under way includes a few small commercial redevelopment projects in Haleʻiwa, a major wind farm in Kawailoa, agricultural and small residential subdivisions. Further proposed commercial developments appear to be stalled.

Socio-Economic Effects of the Proposed Action

This Executive Summary lays out the specific effects or impacts associated with the **Proposed Action**. Similar analyses of the alternatives are in Chapter 5 of this report.

Population

When the new development is built and occupied – by about 2025 -- the Proposed Action would substantially increase the on-site population, bringing not only visitors but new resort residents and community residents to Turtle Bay Resort. (The built area and park resources would expand, so the population increase does not point to an increase in density.) The population on-site during the daytime would include visitors and residents staying at Turtle Bay, resort employees, and day visitors:

Table ES-1: Population at Turtle Bay Resort, with Proposed Action

	Existing Resort	Proposed Action, 2025	Combined
Staying at the Resort			
Visitors and Part time Residents	1,044	2,206	3,251
Full-time Resort Residents	223	55	278
Community Residents	-	638	638
Total	1,267	2,900	4,167
On-Site Daytime Population			
Visitors and Part time Residents	783	1,655	2,438
Full-time Residents	167	520	688
Operations Workers	439	561	1,000
Day Visitors	96	180	276
Daytime Total	1,485	2,916	4,401

NOTE: From Tables 4-5, 4-6. All tables in this summary bring together estimates and calculations from the body of this report. Methodology and references are shown in Chapters 4 and 5 and Appendix B. The numbers in the table are rounded, so totals may differ slightly from the sum of the numbers shown.

As of 2025, the daytime population of the existing Turtle Bay Resort (including visitors, residents, and workers on-site) would amount to 34% of the total resort population with the

Proposed Action. (As of 2025, the existing resort population would amount to, 35% with the Full Build-Out Alternative, 67% with the Resort Residential Alternative, and 46% with the Conservation Partner Alternative. When the Full Build-Out Alternative is completely absorbed (as of approximately 2053), the existing resort would account for only 14% of the total resort daytime population.

Nearly all of the resort's workers and community residents could come from the KNS region. For the purposes of impact assessment, a share of the workforce and on-site community resident population was assumed to come from other locations on O'ahu. The new population associated with the Proposed Action would account for about 3 percent of the regional resident population, or 37 percent of the projected growth in regional population by 2025.

Employment and Wages

The Proposed Action will bring both construction jobs and continuing operations jobs, and will significantly increase payrolls in the KNS region. Construction will involve an estimated 3,263 direct jobs over 11 years. Construction wage impacts will total about $475 million. Construction workers on-site at the resort during that period will number annually about 237 on average. The number of new continuing operations positions at the resort will climb to about 753, an increase of 72 percent. In addition, visitor spending will support jobs outside the resort as well as on-site, so the attraction of additional visitors, part-time and full time residents to Turtle Bay will support an estimated 443 additional jobs in Hawai'i by 2025. Of these, some 177 are estimated to be located in the KNS region.

In sum, visitor spending will support at least 930 new continuing jobs in the KNS region when the project is fully occupied The new jobs figure is approximately six percent of the current regional civilian labor force. Regional residents can be expected to absorb nearly all of these jobs. (Potential hires include resident workers who are now un- or underemployed and new graduates of local high schools or college programs.)

Wages from both construction and continuing jobs will support island households. After construction is completed, , the regional increase in wages is expected to be at least $31 million (2011 dollars, based on $23.8 million in operations wages and $7.4 million in the KNS region for off-site tourism-related work).

Table ES-2: Employment and Wages Associated with the Proposed Action

	Cumulative, through 2025	Annual Average
Construction		
Direct Jobs	3,263	297
On-Site Direct Jobs	2,611	237
Indirect and Induced Jobs	5,482	498
Total	8,746	795
Direct Wages	$225.3	$20.5
Indirect and Induced Wages	$247.7	$22.5
Total	$473.0	$43.0
		Annual, 2025 on
Continuing Operations		
Direct Jobs at Resort		753
Indirect and Induced Jobs		785
Jobs from Off-Site Visitor Spending (Direct and Indirect)		443
Total		1,981
Continuing Jobs in KNS Region		930
Wages from Direct Jobs		$23.8
Wages, Indirect and Induced Jobs		$35.5
Wages, Off-Site Visitor Spending		$18.4
Total		$77.6
Wages, Jobs in KNS Region		$31.1

NOTES: From Tables 4-2, 4-3, 4-4, 4-14. All dollar figures are millions of 2011 $s. The numbers shown are rounded, so totals may differ slightly from the sum of the individual numbers in the table. Regional wages are for direct jobs at the resort plus a regional share of jobs from off-site visitor spending.

Housing

Regional effects would include new housing at the resort and, over time, income to support new households elsewhere in the region. By 2025, operations-related jobs (both on-site and off-site) are expected to support some 556 households in the region. While many employees will remain in the same household or succeed their parents as household heads, others will form new households. The result is estimated as formation of some 83 to 167 additional households in the

KNS region over time. The Proposed Action includes some 160 community housing units (271% of the 59 units required), so the net effect would be a significant increase in workforce housing for the regional community in the short term, and probably a reduction in housing demand over the long term.

Public Services

Population growth would bring demand for public services. Based on current service levels, that new demand from the Proposed Action would justify small increases in local public services. Table ES-3 shows the potential demand, calculated on the basis of current demand and staffing on island:

Table ES-3: New Demand for Public Services in the KNS Region with the Proposed Action

		Proposed Action, 2025
Public Schools		
2011 KNS region enrollment	4,826	
New Project-Related Enrollment, 2025		
Low Estimate		49
High Estimate		123
As share of 2011 Enrollment		
Low Estimate		**1%**
High Estimate		**3%**
Other Public Services		
Police: current number of officers/1,000 persons	1.56	
Fire: current number of officers/1,000 persons	1.07	
Emergency Medical Service: per 1,000	0.30	
Hospital Beds per 1,000 persons	2.70	
New regional demand associated with Project (New residents and visitors)		3,157
Police		4.9
Fire		3.4
Emergency Medical Services		0.9
Hospital Beds		8.5

NOTES: From Tables 4-7 and 4-15 and estimates provided in Sections 4.4.2 and 4.4.5.

Recreation

The Proposed Action includes the creation of five (5) parks all of which are open to the public. Four (4) are required by the City & County and the Master Developer is voluntarily adding an additional park; two (2) will be public parks dedicated to the City and County of Honolulu and three (3) are private parks open to the public. Four (4) of the parks are along the shoreline and are linked by a continuous shoreline easement. Up to 12 public shoreline access points, along with new parking areas, would significantly increase access to the ocean and beachfront along the resort's coastline.

A new golf clubhouse and a new equestrian center are planned to replace existing recreation facilities at the resort. The Proposed Action calls for refurbishing the Fazio Course at Turtle Bay as a nine-hole course. With the number of visitors staying at the resort expected to increase while the number of golf holes is reduced from 36 to 27, golf tee times would likely become less available to visitors and residents on O‘ahu.

Fiscal Impacts

New development brings capital to Hawai‘i for construction. Resort facilities attract visitors and new resort residents, whose spending continues for the lifetime of the resort. These cash flows are taxed both immediately (e.g., General Excise Tax on construction and on goods sold to visitors, Transient Accommodations Tax, Real Property Tax on new development) and over time (e.g., Income taxes paid by workers in direct, indirect and induced jobs supported by visitor spending).

The City and County and the State both spend considerable amounts on services that benefit residents and visitors. Government costs for services to new visitors and new resort residents at Turtle Bay Resort can be estimated based on the size of these populations. (Community housing residents will already be island residents. This component of the Proposed Action would not generate new costs for local government.)

Currently, the City and County of Honolulu collects about $12.4 million in real property taxes annually from residential and resort properties in the KNS region. As of 2025, real property taxes on residential and resort units within the Proposed Action would amount to an addition of about $8.3 million annually, a major increase (67%) in funds available to support municipal services.

The Proposed Action will result in a cumulative net benefit – i.e., total benefits minus total costs – for the period 2014 to 2025 estimated as $163.4 million for the State of Hawai‘i and as $45.6 million for the City and County of Honolulu (in 2011 dollars). After full occupancy has been reached, the annual net benefit for the State will amount to $14.6 million, while the annual net benefit for the City and County will be about $6.6 million.

Table ES-4: Revenues and Costs Associated with the Proposed Action

	Cumulative, through 2025 *Million $ (2011)*
State Revenues	
Excise Tax	$84.1
Income Tax	$55.5
Transient Accommodations Tax	$32.9
Transient Occupancy Tax	$16.3
Conveyance Tax	$5.1
	$193.9
Costs for State	
For Visitors	$27.6
For New Residents	$2.8
	$30.5
Net Benefit (Revenues > Costs)	$163.4
Ratio of Benefits to Costs	6.4
City and County Revenues	
Excise Tax	$9.3
Real Property Tax	$50.3
	$59.7
Costs for City and County	
For Visitors	$13.5
For New Residents	$0.6
	$14.1
Net Benefit (Revenues > Costs)	$45.6
Ratio of Benefits to Costs	4.2

NOTES: All dollar values are in constant 2011 dollars.. See Tables 4-8 through 4-13 for details. The numbers shown are rounded, so totals may differ slightly from the sum of the individual numbers in the table.

Impacts on Community Life in the KNS Region

The Ko‘olau Loa-North Shore region is famed for “country” atmosphere along with its beaches and surf spots. The Turtle Bay Resort currently fits into that atmosphere in many ways. Its beaches and waters are enjoyed by residents as well as visitors. It provides amenities enjoyed by

regional residents. It provides jobs on-site. With wages and benefits protected by union contracts, the resort sets the bar for local employment practices. Its guests contribute to visitor spending for goods and services throughout the region.

The Proposed Action would have several results that would generally be considered beneficial for local communities, above all:

- Job-creation.
- New housing designed for community residents.
- Development of new amenities which could be used by residents and tend to increase visitors’ time at the resort (vs. on the North Shore roadways), notably:
  - New beach parks with parking and shoreline access, greatly improving access to both open coastline and an enclosed bay;
  - A Gathering Place combining performance space, stores and other uses; and
  - An on-site Farmers’ Market.
- Attraction of upscale visitors who value the North Shore as a place to stay, not just to visit for a few hours.
- Attraction of resort residents and homeowners, a few of whom would likely contribute their support to community causes. (Elsewhere in Hawai‘i, such contributions can range for funds for local hospitals to fervent support of environmental groups.)

All of these can contribute to a more prosperous regional community. With shorter commutes, many residents have more time to spend with family and neighbors, and to participate in community life.

Drawbacks of new development may include increased traffic and more visitors in regional communities. The traffic impact assessment for the SEIS estimates both existing traffic congestion and the impact of new resort development. It identifies traffic management strategies to reduce the project’s contribution to this regional problem.

Mitigation of Adverse Impacts

Mitigation measures are part of the Proposed Action and all the development alternatives. The Master Developer and City have entered into an Unilateral Agreement (UA) associated with the resort expansion which requires park development, workforce housing development, employment training to insure that jobs go to regional residents, child care, and traffic management measures. The Master Developer has always agreed to implement the UA conditions. As stated previously, the Master Developer has voluntarily agreed to exceed the UA requirements by adding parks, more access points to the shoreline and additional community housing in the Proposed Action. (The Proposed Action includes 160 community housing units, 101 more than the 10% share of resort residential units mandated by the UA.) Specific programs

for employee training and child care will need to be designed to meet the needs of the workforce in the next years.

The developer is working with the State Department of Transportation and their traffic engineer team to identify traffic impacts and find traffic management strategies to minimize them.

Addressing those impacts calls not just for technical solutions, but for a process of community dialogue. Effective mitigation measures involve consultation and shared assessment of what works.

The vision of the future presented to the community by TBR in the SEIS combines a holistic view of the land and people, an emphasis on stewardship, and a commitment to consultation with elders, neighbors, and other stakeholders. It identifies relationships and discussions that seem well suited to mitigation as an ongoing process of sustaining the land and people of the area. TBR has already discussed plans with a wide range of community members, and is continuing both consultation with elders and involvement others in the community. In sum, TBR has identified, and taken steps to put in place, a promising framework for effective mitigation and responsible development.

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ABBREVIATIONS AND ACRONYMS

ACS	American Community Survey (annual survey of a sample of the population). The ACS may be reported in annual, three-year, and five-year increments, with smaller areas reported for the longer periods. ACS data in this report comes from the 2006-2010 surveys. The ACS includes the "long-form" data sets that had been gathered from a sample of the population in the decennial census before 2010.
BCH	Belt Collins Hawaii
BYUH	Brigham Young University – Hawaii
CDP	Census Designated Place
CT	Census Tract
DI	Direct and indirect (in Input-Output Analysis)
DII	Direct, indirect and induced (in Input-Output Analysis)
DBEDT	Hawai'i State Department of Business, Economic Development and Tourism
DPP	City and County of Honolulu Department of Planning and Permitting
EIS	Environmental impact statement
FT	Full-time (used for full-time resort residents, treated as Hawai'i residents)
KNS	Ko'olau Loa/North Shore combined area
KNSSPC	Kuilima/North Shore Strategy Planning Committee
Kuilima EIS	Group 70. *Revised Environmental Impact Statement, Kuilima Resort Expansion.* Honolulu, HI 1985.
PCC	Polynesian Cultural Center
PT	Part-time (used for part-time residents and second homeowners, treated as visitors to Hawai'i in economic analyses)
SCP	Sustainable Communities Plan. The City and County of Honolulu recognizes seven regional planning areas: two Development Plan areas and five SCP areas.
SIA	Socio-economic impact assessment
SEIS	Supplemental environmental impact statement
SEIS lands	Land area covered by the SEIS for Turtle Bay Resort; smaller than the TBR landholdings, but also including portions of right-of-way along Marconi Road.. Area shown in SEIS and SEISPN.
SEISPN	Supplemental Environmental Impact Statement Preparation Notice. For Turtle Bay, the SEISPN was prepared by Lee Sichter LLC and published via *the Environmental Notice* on August 23, 2011.
TBR	Turtle Bay Resort LLC
UA	Unilateral Agreement (by developer, in connection with zoning decisions by the City and County of Honolulu). The Kuilima UA (No. 86-99) was recorded in September 1986.

1 Introduction

1.1 Purpose of the Analysis

The Turtle Bay Resort, located at the northern point of the island of O'ahu, consists of (a) developed lands, including the Turtle Bay Hotel (with 500 units, including hotel rooms, cottages, and the Ocean Villas condominiums), two townhouse developments (Kuilima Estates East and Kuilima Estates West, totaling 368 units), and two 18-hole golf courses (Fazio and Palmer), (b) additional areas for which development has been proposed and land use permits and approvals were granted, and (c) additional agricultural land on the *mauka* (inland) side of Kamehameha Highway. [1]

The major land use permits for proposed development were issued in the mid-1980s. The proposed development included additional hotel properties, resort residential housing, parks, and public shoreline access ways. In the intervening years, only modest development and redevelopment has occurred. In 2006, the resort's owner received preliminary City and County of Honolulu approval to subdivide approximately 700 acres to implement the previously approved Master Plan. This was a necessary step towards further development of the land. The subdivision approval was then challenged in court, on the grounds that the 1985 Environmental Impact Statement (the "Kuilima EIS") was no longer an adequate basis for government decision-making. The Hawai'i Supreme Court ruled in 2010 that a Supplemental Environmental Impact Statement (SEIS) had to be prepared and accepted before subdivision could occur.

Turtle Bay Resort LLC (TBR) is preparing an SEIS for their newly Proposed Action, the project. This report, a socio-economic impact assessment, has been prepared as part of the SEIS and will be presented as an appendix to that document.

Typically, a socio-economic impact assessment (SIA) deals with proposed development of lands from less intensive use to new, more intensive uses. A typical SIA report deals with impacts of new development, and of conversion of non-urban lands to urban uses. The current situation is different, in at least four respects:

- The site is not a physical or legal green field: the majority of the site is disturbed with parts of the resort developed from 1970 to 2005. The larger area covered by a 1986 agreement and zone change ordinance has been recognized as a future resort destination for decades.

[1] The resort was known as the Kuilima Resort in the 1970s and 1980s. In this assessment, the "Kuilima EIS" refers to the *Kuilima Resort Revised Final Environmental Impact Statement* published in 1985 and accepted by the City and County of Honolulu Department of Land Utilization. Any reference to the "Kuilima" development similarly deals with the plans accepted in the 1980s.

Words and names of Hawai'ian origin are spelt here with diacriticals to mark long vowels and glottal stops, except when referring to a source or agency that omits these.

- The 1985 Kuilima EIS provides assessments of potential impacts of development that may or may not be relevant to the current Proposed Action and Alternatives or to the current and emerging context;

- A 1986 Unilateral Agreement (UA) identified specific actions to mitigate adverse impacts of the Kuilima development. The developer agreed to implement those mitigations as part of the new development proposed at that time.[2]

  The UA runs with the land, meaning that it must be implemented as agreed when development takes place, unless formally amended by the Honolulu City Council. The UA mitigations will be assessed in the course of this report in relation to various development scenarios.

- The SEIS considers a Proposed Action and three development alternatives (summarized in Section 2.1), not just a Proposed Action and a No Action Alternative.

Figure 1-1 shows the resort's location on O'ahu. Figure 1-2 shows the zoning of the Turtle Bay lands and the location of the Turtle Bay Hotel and Kuilima Estates townhouse development. The Turtle Bay SEIS deals with areas *makai* (seaward) of Kamehameha Highway, and not the agricultural lands *mauka* (inland) of the highway.

An Environmental Impact Statement (EIS) is a disclosure document, intended to help decision-makers and the general public consider the implications of new development. The Turtle Bay SEIS provides analysis of a Proposed Action and three development alternatives. This SIA will evaluate not only effects of the Proposed Action, but also ones associated with the other alternatives considered in the SEIS as well as the No Action alternative.

1.2 Objectives and Approach

The Kuilima EIS included a lengthy SIA. This report updates that SIA by dealing with current proposals and conditions. Major issues and concerns discussed in the Kuilima SIA will be reviewed here, to assess their relevance to the new proposed action and alternatives.

Sources for the report include public records, information from interviews with Turtle Bay stakeholders and members of the surrounding community, and accounts of alternatives provided by TBR. The report also draws on other studies conducted for the SEIS, notably an updated market study and an updated traffic impact assessment.

The approach taken here is intended to provide the SEIS authors with information sufficient to identify and disclose the anticipated socio-economic impacts of the Proposed Action. However, the term "impact" should be understood in relation to the project's history.

[2] "The developer" is here understood to be Kuilima Development Company, which built the Turtle Bay Hotel and the Kuilima Estates townhouses, along with its successors, including Kuilima Resort Company, which obtained further development permits in the 1980s, eventually culminating in Turtle Bay Resort LLC. While these are different entities, the differences among them are not at issue herein.

Figure 1-1: Location Map

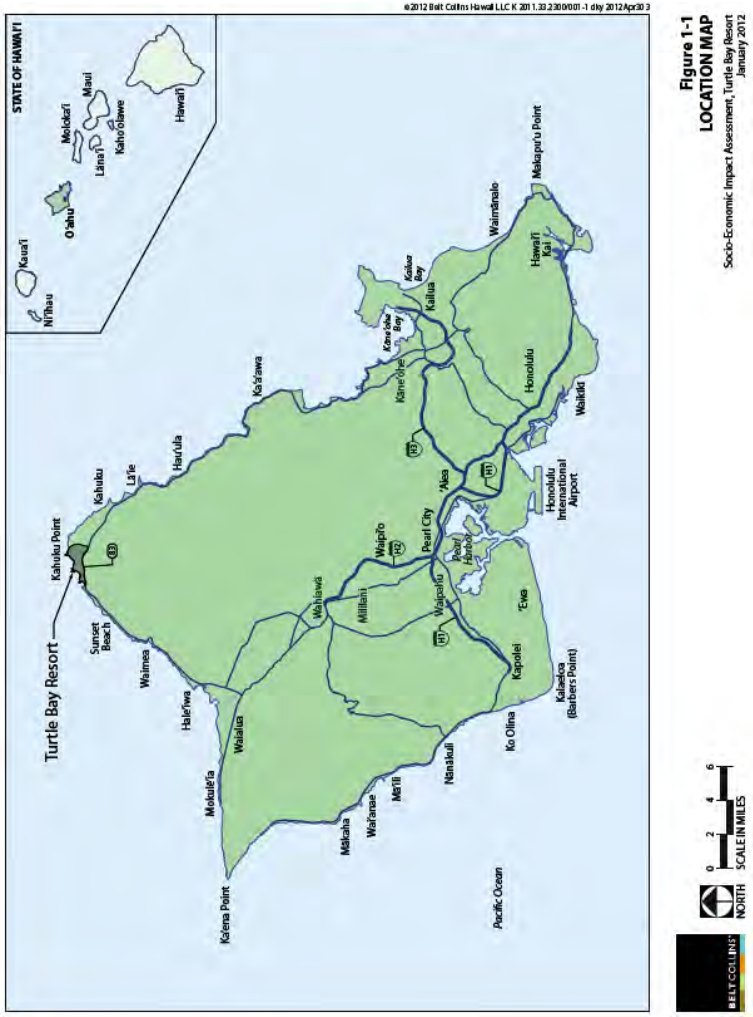
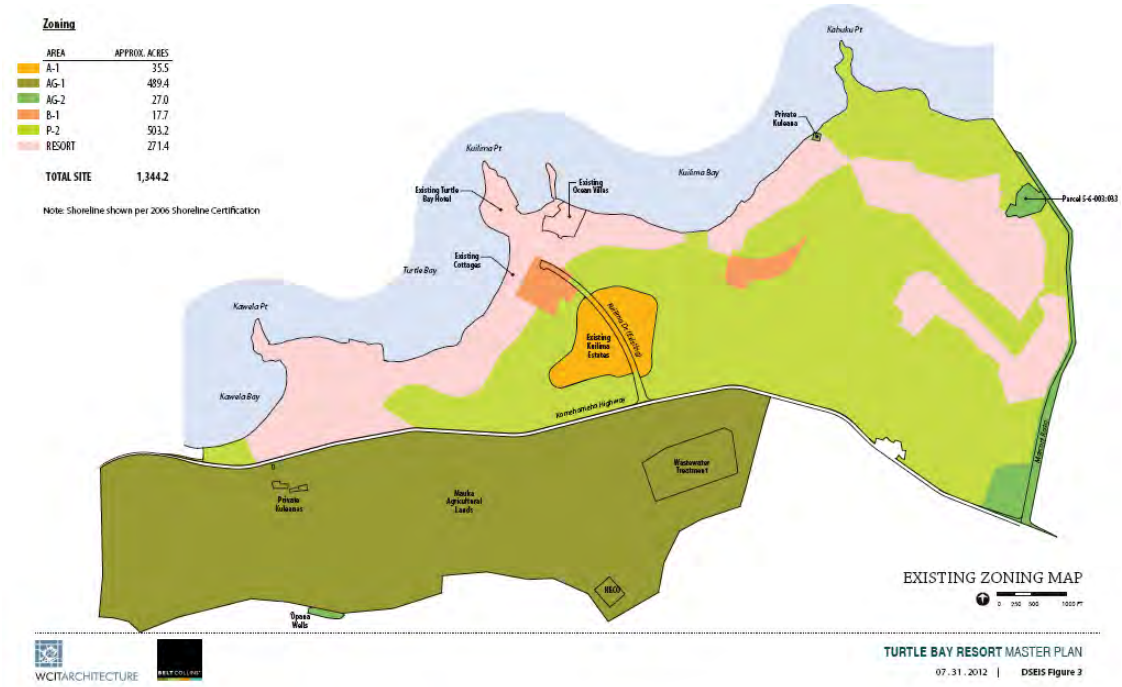
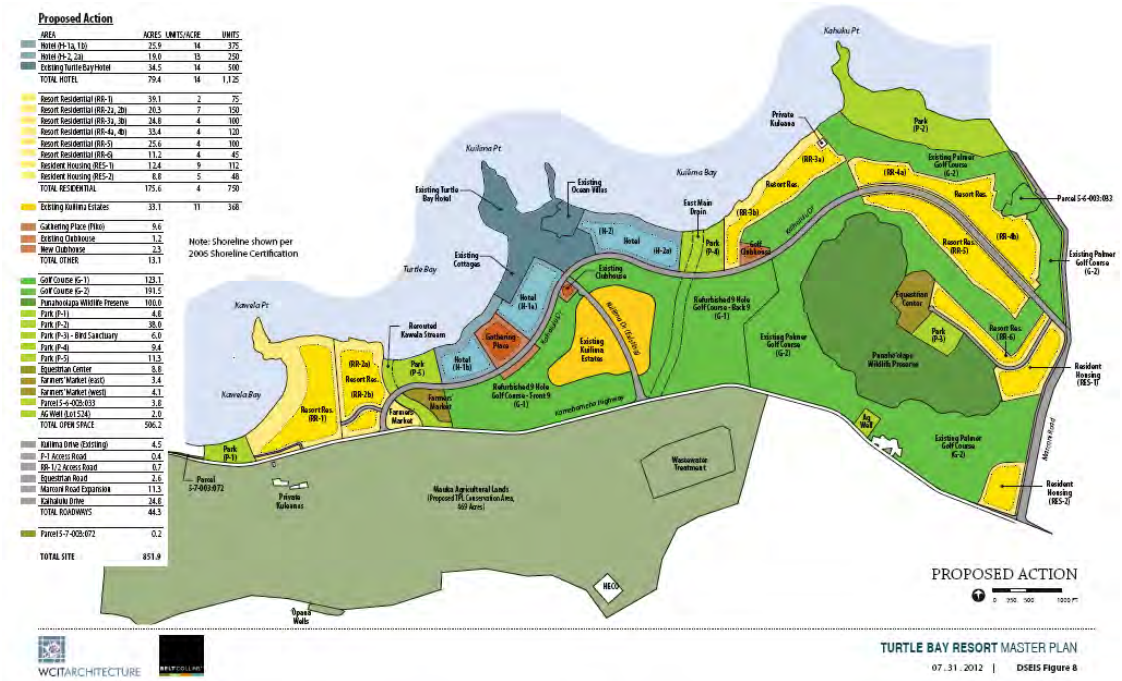


Figure 1-2: Existing Zoning Map



SOURCE: Lee Sichter LLC. *Turtle Bay Resort Environmental Assessment & Supplemental Environmental Impact Statement Preparation Notice*. August 2011.

Figure 1-3: Proposed Action



SOURCE: Lee Sichter LLC. *Turtle Bay Resort Environmental Assessment & Supplemental Environmental Impact Statement Preparation Notice*. August 2011. Figure updated August 2012.

Normally, an impact is understood as an effect of proposed development measured as the difference between the future with project and the likely future without the project. Information about ongoing trends in the surrounding community and consideration of the No Action Alternative normally are enough to sketch the relevant future without the project. In the present case, the future is not so simple. The Hawai‘i Supreme Court ruled that a supplemental EIS is needed *before subdivision can be approved* by the City and County of Honolulu. The ruling calls for new information and analysis, but does not void existing permits. Once the SEIS is accepted, those permits could allow for development of what is termed here the Full Build-Out Alternative. Strictly speaking, then, the "impact" of the Proposed Action involves reducing the amount of development from that allowed under the Full Build-Out Alternative, rather than increasing development over the level found in the No Action Alternative.

The situation is further complicated by the Unilateral Agreement (UA) associated with the 1986 rezoning. The developer agreed to make roadway improvements, to assure beach access, to provide housing and parks, and to provide transportation management mitigations and a child care center in connection with planned development. These actions are part of the likely future under all development alternatives unless the Honolulu City Council amends the UA.

The accepting agency for the SEIS (in this case, the City's Department of Planning and Permitting) will determine whether the SEIS has fulfilled the process and content requirements specified by law. The developer and the City and County of Honolulu will ultimately review the proposed development in light of the UA, and seek to implement or adapt the UA to the new proposal and circumstances as seems appropriate to them.

TBR has planned the Proposed Action after careful consideration of the range of actions possible under existing permits. It has chosen the Proposed Action in light of the resources of the property along with concerns about the quality of visitors' experiences, community-resort relations, market conditions and financial return.

For the rest of this report, contrasts will be identified for the Proposed Action, three Development Alternatives, and the No Action Alternative. Effects of the Proposed Action will be discussed mainly in contrast to the Full Build-Out Alternative (i.e., development according to existing permits) and to the No Action Alternative. "Effects" point to contrasts between the Proposed Action, current conditions, and alternatives under study, while "impacts" suggests that the Proposed Action must be considered in relation to a single current or future baseline.

1.3 Organization

The report consists of:

- This introduction;
- A brief account of the Proposed Action and Alternatives;

- An account of existing and anticipated conditions in the area surrounding the proposed development;
- Assessment of potential social and economic effects of the Proposed Action for the resort, nearby properties, the surrounding Ko‘olau Loa/ North Shore region, and the economies of O‘ahu and the state of Hawai‘i;
- Similar assessment of effects for the other alternatives;
- Consideration of the application of the SIA analysis in the 1985 Kuilima EIS to the existing context of development and the Proposed Action and alternatives currently under study, with assessment of the relevance of socio-economic mitigations in that EIS to the Proposed Action and the new alternatives; and
- Discussion of potential mitigation measures suggested in the course of the study, taking into account the extent to which they may mitigate effects of the Proposed Action and each development alterative.

2 Action and Alternatives Considered

Turtle Bay Resort LLC (TBR) has identified a Proposed Action and alternatives for consideration. The Proposed Action involves less development and less dense development than the Full Build-Out alternative. (The Full Build-Out alternative corresponds to the Kuilima development presented in the 1985 Kuilima EIS and subsequently granted land use approvals.) The *Supplemental Environmental Impact Statement Preparation Notice* (published on August 8, 2011 to commence the SEIS process) identified a total of five concepts:

1. Proposed Action
2. Full Build-Out Alternative
3. Resort Residential Alternative
4. Kawela Conservation Alternative
5. No Action Alternative

The Kawela Conservation Alternative was intended to respond to some residents' interest in limiting the scale of development. As discussions have continued, it has become clear that some stakeholders wanted an alternative that restricts new development on both the Kawela and Kahuku sides of the property. Accordingly, the developer worked with these groups to define a new alternative and now the SEIS includes a Conservation Partner Alternative, instead of the Kawela Conservation Alternative. It is called the "Conservation Partner Alternative" because it would depend on involvement of a future, as yet unknown, financial partner who is prepared to provide economic consideration in return for preservation: Turtle Bay Resort could not implement it without outside support.

Table 2-1 provides a summary of resort development and the park spaces in the various alternatives. Figures 2-1 through 2-5 are reduced versions of the alternative concept plans developed for TBR by its design consultants.

The summary in Table 2-1 and much of the discussion in this section treats alternatives as varying types and densities of development within the resort lands as a whole. Planning for the proposed action has included consideration of the resources, opportunities and constraints of subareas within the SEIS lands, and a vision of the TBR properties in terms of *ahupua'a*. Three areas within the SEIS lands are viewed as parts of separate *ahupua'a*, as shown in the map in Figure 2-3.

Table 2-1: Development Summary

	Proposed Action	Full Build Out Alt.	Resort Residential Alt.	Conservation Partner Alt.	No Action Alt.	Kawela Conser-vation Alt.
Existing						
Hotel Units	500	500	500	500	500	500
Residential Units	368	368	368	368	368	368
Proposed						
Hotel Units	625	2,500	-	440	-	625
Resort Residential Units	590	910	454	252	-	565
Resident Housing Units	160	90	46	48	-	160
Park (acres)	69.5	50.8	50.8	59.7	-	73.3
Preserve (acres)	100.0	100.0	100.0	100.0	N/A	120.2
Golf Courses (Holes)	27	36	36	18	36	27

NOTE: The Kawela Conservation Alternative is listed here because it was considered during interviews for the report. It is not treated as an alternative in the SEIS; the Conservation Partner Alternative replaces it.
SOURCE: Adapted from SEIS Preparation Notice and information from TBR.

2.1 Proposed Action

The Proposed Action as shown in Figure 1-3 is based on a Revised Master Plan that includes two hotel parcels adjacent to the Turtle Bay Hotel,[3] resort residential development on the Kawela and Kahuku sides of the property, a Gathering Place including shops, restaurants, and an ocean sports club integrated with one of the hotel parcels, parks, and day care center for employees' children. Also, a farmers' market is proposed.

The UA calls for 10 percent of housing developed to be available for the local community, at rates affordable to families earning 80 percent or more of the area median income. The Proposed Action would trigger an obligation of 59 affordable housing units. However, the Proposed Action provides for 160 "community residential" units, including units built on-site and lots developed for self-help housing construction, along with 590 resort residential units. This is an appreciably larger share of new homes for community residents than in the UA requirement. While the "community residential" units would meet the income criteria in the UA, TBR hopes that their cost could be lower, in line with the needs of local residents.

A new golf clubhouse is proposed near the 18th green of the Palmer Course. The Fazio course would be reconfigured as a nine-hole course. Parks and the wildlife preserve would be developed as shown in Figure 1-3. Additional information about the developers' concepts, open space and infrastructure is provided in the SEIS.

[3] The two hotels could be operated as a time share and a condominium property. The specifics of their operations will depend on market conditions.

The Proposed Action is part of a comprehensive property, natural and cultural resources management plan created by the developer, entitled "Tomorrow's Ahupuaʻa," for all the TBR lands, including agricultural lands inland from the resort. Elements of that plan include environmental stewardship, farm-to-table programs, and "respectful" planning for Kawela Bay and Punahoʻolapa Marsh. The plan includes continuing review of and input on operations and design by community stakeholders and experts. It aims to integrate the resort into the local community as "equally welcoming to locals from neighboring communities as to visitors from afar," as "sensitive to the environment and respectful to the host Hawaiian culture" and as a source of employment and business for local residents.[4] Tomorrow's Ahupua`a provides responsible guidelines for action to preserve and enhance environmental, social and cultural resources.

TBR forecasts absorption of a total of 1,375 new hotel and residential resort units, 61% less than current approvals, as of 2025. Accordingly, construction is expected to occur from 2014 through 2024. (For all development alternatives, construction is assumed to end the year before full absorption.)

2.2 The Full Build-Out Alternative

The Full Build-Out Alternative realizes the land use entitlements approved in the 1986 rezoning and Unilateral Agreement (five new hotel parcels totaling 2,500 new units, 1,000 new residential units, with both resort and local resident housing on-site, new Palmer golf clubhouse, a beach club and a commercial area). (The UA would allow the local resident housing to be off-site.)

TBR forecasts absorption of a total of 3,500 new hotel and residential resort units in the Full Build-Out Alternative as of 2053. Construction is expected to occur from 2014 through 2052.

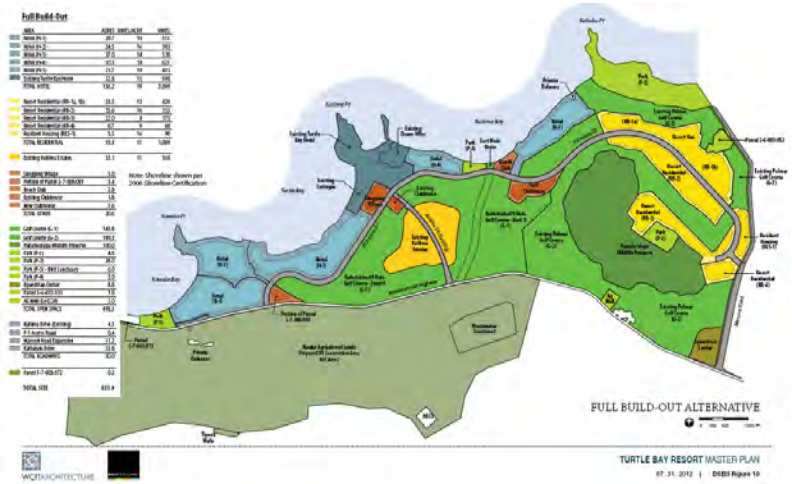
2.3 Resort Residential Alternative

The Resort Residential Alternative involves development of the resort with no additional hotels. The count of resort residential units is only 454; many would be large-lot homes. Some 46 community residential homes would also be developed, representing ten percent of the market housing.

TBR forecasts absorption of the new residential units in the Resort Residential Alternative as of 2025. Construction is expected to occur from 2014 through 2024.

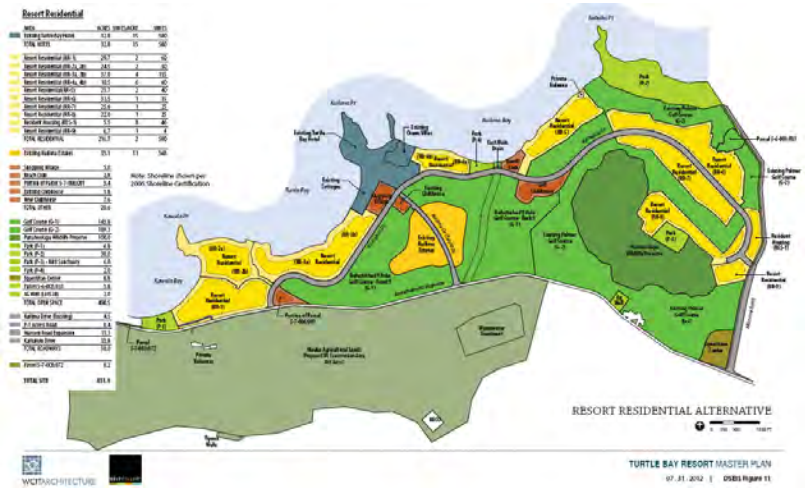
[4] Lee Sichter LLC. *Environmental Assessment & Supplemental Environmental Impact Statement Preparation Notice*. Prepared for Turtle Bay Resort LLC. Page 12. Posted at http://oeqc.doh.hawaii.gov/Shared%20Documents/EA_and_EIS_Online_Library/Oahu/2010s/2011-08-23-FEA-SEISPN-Turtle-Bay-Expansion.pdf.

Figure 2-1: Full Build-Out Alternative



SOURCE: TBR.

Figure 2-2: Resort Residential Alternative



SOURCE: TBR.

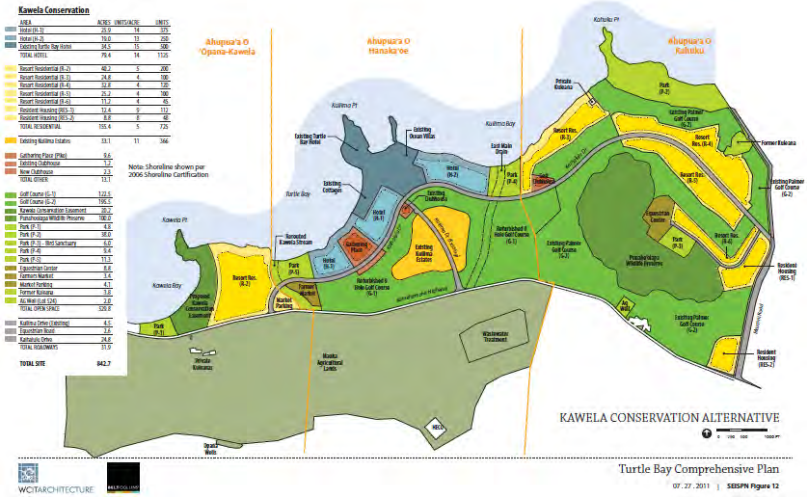
2.4 Conservation Alternatives: The Kawela Conservation Alternative and the Conservation Partner Alternative

The Kawela Alternative was conceived as a conservation alternative, since it kept new development away from Kawela Bay. The Conservation Partner Alternative goes farther than the Kawela Alternative, increasing the conservation area acreage near Kawela Bay and limiting new development on the Kahuku side of the property to open space, recreation and community residential homes.

The Conservation Partner Alternative includes large areas of open space at the east and west sides of the SEIS lands. No plan for the use and maintenance of that space has been advanced. Turtle Bay Resort LLC has indicated that this concept could be realized only with the active financial participation of a partner able to contribute significant funds to compensate the owner for extinguishing development rights, to achieve both conservation and the success of the scaled-down resort.

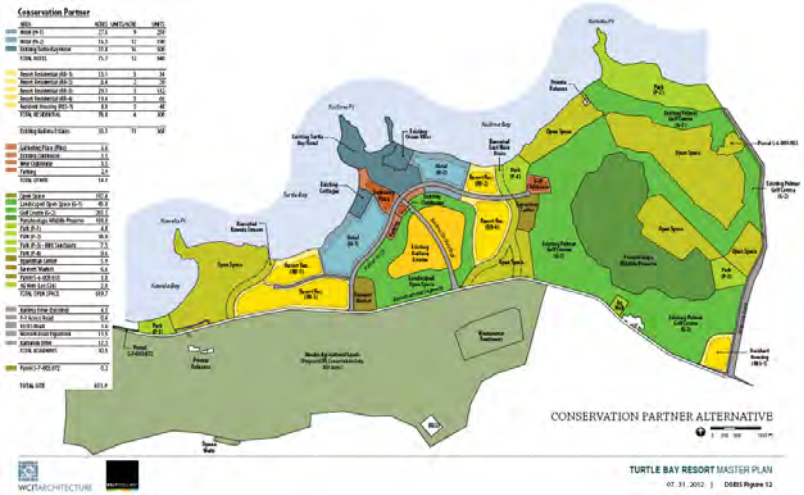
TBR forecasts absorption of 440 new hotel units and 300 new residential units in the Conservation Partner Alternative as of 2022. Construction is expected to occur from 2014 through 2021.

Figure 2-3: Kawela Conservation Alternative (Now Superceded)



SOURCE: Lee Sichter LLC. *Turtle Bay Resort Environmental Assessment & Supplemental Environmental Impact Statement Preparation Notice.* August 2011.

Figure 2-4: Conservation Partner Alternative

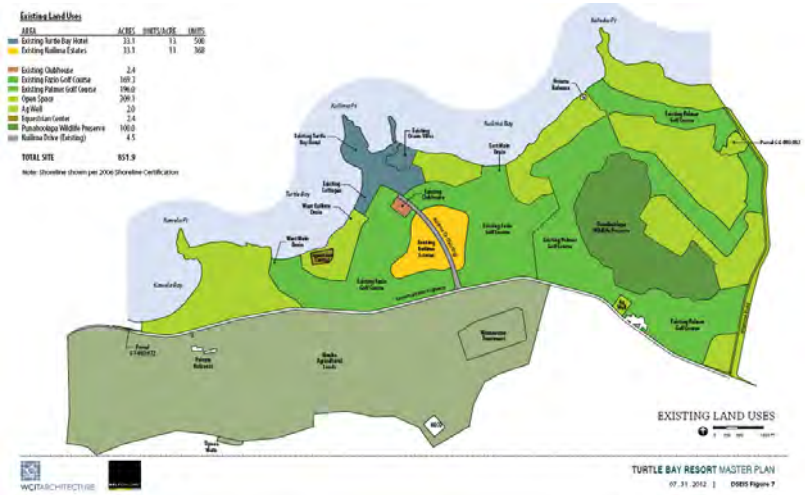


SOURCE: TBR.

2.5 No Action Alternative

The No Action Alternative would involve no further development of the lands in the SEIS. Golf and equestrian facilities would not be redeveloped. The parks and housing identified in the 1986 UA are not included, since these are tied to new development.

Figure 2-5: Existing Conditions / No Action Alternative



SOURCE: TBR.

3 Socio-Economic Context

3.1 Regions Potentially Affected

The Turtle Bay Resort is located outside the town of Kahuku and near the boundary between the Koʻolau Loa and Waialua (or North Shore) Districts. In this report, the combined districts – the Koʻolau Loa/North Shore (KNS) region – will be treated as the area most likely to be affected by change at the Resort. Attention is given to effects on the existing resort, on Kahuku, and other communities, and on particular groups within the region. In this introductory chapter, characteristics of the region and some of its geographic variation are highlighted.

The economic consequences of development would extend beyond the region to the remainder of the City and County of Honolulu and the State of Hawaiʻi. These are charged to provide public services to the region; they would collect taxes and fees from the development.

Figure 3-1 shows the region, major communities, and subareas recognized by the U.S. Census and local government. It shows also a source of possible confusion: State and City definitions of local regions diverge. The City and County of Honolulu recognizes Sustainable Communities Plan (SCP) Areas, with a boundary just west of the Resort; the State of Hawaiʻi recognizes judicial districts – and, following the state, the U.S. Census identifies census tracts – with Waimea Bay at the western limit of the Koʻolauloa District.[5]

In most of this section, the discussion deals with the KNS Region, and with particular Census Tracts or communities within it. The two SCP Areas can be contrasted, with Koʻolau Loa characterized as a network of small, rural communities, while the North Shore is deeply affected by its role as the surfing capital of the world. However, in many ways, residents of the region as a whole share a commitment to their area and to a rural lifestyle. Also, differences among adjacent communities within each Area also deserve notice, so a two-Area approach to the region misses important differences within each Area and similarities among some of the communities along the coastline.

[5] Appendix A, Table A-1 identifies the relationship between specific communities and the various federal, state and county boundaries. The City and County of Honolulu uses the spelling Koʻolau Loa, while the State uses Koʻolauloa. The former spelling is used here except when referring to the State's judicial district. The City's approach, which treats Sunset Beach and Pupukea as part of the North Shore, rather than of Koʻolau Loa, seems to fit most regional residents' views better than the State's boundaries.

Figure 3-1: Regional Map

Figure 3-1
REGIONAL MAP
Socio-Economic Impact Assessment, Turtle Bay Resort
July 2012

NOTE: Census Tract boundaries follow the State division: Census Tract 101 includes Sunset Beach and Pupukea as well as Kahuku.

The recognized communities of the KNS region vary in ways rooted in their histories. Two – Kahuku and Waialua – once were the centers of sugar plantations. They retain remnants of mill infrastructure. They have public secondary schools. Their residents include retirees from the plantations, and the children and grandchildren of plantation workers. Lāʻie was acquired as a center for the Church of Jesus Christ of Latter-day Saints in 1865. It remains the center of Mormon worship and education in Hawaiʻi. Haleʻiwa and Sunset Beach have become famous as the home of North Shore surfing. They are mainly tourist and surf industry destinations, especially during the winter season, and are the base for major surfing contests.

Much of the SEIS site was once in sugar cultivation. Along Kawela Bay, cottages were placed above the beach area. During World War II, an airfield, revetments and barracks occupied most of the lands on the Kahuku side of the property. (See SEISPN Figure 13.)

The Turtle Bay Hotel opened in 1972. The two Kuilima Estates townhouse projects were built soon afterwards. The hotel provided a much-needed source of jobs, since the Kahuku Sugar plantation had just closed in 1971.

The Kuilima EIS process, in the mid-1980s, sought permits for development of a "critical mass" of hotels and vacation homes that would succeed as a separate resort destination as envisioned by the 1977 O`ahu General Plan. While permits were obtained and some initial work occurred, the new hotels were not built. In the intervening years, development has involved redevelopment of the Ocean Villas next to the hotel, a new 18-hole Palmer golf course and Fazio golf course renovations, and the construction of a new wastewater treatment plan mauka of Kamehameha Highway.

3.2 Socio-Economic Trends, 1980 to 2010

3.2.1 Population Characteristics

The KNS region has experienced population growth in every decade since 1980. However, that growth has been largely on the Koʻolau Loa side and in the Kawailoa area between Waimea and Haleʻiwa (Census Tract [CT] 100, labeled in Figure 3-1). The resident population of Haleʻiwa has declined, while the population of the Waialua area has been stable. For the entire KNS region, the result has been population growth at much the same rate as for the island as a whole over thirty years. (See Table 3-1.)

As Table 3-2 indicates, some characteristics of the population of the regional census tracts vary greatly. Lāʻie and Kawailoa stand out as having young populations. In Lāʻie, youths form a large part of the population. In Kawailoa, the young demographic is mostly over 18 years old. Throughout the region, the share of seniors in the population is lower than for Oʻahu as a whole.

The racial data in Table 3-2 reflects (a) broad Federal categories and (b) multiple claims to racial identity. Region-wide, White claims are more frequent, and Asian identification less frequent, than island-wide. The share of residents claiming Native Hawaiian or Pacific Islander status is much higher in Koʻolau Loa than island-wide. The Native Hawaiian or Pacific Islander share of

the population is highest in the Hauʻula-Kaʻaʻawa and Lāʻie CTs. Claims to more than one racial identity are higher in the former tract (CT 102.01). The share of the population identifying as Hispanic is higher in the three North Shore Census Tracts than the island average.

Schools assign a single ethnicity to each student for statistical purposes. The secondary school data in Table 3-3 show significant numbers of Native Hawaiians and Samoans at Kahuku High & Intermediate School (i.e., in Koʻolau Loa). At Waialua High & Intermediate School, Filipinos form the largest recognized population. Only about a fifth of the population in either school is categorized as White.

Table 3-1: Population Trends, 1980 to 2010

	1980	1990	2000	2010
City and County of Honolulu	762,565	836,231	876,156	953,207
KNS Region	27,352	29,992	32,926	34,452
Koʻolualoa District	14,195	18,443	18,899	21,406
CT 102.01 [Hauula-Kaaawa]	3,952	4,608	5,312	5,882
CT 102.02 [Laie]	5,752	6,926	6,100	7,643
CT 101 [Waimea-Kahuku}	4,491	6,909	7,487	7,881
Waialua District	13,157	11,549	14,027	13,046
CT 100 [Kawailoa]	1,879	1,801	4,338	3,320
CT 99.02 [Haleiwa]	5,350	3,956	3,958	3,740
CT 99.04 [Kaena Point]	5,928	5,792	5,731	5,986
	Average Annual Increase, over the decade ending in:			
		1990	2000	2010
City and County of Honolulu		0.9%	0.5%	0.8%
KNS Region		0.9%	0.9%	0.5%
Koʻolualoa District		2.7%	0.2%	1.3%
CT 102.01 [Hauula-Kaaawa]		1.5%	1.4%	1.0%
CT 102.02 [Laie]		1.9%	-1.3%	2.3%
CT 101 [Waimea-Kahuku}		4.4%	0.8%	0.5%
Waialua District		-1.3%	2.0%	-0.7%
CT 100 [Kawailoa]		-0.4%	9.2%	-2.6%
CT 99.02 [Haleiwa]		-3.0%	0.0%	-0.6%
CT 99.04 [Kaena Point]		-0.2%	-0.1%	0.4%

SOURCE: U.S. Census, as reported in State Data Center reports and Data Books.

Table 3-2: Selected Population Characteristics, 2006 to 2010

	City and County of Honolulu	KNS Region	Census Tract 102.01 Hauula-Kaaawa	Census Tract 102.02 Laie	Census Tract 101 Waimea-Kahuku	Census Tract 100 Kawailoa	Census Tract 99.02 Haleiwa	Census Tract 99.04 Kaena Point
Population	936,984	32,700	5,286	6,940	7,408	3,179	3,729	6,158
Median Age	37.5	NA	32.0	23.8	33.3	24.5	37.5	39.0
Racial/Hispanic Identification (1)								
White	36.8%	56.2%	58.2%	46.1%	64.3%	77.5%	46.2%	51.4%
Black or African American	3.4%	2.6%	4.5%	0.5%	0.9%	8.4%	1.9%	3.0%
American Indian and Alaska Native	2.1%	4.4%	6.7%	2.1%	5.0%	7.9%	4.2%	2.9%
Asian	61.8%	37.7%	34.4%	25.1%	37.9%	20.8%	53.3%	53.8%
Native Hawaiian and Other Pacific Islander	23.1%	37.0%	55.0%	61.2%	30.3%	7.1%	27.9%	23.3%
Some Other Race	2.4%	1.5%	1.3%	0.7%	1.2%	4.0%	1.7%	1.7%
Hispanic	7.9%	9.3%	8.4%	4.5%	9.8%	13.6%	9.9%	12.1%
Persons below Poverty Level Share of Population	8.8%	10.4%	14.1%	10.0%	9.2%	19.5%	7.8%	6.2%
Population 16 and over	752,343	24,982	4,020	4,885	5,889	2,158	2,936	5,094
In Labor Force	501,779	17,106	2,580	3,382	3,935	1,516	2,217	3,476
In Civilian Labor Force	462,843	16,079	2,566	3,372	3,822	977	2,208	3,134
Civilian Labor Force Participation	61.5%	64.4%	63.8%	69.0%	64.9%	45.3%	75.2%	61.5%
Mean Travel Time to Work, Civilian Labor Force (minutes)	27.0	NA	37.4	17.9	35.1	23.7	27.4	32.2
Unemployment Rate, Civilian Labor Force	5.0%	6.5%	6.7%	3.5%	6.2%	9.8%	15.2%	5.1%
Households	304,827	9,135	1,546	1,225	2,297	1,034	1,091	1,942
Median Household Income	$70,093	NA	$66,500	$75,417	$64,623	$40,441	$74,719	$73,883
Population in households	902,832	31,111	5,236	5,978	7,277	3,096	3,729	5,795
Population in group quarters	34,152	1,589	50	962	131	83	-	363

NOTE:
(1) Based on "Race alone or in combination with other races" tally. Percentages add up to more than 100% since persons may claim more than one race.
SOURCE: U.S. Census, American Community Survey combined samples for 2006 through 2010, downloaded from American FactFinder at www.census.gov.

The difference between the racial data in Table 3-2 and in Table 3-3 is due in part to methodology and in part to the fact that many of the Whites in the region are young adults, not school-aged youth.

Table 3-3 also shows that very few students have limited English proficiency, while nearly half of the students in either school can qualify for free or reduced-priced lunch because of low family income. These indicators point to a low-income family population with a small number of immigrants from non-English-speaking lands.

Table 3-3: School Population Characteristics, 2011

	Kahuku	Waialua
Major recognized ethnicities (Percentage of student body)		
Filipino	6.1%	35.8%
Native Hawaiian	40.0%	27.3%
Samoan	13.5%	1.6%
White	20.7%	19.5%
Students with Limited English Proficiency	3.6%	6.2%
Students qualifying for Free or Reduced Price Lunch	49.2%	45.0%

SOURCE: School Status and Improvement Reports, 2011, for Kahuku High and Intermediate School and for Waialua High and Intermediate School, posted at http://doe.k12.hi.us/.

The group-quarters population in Lāʻie consists of students at Brigham Young University – Hawaii (BYUH) in dormitories. The persons in group-quarters in the Kaena Point tract (CT 99.04) are largely military (at Helemano). Both nursing homes and other, not categorized, facilities house the group-quarters population of CT 101.

3.2.2 Housing Characteristics

The region has seen growth in both households and housing units since 1980 (as shown in Table 3-4). Much of the housing is dedicated to vacation or part time resident housing due to the surfing and other recreational attractions of the area. (The large majority of the "vacant" units counted by the various Censuses in the region are second homes or vacation rentals.) Rentals form a larger share of the housing stock than in the rest of Oʻahu, especially in the Kawailoa Census Tract (as shown in Table 3-5). This is due in part to the area's appeal to surfers, many of whom rent for longer periods than other vacationers.

Limited availability of affordable housing for local working families has been a concern for decades in the region (and island-wide). Key reasons include limited availability of zoned residential land, and the high cost of land and construction. General housing trends for the area include an increase in the total number of units in both districts of the KNS region since 1980, with a decline in the Waialua district after 2000. The number of occupied housing units grew throughout the period in the Koʻolau Loa District, but only through 2000 in Waialua District. Housing has increased at a faster rate than the resident population in the region, but increased housing prices have made most new homes too expensive for working families. This phenomenon is understandable in light of the North Shore's appeal as a surfing destination with broad expanses of beaches that are attractive year round.

Vacation rentals affect the availability of housing for residents. The City and County of Honolulu recognizes some 70 units with Non-Conforming Use Certificates in Koʻolau Loa and 10 in the North Shore. These are vacation rentals or bed-and-breakfast establishments that have received legal transient accommodation permits. Many more units are rented illegally. One resident has estimated that the Haleʻiwa or North Shore area includes 450 illegal rentals.[6]

[6] Outside of resort districts, housing can be rented for six months or more at a time. Shorter rentals – "transient vacation rentals" – are sources of income for some homeowners, but may be irritants for others in their neighborhoods. Only long-standing transient vacation rentals can be recognized as legal so long as the use continues from before current zoning rules were enacted. The count of recognized Non-Conforming Uses is from http://honoluludpp.org/HotIssues/NUCreport.pdf. The resident cited in the text is B. Ready, "Illegal Vacation Rentals behind Opposition to Haleiwa Inn?" *Hawaiʻi Free Press.* June 26, 2012. Posted at http: www.hawaiifreepress.com/ArticlesMain/Tabid/56/ArticleType/CategoryView/categoryID/47/Oahu-News.aspx.

Table 3-4: Housing and Occupancy, 1980 to 2010

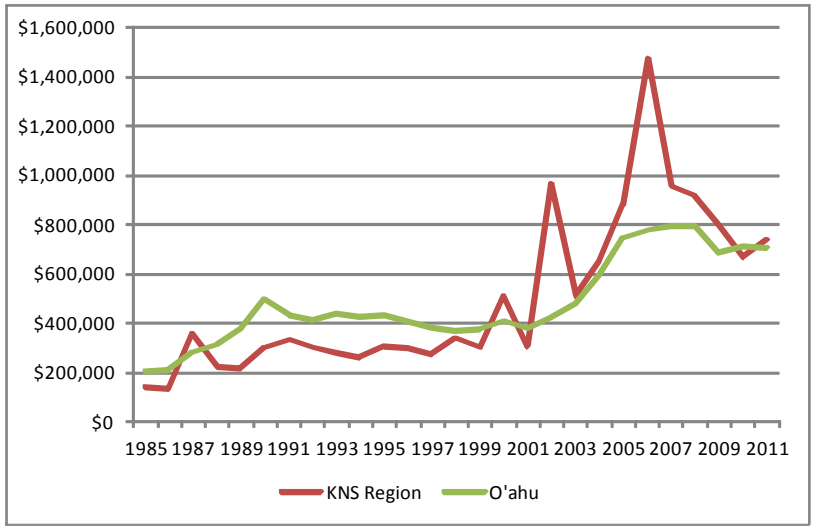
	1980	1990	2000	2010
Total Housing Units				
City and County of Honolulu	250,864	281,683	315,988	336,899
KNS Region	7,877	9,709	11,121	11,562
Ko'olualoa District	4,679	5,939	6,199	6,808
CT 102.01 [Hauula-Kaaawa]		1,826	1,932	2,098
CT 102.02 [Laie]		1,517	1,452	1,560
CT 101 [Waimea-Kahuku}		2,596	2,815	3,150
Waialua District	3,198	3,770	4,922	4,754
CT 100 [Kawailoa]		559	1,517	1,309
CT 99.02 [Haleiwa]		1,187	1,247	1,231
CT 99.04 [Kaena Point]		2,024	2,158	2,214
Occupied Housing Units (Households)				
City and County of Honolulu	230,214	265,304	286,450	311,047
KNS Region	6,586	8,403	9,575	9,675
Ko'olualoa District	3,742	4,935	5,172	5,483
CT 102.01 [Hauula-Kaaawa]	1,166	1,458	1,571	1,684
CT 102.02 [Laie]	1,080	1,350	1,274	1,342
CT 101 [Waimea-Kahuku}	1,496	2,127	2,327	2,457
Waialua District	2,844	3,468	4,403	4,192
CT 100 [Kawailoa]	478	491	1,375	1,163
CT 99.02 [Haleiwa]	753	1,113	1,145	1,112
CT 99.04 [Kaena Point]	1,613	1,864	1,883	1,917
Vacant Units as Share of Total Units				
City and County of Honolulu	8.2%	5.8%	9.3%	7.7%
KNS Region	16.4%	13.5%	13.9%	16.3%
Ko'olualoa District	20.0%	16.9%	16.6%	19.5%
CT 102.01 [Hauula-Kaaawa]		20.2%	18.7%	19.7%
CT 102.02 [Laie]		11.0%	12.3%	14.0%
CT 101 [Waimea-Kahuku}		18.1%	17.3%	22.0%
Waialua District	11.1%	8.0%	10.5%	11.8%
CT 100 [Kawailoa]		12.2%	9.4%	11.2%
CT 99.02 [Haleiwa]		6.2%	8.2%	9.7%
CT 99.04 [Kaena Point]		7.9%	12.7%	13.4%

SOURCES: Kuilima EIS, Appendix J and American FactFinder (www.census.gov).

In the period from 1985 through 2010, a total of 1,077 new single family homes were built in the KNS region.[7] On average, some 18 houses were built each year in the area from Ka'a'awa through Kahuku, 12 in the area from Turtle Bay through Waimea Bay, and 11 in the remaining North Shore area.

Average single family housing prices in that time increased faster in the KNS region than island-wide, as shown in Figure 3-2. The increase in average single family prices since 2000 is consistent with rapid growth of a non-resident market in the region. At the peak of the recent high sales period, KNS single family sales averaged 189% of island-wide sales. (In 2006, the regional average was $1,472,726, and the island average was $778,393. Since then, the regional average has returned to levels close to the island average.)

Figure 3-2: Average Annual Sales Prices, Single Family Homes, KNS Area and O'ahu



NOTE: Average (mean) prices are used rather than medians in order to compare data from different sources. For small areas, average prices can be affected significantly by outliers, i.e., a few extreme cases. This obviously occurred in 2002 and 2006. Still, the overall trend is that the KNS average, once below the island average price, now tends to exceed the island average.
SOURCES: Honolulu Board of Realtors; download from Hawaii Information Service.

[7] Hawaii Information Service download, analyzed by Belt Collins Hawaii. Only single family units were analyzed because information about the year condominium units were built was not consistently available.

Table 3-5: Households and Household Size, 2010

	City and County of Honolulu	KNS Region	Census Tract 102.01 Hauula-Kaaawa	Census Tract 102.02 Laie	Census Tract 101 Waimea-Kahuku	Census Tract 100 Kawailoa	Census Tract 99.02 Haleiwa	Census Tract 99.04 Kaena Point
Population in Households	917,907	31,656	5,531	5,776	7,848	3,170	3,683	5,648
Households	311,047	9,675	1,684	1,342	2,457	1,163	1,112	1,917
Owner-occupied	56.1%	47.0%	50.8%	44.7%	52.3%	18.9%	53.5%	51.5%
Rented	43.9%	53.0%	49.2%	55.3%	47.7%	81.1%	46.5%	48.5%
Average household size								
All households	2.95	3.27	3.28	4.30	3.19	2.73	3.31	2.95
Owner-occupied	3.11		3.59	4.60	3.58	2.79	3.64	3.15
Rented	2.75		2.97	4.06	2.78	2.71	2.94	2.73

SOURCE: U.S. Census, 2010 Census. Download from www.census.gov.

In most of the region, about half of the occupied households are owner-occupied, except in CT 100. (See Table 3-5.) Household sizes for owner-occupied households are larger than the island average (again, except in CT 100), with households in Lāʻie appreciably larger than elsewhere. Renters in Lāʻie also have large households. In other tracts in the region, average renter household sizes are close to the island average.

The Kawela Bay Census Designated Place (CDP) includes the Turtle Bay Resort and some neighboring residential sites. In 2010, it was home to 330 persons in 153 households: the average household size was 2.16 persons per household. Owners lived in 87 (56.9 %) of these units; renters occupied the remaining 66 units. The CDP included a total of 518 housing units, so the occupied units accounted for only 29.5 percent of the housing stock.[8]

By 2012, the Honolulu Real Property Tax files recognized 366 parcels with taxable housing units within Kuilima Estates[9]. Of these, some 52 (14.2 %) were listed as owner-occupied. This share is slightly lower than the share counted by the Census in 2010 for the CDP as a whole (87 of 518 units, or 16.8%).[10]

The TMK database shows that less than half of dwellings in the region are registered as owner-occupied for tax purposes, and the share of all housing units registered as owner-occupied is especially low in the region between Turtle Bay and Waimea Bay. In other words, rentals, second homes and vacation units are more prevalent in this area than elsewhere in the region.[11] Illegal rentals are also said to be common. All of these uses for housing, which tend to limit the

[8] US Census, Summary File 1. Data posted at http://hawaii.gov/dbedt/info/census/Census_2010/SF1/DEC_10_SF1_GCT_CDP.xls.

[9] There are 368 total units in the Kuilima Estates, but two of them are management units.

[10] Information for TMK 1-5-7:27 and 1-5-7:29, downloaded from Hawaii Information Service in June 2012.

[11] The count of single-family dwellings in the TMK database is much smaller than the housing units counted in the 2010 Census. As a result, only the general statement of findings noted in the text seems warranted.

supply affordable for residents, are consistent with the North Shore's appeal as a surfing and beach destination.

3.2.3 Economic Characteristics of the Resident Population

Table 3-6 shows basic data on residents' economic situation captured by the American Community Survey (ACS) for 2006 to 2010. (The ACS data consist of samples collected in each of five years, and cannot be treated as occurring in any single year. It is the most recent data available at the CT level.)[12]

Two indicators of prosperity tell distinct stories. On the one hand, the median household income is about the same as island-wide in all of the KNS Census Tracts except Kawailoa (CT 100). On the other hand, the share of the population with incomes below the poverty level was elevated in both the Hauʻula-Kaʻaʻawa and Kawailoa CTs.

Labor force participation was low in the Kawailoa CT, but equal to or higher than the island average in the rest of the region. Unemployment in Kawailoa and Haleʻiwa was high compared to the island average.[13] Lāʻie, with some of the region's major employment centers, had very low unemployment.

Table 3-6: Selected Economic Characteristics, 2006-2010 ACS

	City and County of Honolulu	KNS Region	Census Tract 102.01 Hauula-Kaaawa	Census Tract 102.02 Laie	Census Tract 101 Waimea-Kahuku	Census Tract 100 Kawailoa	Census Tract 99.02 Haleiwa	Census Tract 99.04 Kaena Point
Population	936,984	32,700	5,286	6,940	7,408	3,179	3,729	6,158
Median Age	37.5	NA	32.0	23.8	33.3	24.5	37.5	39.0
Persons below Poverty Level								
Share of Population	8.8%	10.4%	14.1%	10.0%	9.2%	19.5%	7.8%	6.2%
Population 16 and over	752,343	24,982	4,020	4,885	5,889	2,158	2,936	5,094
In Labor Force	501,779	17,106	2,580	3,382	3,935	1,516	2,217	3,476
In Civilian Labor Force	462,843	16,079	2,566	3,372	3,822	977	2,208	3,134
Civilian Labor Force Participation	61.5%	64.4%	63.8%	69.0%	64.9%	45.3%	75.2%	61.5%
Mean Travel Time to Work, Civilian Labor Force (minutes)	27.0	NA	37.4	17.9	35.1	23.7	27.4	32.2
Unemployment Rate, Civilian Labor Force	5.0%	6.5%	6.7%	3.5%	6.2%	9.8%	15.2%	5.1%
Households	304,827	9,135	1,546	1,225	2,297	1,034	1,091	1,942
Median Household Income	$70,093	NA	$66,500	$75,417	$64,623	$40,441	$74,719	$73,883

SOURCE: American Community Survey, 2006 to 2010, downloaded from American FactFinder at www.census.gov.

[12] This section deals with the economic situation of KNS residents; Section 3.3.8 discusses the situation of the various industries in the region.

[13] Census unemployment rates are based on different definitions than the rates commonly reported. Also, since ACS data are drawn over a five-year period, the ACS rates cannot be compared to other unemployment rates for any given date or year.

About 80% of the Turtle Bay Resort workforce lives in the KNS Region. While more than a hundred live in Kahuku, resort employees are found throughout the region.

3.2.4 Public Facilities and Natural Resources

Public Safety: Police

The KNS region is within two police districts, with stations in Kāneʻohe and Wahiawā, outside the region. A substation in Kahuku, about five (5) miles from the resort, serves the Koʻolau Loa side of the region. Island-wide, recruitment is adequate to keep police staffing constant, but not to expand to fill vacancies. The Kahuku substation is authorized to have five officers but has only three or four at a time.

Public Safety: Fire

Fire stations are located in the KNS region at Kaʻaʻawa, Hauʻula, Kahuku, Sunset Beach, and Waialua. The Kahuku station is about five (5) miles from the resort. The Fire Department plans to relocate the Hauʻula and Waialua stations to sites outside of the flood plain.

Medical Facilities

Kahuku Medical Center is the only hospital in the region. It is approximately four (4) miles from the resort. It provides 24-hour emergency care. It is part of the Hawaii Health Systems Corporation, a state organization providing primary care in underserved areas. Koʻolauloa Community Health and Wellness Center, a federally qualified health center, has a clinic in Hauʻula and offices at the Kahuku Medical Center. Wahiawa General Hospital, in Central Oʻahu, also serves North Shore patients, while Castle Medical Center in Kailua serves some Koʻolau Loa patients. Honolulu hospitals provide specialty services and care.

In the Kahuku area, Kahuku Medical Center has 31 beds, and Crawford's Convalescent Home has 55. Kahuku Medical Center's occupancy varied by bed type: surgical care (11 beds, 5% occupancy in 2009), acute/specialized nursing care (11 beds, 55% occupancy), and intensive care (10 beds, 98% occupancy).[14]

On the Behavioral Risk Factor Surveillance survey, KNS respondents usually report high levels of health care coverage, although an indicator of usage ("Visited doctor for a routine checkup during the past year") shows mixed results from 2005 through 2010.[15]

[14] Occupancy estimates for 2009 from Hawaii State Department of Health, posted at http://hawaii.gov/shpda/resources-publications/health-care-utilization-reports/updates-and-results/2009-data/table-6. The figures for acute and long-term care are below the county averages for that year.

[15] Hawaii State Department of Health website, http://hawaii.gov/health/statistics/brfss/HBRFSS-IA9/atlas.html accessed April 26, 2012.

Schools

Two high schools catchment areas cover the region. Table 3-7 lists these and their current enrollment.

Table 3-7: Enrollment in KNS Public Schools, September 2011

	Enrollment
Leilehua-Mililani-Waialua Complex Area	
Waialua High and Intermediate School	642
Haleiwa Elementary School	180
Waialua Elementary School	506
Castle-Kahuku Complex Area	
Kahuku High and Intermediate School	1,491
Hauula Elementary School	267
Kaaawa Elementary School	141
Kahuku Elementary School	490
Laie Elementary School	658
Sunset Beach Elementary School	451
Total Enrollment, KNS public schools	*4,826*

SOURCE: Hawaii Department of Education website.

St. Michael's School in Waialua and Sunset Beach Christian both provide private elementary education. Plans for a high school near Haleʻiwa, Aloha Ke Akua, have been advanced, but the initiative appears to have stalled for lack of financial support.

A new school based in Hauʻula, Hawaii Active Learning Academy, combines on-line classes with projects led by teachers. Its application for charter school status was denied in 2011. It functions now as a private school.

Kahuku High School graduated 250 students in 2009, while Waialua High School graduated 98.[16] Over 80 percent of graduating students from Kahuku have planned to continue schooling, but most planned to combine school and work.[17]

Preschools

Early child-care facilities in Hawaiʻi are licensed or, if small, license-exempt. Ten licensed programs are located in the KNS region: four Head Start programs, two programs associated with local churches, two non-denominational private programs, a Hawaiian language preschool and a preschool run by a charity serving low-income families. All run day programs only.

[16] Hawaii State Department of Education report posted at http://doe.k12.hi.us/reports/highschoolcompleter0809.pdf

[17] Based on School Exit Plans Survey, last conducted in spring 2008, for Kahuku High School, http://arch.k12.hi.us/PDFs/resources/archive/seps/2008/SEPS307.pdf.

In recent years, preschools in the region have not operated at capacity (personal communication, Steve Albert, Rainbow Schools, October 2011). With the economic downturn, state funds to support preschools were cut and family budgets tightened.

Recreation Facilities

The North Shore's beaches and harbors support surfing, boating activities, swimming and, in calm weather, snorkeling and scuba diving. The region is host to the Triple Crown of Surfing competition and the Quiksilver in Memory of Eddie Aikau surfing competition held at Waimea Bay only when waves are consistently over 20 feet (measured from behind the wave). The North Shore surf attracts tourists, whether as beachgoers or observers, throughout the year, but especially during the winter season.

In 2010, some 1.5 million beachgoers were counted by Water Safety Officers at guarded beaches in the KNS region, 9.6% of the total Oʻahu beach count.[18] Some 17% of the surfing accidents and rescues reported island-wide were at KNS beaches.

These counts do not cover the Turtle Bay Resort beaches. Kawela Bay is currently used by a few people for beach going, fishing and water sports (as documented in the SEIS Appendix on Marine Resource Impacts).

In recent years, turtle and seal populations have increased in Hawaiʻi. Turtles are sighted regularly by visitors along the KNS coastline. A marine resources impact analysis conducted for the SEIS documents an increase in turtle and seal populations at Kawela Bay since 1985. Laniākea Beach (also known as Turtle Beach), approximately nine miles west of Turtle Bay Resort, has become an extremely popular destination for tour buses and free-and-independent (F.I.T.) visitors to view turtles basking on the shore and swimming in the near shore area.

The KNS region has a wide range of recreation sites. Beach parks are dotted along the entire coast, notably near famous surf breaks. District parks at Kahuku and Waialua include sports fields. (Kahuku District Park, about three miles from the resort, has baseball and softball fields, and a volleyball court.) Malaekahana State Recreation Area supports camping by the beach. The Friends of Malaekahana provide patrolled camping sites, yurts, and other overnight shelters for rent. Within Koʻolau Loa, the Ahupuaʻa o Kahana State Park is an entire valley dedicated as a cultural park, with marked trails for walkers. Waimea Valley, on the North Shore, has extensive horticultural plantings and cultural exhibits. It is operated as a visitor attraction. Dillingham Airfield has glider rides.

In addition to the golf courses at Turtle Bay, Kahuku has a nine-hole public course.

The Polynesian Cultural Center is a visitor destination, with "villages" representing several island societies, *luʻau* dinners, and an evening show. The PCC reported 692,081 visitors in

[18] KNS guarded beaches are Haleʻiwa Aliʻi, ʻEhukai, KeWaena, Sunset and Waimea. Other popular beaches are found throughout the region. DBEDT, *2010 State of Hawaii Data Book*, Table 7.51.

2010.[19] Just south of the KNS region, Kualoa Ranch offers a range of outdoor activities for visitors, including horse rides and all-terrain vehicle tours.

3.2.5 Social Trends

Community Decision-Making and Cohesion

While all of Oʻahu is a single political entity, the City and County of Honolulu, smaller areas have representatives on the City Council and in the State Legislature. Local decision-making and advisory bodies that express and shape local views include two Neighborhood Boards. Neighborhood Board No. 28 (Koʻolau Loa) covers the Koʻolau Loa SCP area (i.e., Kaʻaʻawa to Kawela), and Neighborhood Board No. 27 (North Shore) serves communities from Sunset Beach to Kaʻena Point. The Neighborhood Boards are elected, meet regularly, and post minutes (at http://www1.honolulu.gov/nco/boards.htm). Board members on Oʻahu often are recognized local stakeholders, and many go on to serve in political offices. The Boards' role is defined as advisory, but they are regularly asked to comment on development proposals. They provide an arena for local issues and debates.

Community Advisory Committees were formed in support of updates for the North Shore and Koʻolau Loa Sustainable Communities Plans. Members carefully reviewed both the existing SCPs and proposals for development or new regulatory frameworks in each area. The North Shore revised SCP was adopted in 2011. A Public Review Draft of the Koʻolau Loa SCP was published and reviewed in the region in 2010. The City and County Department of Planning and Permitting (DPP) is responsible for finalizing the SCP and forwarding it to the City Planning Commission and City Council.

The Public Review Draft of the Koʻolau Loa Plan includes support for small-scale visitor facilities in keeping with the area's "country" character. The draft reflects community concerns about traffic and stress on local infrastructure with regard to expansion of the Turtle Bay Resort, while expressing support for existing operations. The draft can be taken as reflecting the views of a range of local leaders, but its contents are determined by DPP.

The North Shore Chamber of Commerce has grown from Haleʻiwa Main Street to represent local commercial interests throughout the KNS region. It arranges events such as the annual Arts Festival.

Other local groups include community associations, which vary greatly in their level of activity. The Waialua Community Association was incorporated in 1937. It built the WCA gymnasium in Haleʻiwa and continues to operate this facility, serving the entire North Shore. A separate group, Friends of Waialua, sponsored a master plan for the Waialua Town Center (developed with City and County funding). The Lāʻie Community Association has participated extensively in the Envision Lāʻie process, supporting expansion of BYUH and the building of a larger hotel to replace the Laie Inn. (The Kahuku Community Association has written to the City and County in support of the Envision Lāʻie process.) Other community associations deal with issues of

[19] DBEDT, *2010 State of Hawaiʻi Data Book*, Table 7.43.

concern in the towns along the coast. Local institutions may have active groups of associates and supporters. Waimea Valley has provided a venue for Hawaiian cultural practitioners in the region. Kahuku High & Intermediate School has active community support, most visibly for its winning football team.

Concerns about development have been voiced by groups of local stakeholders. Keep the North Shore Country was a plaintiff, along with the Sierra Club, in the suit challenging the Kuilima EIS as outdated. It is part of the Koʻolau Loa/North Shore Alliance and works with the Defend Oʻahu Coalition to oppose development at Turtle Bay and in Lāʻie.

The Kuilima/North Shore Strategic Planning Committee was formed in the 1980s to identify ways in which redevelopment of the resort could benefit regional residents. It was involved in planning for community benefits after the Kuilima EIS was approved. It continues to meet and provide community input to redevelopment planning for the Turtle Bay Resort.

Quality of Life

Residents of the KNS region are proud of their communities. The North Shore is renowned for its surf and surfing lifestyle. Koʻolau Loa is less well known. Both areas are viewed as "country" by Oʻahu residents, and many agree that they should be protected from urbanization.

These "country" areas are far from isolated. Many workers commute daily outside the region. The North Shore exports surfboards and agricultural products worldwide. Retail and recreational businesses in Haleʻiwa cater to tourists traveling around the island. During the winter surf season, local traffic is even more congested than usual because of the influx of spectators to surfing competitions. Koʻolau Loa includes both major visitor facilities (the PCC and Turtle Bay) and institutions central to Hawaiʻi's Mormon community. BYUH has attracted students and residents from the island communities of Polynesia as well as Hawaiʻi.

Few useful generalizations about quality of life can be made for the entire region. Persons, families and communities vary over time as they encounter challenges or enjoy prosperity and wellbeing. A few indicators may help to suggest ways that the region's reputation, economy and community life inform residents' lives:

- Unemployment is higher in the KNS region than the island average, and average wages (as distinct from household income as a whole) are lower;

- Surveys of students, parents and teachers indicate that family ties and family involvement in schools are strong in the Kahuku High School catchment area (i.e., mainly Koʻolau Loa). Young people report that they have close neighborhood ties. When data from schools throughout Hawaiʻi were compiled, the Kahuku community was ranked ninth of 42 communities in "protective factors" tending to support young people's success in life.[20]

[20] Center on the Family, University of Hawaiʻi, *Kahuku Area Community Profile*. Honolulu, HI: 2003

Responses from the Waialua High School area are closer to the island and state average. The summary report suggests some of the strengths of the area:

> In a Statewide survey of students, more than half of the adolescents responding in the Waialua Area reported problems in family relationships. However, most of the adolescents reported strong neighborhood ties and that their schoolwork was interesting and meaningful. The graduation rate in this community is high, and most high school seniors plan to attend college.[21]

- Respondents to the Behavioral Risk Factor Surveillance Survey from the KNS region were more likely than ones from any other community in Hawaiʻi to report their general health status as good to excellent. They also ranked highest as experiencing social and emotional support. On the other hand, the community also ranked high in reports of high blood pressure.[22]

Emerging Regional Trends

Long-term projections are for slow population growth (at a rate of about 0.5 percent annually) and slightly faster job growth for the KNS region, as shown in Table 3-8. The City and County's Department of Planning and Permitting developed these projections based on a State forecast issued in 2009. The projections were based on information available to the Department about permitted development, including the new development permitted at Turtle Bay Resort, as allowed under the Full Build-Out alternative. Figure 3-3 shows the areas as defined by DPP.

[21] Center on the Family, University of Hawaiʻi, *Waialua Area Community Profile*. Honolulu, HI: 2003. Waialua ranked 21st of 42 on the scale mentioned above, with protective factors slightly outweighing risk factors.

[22] Hawaiʻi State Department of Health, interactive database with data for 2005 to 2010, posted at http://hawaii.gov/health/statistics/brfss/HBRFSS-IA9/atlas.html. The region's respondents had less extreme results for asthma and other health problems.

Table 3-8: Population and Employment Projections, KNS Region, to 2035

	Total Population			Civilian Employment		
	2010 est.	2025	2035	2010 est.	2025	2035
Ka'a'awa	1,399	1,393	1,379	147	80	89
Hauula/Punaluu	3,717	3,864	3,893	600	648	673
Lā'ie	5,902	6,394	6,557	3,147	3,318	3,359
Kahuku/Kawela	3,138	3,499	3,623	1,734	2,522	2,723
Sunset Beach/Pupukea	4,240	5,643	6,177	995	1,082	1,068
Kawailoa	3,779	3,732	3,674	227	238	239
Hale'iwa	4,198	4,350	4,365	1,765	1,796	1,807
Waialua	3,249	3,157	3,085	384	390	391
Mokulē'ia	2,258	2,244	2,216	392	403	405
KNS Region	31,880	34,276	34,969	9,391	10,477	10,754
KNS 2010 Census	32,700			NA		
Increase over 2010 Census		1,576	2,269			

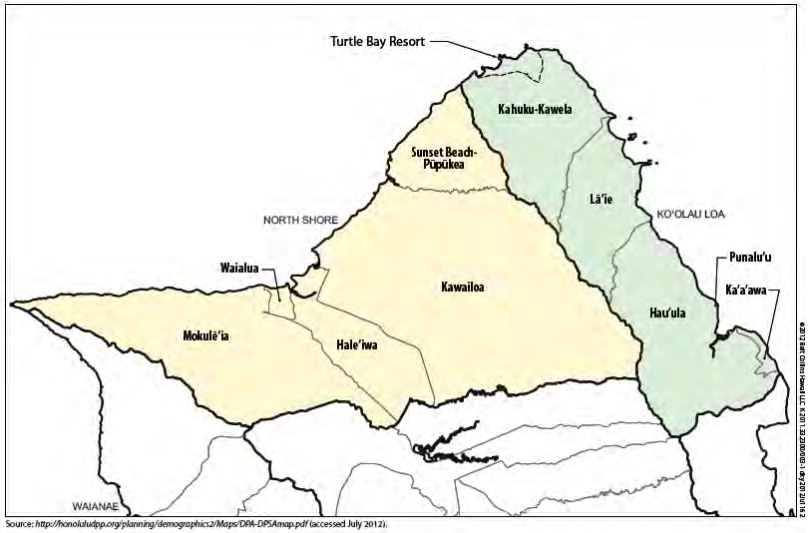
NOTE: The Census deals with employed residents; the projections deal with jobs in the region. In 2010, some 16,079 persons living in the KNS region were in the civilian labor force. Civilian employed residents of the region numbered about 1.6 times the number of jobs in the region.

SOURCE: City and County of Honolulu, Department of Planning and Permitting, posted at http://honoluludpp.org/planning/demographics2/Projections/2000-2035byDPSA.pdf

Recently, the State forecast has been updated. For the civilian population of the City and County as a whole, population growth now is projected as slightly slower.[23] While the projected total island population in 2025 and 2035 is higher in the new projection, the difference is due to the increase that has already occurred on O'ahu, not to future growth.

[23] In the new projection, DBEDT expects the military and military dependent population on O'ahu to shrink slightly (http://hawaii.gov/dbedt/info/economic/data_reports/2040-long-range-forecast).

Figure 3-3: Sub-Areas in the KNS Region



Source: http://honoluludpp.org/planning/demographics2/Maps/DPA-DPSAmap.pdf (accessed July 2012).

Figure 3-3
KO'OLAU LOA-NORTH SHORE REGION SUBAREAS
Socio-Economic Impact Assessment, Turtle Bay Resort
July 2012

3.2.6 Community Issues and Concerns

Sources

For this analysis, Belt Collins Hawaii (BCH) has drawn on public records of those discussions and planning documents produced with community input, and on a series of interviews with key stakeholders. Most of the interviews were conducted in October through December 2011. Table 3-9 lists the interviewees who shared their views and those of others in their communities.

Throughout the interview process, BCH staff sought to learn stakeholders' ideas and concerns, not to convince them or to poll them on a single issue. The process did not yield quantitative findings that can be attributed to the regional population or even any stakeholder group. Instead, it served to identify the range of issues and concerns that shape attitudes towards the Proposed Action and Alternatives. Interviewees were asked whether they thought the various alternatives would have greater or lesser, or different, impacts than the Proposed Action. The aim was to learn more about anticipated impacts, not to find which alternatives had more support.

Table 3-9: Persons Interviewed for This Report

First	Last	Affiliation Notes
Kat	Adcox	Kuilima Estates resident Waimea Valley employee
Steve	Albert	Rainbow School
Eric	Beaver	President, Hawaii Reserves, Inc. Past Chairman, Kahuku Hospital
Tinker	Bloomfield	Pupukea resident; Waimea Valley employee
Clifton C.	Cassity	Managing Agent, Villa Management at Turtle Bay Resort
Mona	Chang-Vierra	Waimea Valley
Mitch	Costino	Kuilima Estates West Association - President
Tom	Cross	Turtle Bay Resort, Resort Manager
Joann	Dicion	Turtle Bay Resort employee
Kent	Fonoimoana	Ko'olauloa Neighborhood Board; Defend Oahu Coalition
Danna	Holck	Turtle Bay Resort, General Manager
Randal	Hoopai	Waimea Valley Facilities Manager; Waimea resident
Elaine	Hornal	Turtle Bay Resort employee
Patsy	Izumo	Waimea Valley
Choon	James	Marconi Road resident
Jeff	Johnston	Turtle Bay Resort employee

Continued on next page

Table 3-9, continued

First	Last	Affiliation Notes
Barbara	Kahana	Ko'olaulea Neighborhood Board
Kent	Kamiya	Kamiya Papaya Farm
Dee Ann	Kekahuna	Waimea Valley Human Resource Manager; Kahuku resident
Daniel	Kerwin	Unite Here! Local 5 Hawaii, Organizer
Bob	Leinau	North Shore Neighborhood Board
DeeDee	Letts	Ko'olauloa Neighborhood Board; Ko'olauloa North Shore Alliance; Specialty Courts Coordinator; Mutual Housing Board - President
Melvin	Matsuda	Kahuku Brand Farms
Susan	Matsushima	Alluvion Inc, CEO (North Shore)
Creighton	Mattoon	Ko'olauloa Neighborhood Board: Kahuku Medical Center Board of Directors, Vice President; Ko'olauloa North Shore Alliance; Punalu'u Community Association; Ko'olauloa Hawaiian Civic Club; Keep the Country Country
Cathleen	Mattoon	Koʻolauloa Hawaiian Civic Club; Punaluʻu Community Association
Lt Tasman	McKee	Honolulu Police Department
Elena	Meehan	Turtle Bay Resort employee
Antya	Miller	North Shore Neighborhood Board; North Shore Chamber of Commerce; Haleiwa Main Street; Wailua Community Association
Bob	Nakata	Former State Representative; Former State Senator; Kahaluu United Methodist Church, Sr. Pastor; Kahalu'u resident
Josanda	Napeahi	Turtle Bay Resort employee
Jay	Oku	North Shore Disaster Preparedness Committee
Kathleen	Pahinui	North Shore Neighborhood Board; Wailua Community Association
Junior	Primacio	North Shore Strategy Planning Committee; Former Koolualoa NB, No 28; General Manager of former Kahuku Housing Corporation
Ben	Shafer	Kahana Valley resident
Captain D.	Tsuchida	Honolulu Police Department
Bernadette	Tyrell	Principal, Sunset Elementary School
Stephanie	Vaioleti	Administrative Director, Kahuku Medical Center; Board Member, Koolauloa Educational Alliance Corp
Jeff	Wallace	Honolulu Fire Department; Caretaker for Continental Properties on Marconi Road
Ronald	Weidenbach	Hawaii Fish Company
Sadia	Wilkins	Turtle Bay Resort employee
Harvey	Wong	Turtle Bay Resort employee
Anonymous (three persons)		Kuilima Estates residents

NOTE: Affiliations are given to suggest how particular stakeholders helped Belt Collins Hawaii understand issues and concerns in the region. When an organization or agency is mentioned, no claim is made here that it supports the Proposed Action, or that it has made any official response to the Turtle Bay Resort redevelopment. BCH interviewers sought to elicit interviewees' knowledge and perspectives, not their support or opposition to the Proposed Action.

Many of the stakeholders interviewed have already expressed strong views about the Proposed Action or earlier plans for expansion. Several are members of organizations that have challenged expansion plans in court and in community discussions. BCH sought to learn from a wide range of knowledgeable members of the KNS population, not just those with a particular stand on the Proposed Action.

Issues and Concerns Independent of Project

For this report, BCH reviewed the minutes of the two Neighborhood Boards in the region for 2010 through early 2012 to learn of current concerns. Recurring themes that arose in the discussions included:

- Congested roadways: On the North Shore, this issue largely involves tourist traffic and visitors parking near beach sites, especially Laniākea. In Koʻolau Loa, residents were concerned about roadways where resident parking obstructed traffic, and about possible future expansion of the highway that could affect abutting properties.

- Concern about proposed development and redevelopment: Many residents in both areas expressed opposition to new development projects, including Envision Lāʻie, the expansion of Turtle Bay Resort and the proposed Haleʻiwa hotel. The Kamehameha Schools' project to renovate commercial areas in Haleʻiwa was viewed critically as affecting existing businesses, while the proposed move of the Hauʻula fire station was seen as taking limited Commercially-zoned land out of private hands.

- Appreciation for developers who listen to local stakeholders: While community members expressed concern about wind farm development at Kahuku and Kawailoa, they also expressed appreciation for the involvement of First Wind, the developer of both the currently operating Kahuku wind farm and the Kawailoa wind farm, now under construction. Similarly, community stakeholders have welcomed the open attitude of TBR in introducing and sharing information about the Proposed Action and the SEIS process.

- Members of both boards support agriculture and preservation of land for agriculture.

- Outside agencies may make decisions that ignore local views and concerns. Discussion of the Koʻolau Loa Sustainable Communities Plan has recently focused on the fact that the Public Review Draft, issued by the City Department of Planning and Permitting (DPP), supports the Envision Lāʻie plans, while the earlier draft vetted by an advisory committee did not. The change was repeatedly attributed to meetings "behind closed doors." Similarly, the Department of Education has threatened to close Kaʻaʻawa Elementary School despite community opposition.

- Residents are concerned about the effects of limited government budgets on local facilities and resources. Schools, parks, and civil defense budgets may all be affected.

- Disaster planning has emerged as a local initiative throughout the region, with an emphasis on stockpiling supplies needed in the event of emergencies.

- Tensions clearly exist among community leaders. These were evident when a petition to dissolve Neighborhood Board No. 28 in Koʻolau Loa was discussed, and in accounts of various parties involved in housing redevelopment in Kahuku who failed to meet to develop shared goals and proposals. However, Neighborhood Board meetings appear to have proceeded without disruption, unlike more contentious boards elsewhere on Oʻahu. (The North Shore Board convened a meeting on the Haleʻiwa Hotel proposal that was rowdy and quickly adjourned. In this case, members of the audience were disruptive.)

In the course of interviews, respondents emphasized their deep commitment to "country" lifestyles. They list difficulties for local residents ranging from the inconvenient – Sears delivery service only on Sundays – to traffic congestion that can make the highway impassible during surf season. Still, no interviewee went on to suggest that they or their friends would leave the region because of such problems.

Interviewees mentioned the cost of housing and the limited availability of housing for residents as significant problems for the region. Illegal vacation rentals were sometimes mentioned as part of the problem, both as disruptive in residential neighborhoods and as affecting housing supply and prices.

The ideas of sustainability and food security, much discussed in Hawaiʻi recently, have taken local form in the KNS region. First, much of the opposition to development has been expressed in terms of preserving the North Shore as a shared resource, a unique area enjoyed by the whole island and tourists from around the world. Next, many stakeholders are interested in maintaining the region's agricultural resources. Third, major landowners – notably Kamehameha Schools and Hawaii Reserves Inc. – have identified the need for their regional resources to be increasingly self-sustaining.

Concerns with Regard to the Project

Redevelopment at Turtle Bay has been discussed in the KNS region for decades. The Proposed Action is seen by residents in relation to earlier proposals and discussions. The original master plan for the Kuilima EIS was welcomed by some as assuring economic stability, continuing jobs in the region, and opposed by others as bringing too much development, too many tourists, and too much traffic to the North Shore. Since the 1980s, public debates over development vs. open space have arisen again, notably with regard to plans for Lihi Lani, a recreational community, just north of Pupukea, for a proposed eco-camping resort at Puaʻena, and, more recently, for a proposed Haleʻiwa hotel. Smaller residential subdivisions have been developed along the North Shore coastline. Along the Koʻolau Loa side of the region, major new development has been proposed only by Hawaiʻi Reserves, Inc., as part of the Envision Lāʻie process, and little has been put in place.

At Turtle Bay, the 2005 announcement that the resort would carry out the development proposed in the Kuilima EIS revived old arguments, and several stakeholders developed the legal challenge that resulted in the Hawai‘i Supreme Court ruling that set the Kuilima EIS aside. The draft of the *Ko‘olau Loa Sustainable Communities Plan* spells out the concerns expressed in response to the proposal for expansion to the extent allowed in the late 1980s: [24]

> … many residents of Ko‘olau Loa do not support the resort expansion due to concerns about traffic impacts on the two-lanes of Kamehameha Highway, the capacities of existing infrastructure systems and public services to accommodate the future projected demand (e.g., water, wastewater, electrical systems, police and fire protection, and emergency services) and the potential impacts to archaeological, cultural and natural resources. Labor force issues related to population growth, housing demand and transportation, as well as a desire to preserve the undeveloped shoreline and scenic view planes and maintain the region’s rural character are also concerns. Although there is general support for the existing hotel operations, community discussions about the future development of the resort continues [*sic*], pending completion of an updated EIS. Community concerns about the proposed resort expansion include:
>
> - Preserving the uninterrupted shoreline and scenic view plane, as well as the cultural and historic significance of the area for future generations;
> - Providing for appropriate recreational and other uses that are compatible with existing land uses;
> - Maintaining the viability of the existing Turtle Bay Resort, restaurants, condominiums and golf courses as an employment base for the region;
> - Minimizing the impacts of future development;
> - Developing design guidelines for any proposed additional structures to assure their compatibility with the rural character of the region;
> - Providing for appropriate agricultural and other compatible uses in the *mauka* area; and
> - Acknowledging existing land use designations and development approvals that have already been granted.

This entire discussion is included here both because it reflects input from local stakeholders on the Community Advisory Committee for the planning process and because it covers the range of concerns about the resort that arose in recent interviews. (We did not hear discussions of design guidelines, but did learn of people’s concern that the resort be in keeping with the region’s rural

[24] City and County of Honolulu, Department of Planning and Permitting, *Ko‘olauloa Sustainable Communities Plan Five-Year Review: Public Review Draft.* Honolulu, HI: 2010. The language quoted here was crafted largely in response to proposals by Oaktree, which sought development as permitted with the UA. Some of the concerns raised in the quotation have also been mentioned regarding the more limited Proposed Action. The Sustainable Communities Plan now in force and the draft update are more supportive of resort expansion than the stakeholders whose views are described in the above quotation.

character.) Interviewees emphasized traffic congestion as the leading problem for the region. Some went on to discuss the resort expansion in relation to the need for jobs and housing in the region, and to inadequate infrastructure and public facilities. Others saw it as bringing too many tourists to the area, and as not needed.

The quotation above downplays differences in views of regional residents that could be heard in the course of interviews:

- The draft texts from the Department of Planning and Permitting emphasize opposition to the resort expansion; in interviews with BCH, both support and opposition were expressed. Many residents continue to see job creation as needed to support local communities, and welcome resort expansion for that reason.
- While view planes at Turtle Bay are important to some residents, others’ attention focuses above all on their own home communities. Most interviewees said little about the appearance of the resort.

Comments on the SEISPN and at public events have covered the points raised above. Issues of concern to many include traffic congestion and protection of marine life (turtles and monk seals). Demands for careful archaeological studies and cultural sensitivity have been made forcefully; the archaeological inventory and cultural impact assessment conducted for TBR are part of the resort’s response.

BCH staff asked interviewees to comment on the various alternatives and on components of the Proposed Action and alternatives that caught their eye. No consensus emerged. Some preferred the Kawela Conservation plan to the Proposed Alternative because it would limit development at Kawela Bay. A few preferred the Resort Residential Alternative because it involves no new hotels – while others saw a resort residential community as likely to be less responsive to the surrounding community than the operators of a mixed hotel and residential resort. A few said the Proposed Action seemed an appropriate and viable revision of earlier plans.

Some interviewees raised questions about the impact of resort development, especially resort residential development, on property values nearby.

Interviewees were also asked what steps they thought would be appropriate to mitigate effects of the Proposed Action. Some responses dealt with mitigation of specific anticipated impacts; others simply identified ways in which the resort could be of greater benefit to stakeholders:

- **Community housing**: KNS residents largely see “affordable housing” built to government pricing guidelines as unaffordable. Many do not trust the government or any developer to build homes that meet the needs of the regional community.
- **Unionization:** Several resort workers viewed the Proposed Action narrowly in relation to ongoing contract talks with the major union representing workers at the resort. They accused the hotel operators of increasing workloads in order to set a low baseline for future expansion. They viewed expansion as likely to involve facilities that were not

unionized, where wages, benefits and working conditions could be worse than at the current hotel.

- **Disaster planning:** Some residents suggested that the resort could help surrounding communities by providing an evacuation site upland or by supporting work to maintain resources that would help the community in case of disasters. A related concern was that additional visitors at the resort would make evacuation even more difficult for the region than it is already.

- **Control over parks**: Conversion of land at Kawela Bay and Kahuku Point to City and County parks would involve increased access for visitors as well as nearby residents. Some question whether the City and County would be able to maintain these parks well. One Kawela Bay resident has spoken publically of his desire for limited access to Kawela, and for policing of any park by the resort. Others may share his hope that new park areas would be kept clean and park usage would be monitored without aiming to limit local access.

- **Pedestrian and bicycle routes**: Some interviewees pointed to the Malaekahana bike path as a valuable addition to the community, and sought to see it extended from Kahuku past Turtle Bay toward Sunset Beach. They mentioned this as bringing together people from Kahuku and Lāʻie who enjoy it as a new pedestrian link between their communities.

These comments should be understood as pointing towards desired goals as much as an analysis of the merits of the Proposed Action or alternatives.

3.2.7 KNS Regional Economy

Local employers support at least some 6,200 jobs. (Many additional jobs exist in the region, but the employers – for example, the State Department of Education – are located elsewhere. In addition, agricultural jobs are not included in Table 3-10.). Figure 3-4 shows the Zip Code areas in the region.

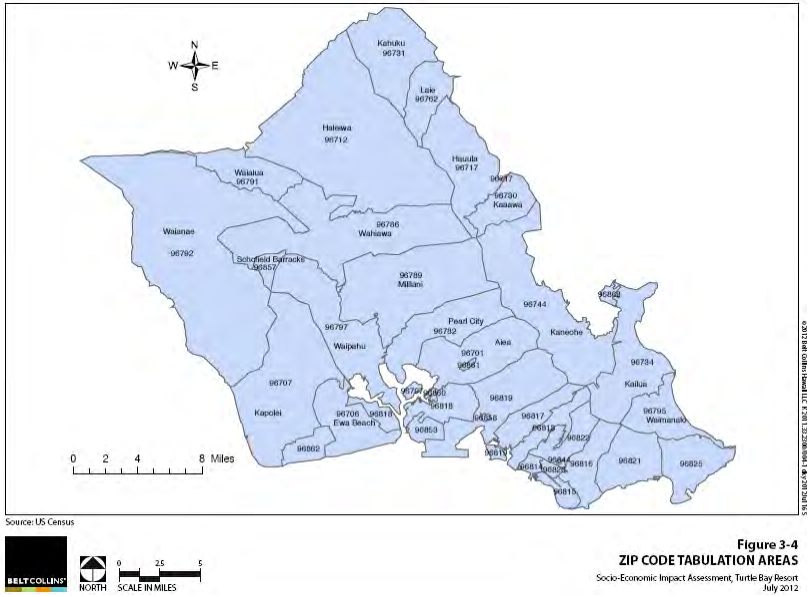
The largest employers are found in the Lāʻie and Kahuku ZipCode tabulation areas. These include the Polynesian Cultural Center, BYUH, Kahuku Medical Center and Turtle Bay Resort. Kahuku, with the Turtle Bay Resort and the Medical Center, has the highest average wage. Haleʻiwa is home to mid-sized retail and food service establishments. Alluvion, which grows and ships plants from Kawailoa, is also in the Haleʻiwa ZipCode area. On the other hand, few businesses are located along the coastline from Kaʻaʻawa through Hauʻula, and their workforce amounts only to 208 persons.

Table 3-10: Employment Patterns by Zip Code of Establishment, 2009

		2009 Business Patterns Data					
Area	ZipCode	Business Establishments	Workforce	Average No. Workers per Establishment	Average Annual Wage	Number of Establishments 50 to 99 Workers	Number of Establishments 100 or more Workers
Kaaawa	96730	10	60	6.0	$27,833	-	-
Hauula	96717	30	148	4.9	$25,601	-	-
Laie	96762	41	2,904	70.8	$18,826	4	2
Kahuku	96731	46	1,251	27.2	$33,160	1	3
Haleiwa	96712	202	1,491	7.4	$25,452	6	-
Waialua	96791	68	349	5.1	$31,350	-	-

SOURCE: ZipCode Business Patterns, 2009, downloads from http://censtats.census.gov/cgi-bin/zbpnaic/zbpsect.pl.

Figure 3-4: Zip Code Tabulation Areas, Oʻahu



Source: US Census

Figure 3-4
ZIP CODE TABULATION AREAS
Socio-Economic Impact Assessment, Turtle Bay Resort
July 2012

Table 3-11 provides more information on the work done by residents of the KNS region. The share of the workforce in the construction industry is high, especially in the North Shore CTs. On the Koʻolau Loa side of the region, workers in the accommodation/food service/arts and recreation sector are especially numerous. A large share of the jobs in Lāʻie, with a private university as well as public schools, is in education. Throughout the region, few workers are in the financial and real estate sector. Data on class of workers indicates that self-employment is high in the region, especially in CT 101 (Waimea-Kahuku).

Table 3-11: Industry and Class of Worker, 2006–2010

	City and County of Honolulu	KNS Region	Census Tract 102.01 Hauula-Kaaawa	Census Tract 102.02 Laie	Census Tract 101 Waimea-Kahuku	Census Tract 100 Kawailoa	Census Tract 99.02 Haleiwa	Census Tract 99.04 Kaena Point
Employed Civilian Workers	439,691	14,960	2,394	3,254	3,584	881	1,872	2,975
Industry								
Agriculture	0.8%	2.1%	1.5%	0.4%	1.2%	0.0%	6.0%	3.7%
Construction	7.2%	12.4%	13.7%	7.3%	15.3%	8.7%	9.1%	16.6%
Manufacturing	3.5%	2.3%	3.3%	1.0%	2.5%	3.4%	2.3%	2.6%
Wholesale trade	2.9%	1.7%	2.3%	0.7%	1.3%	0.2%	1.8%	3.4%
Retail trade	11.1%	10.0%	7.8%	7.9%	12.6%	6.0%	14.2%	9.7%
Transportation, Warehousing, Utilities	6.0%	3.3%	2.9%	3.3%	2.2%	3.7%	4.3%	4.3%
Information	2.1%	1.7%	1.6%	1.2%	2.0%	0.9%	0.5%	3.1%
Finance, Insurance, Real estate	7.2%	4.0%	4.8%	3.7%	3.8%	0.0%	4.4%	4.7%
Professional, administrative services	10.2%	7.3%	7.4%	6.3%	2.8%	18.8%	10.6%	8.2%
Education and Health	21.7%	25.5%	28.8%	39.0%	23.2%	19.4%	17.6%	17.7%
Accommodation, Food Service, Arts, Recreation	13.6%	19.8%	14.5%	26.1%	23.3%	21.3%	17.3%	14.1%
Public Administration	9.5%	5.7%	8.8%	1.7%	4.5%	12.6%	8.6%	5.3%
Other services	4.3%	4.0%	2.7%	1.5%	5.3%	4.8%	3.2%	6.6%
Class of worler								
Private wage & salary	71.5%	70.9%	67.1%	80.7%	64.9%	67.1%	72.8%	70.3%
Government	21.9%	18.6%	23.1%	13.6%	18.1%	25.3%	17.7%	19.5%
Self-Employed	6.4%	10.5%	9.9%	5.5%	17.0%	7.6%	9.5%	9.9%
Unpaid family workers	0.2%	0.1%	0.0%	0.2%	0.1%	0.0%	0.0%	0.2%

NOTE: The ACS is based on a series of samples, not an enumeration of the whole population, and is less reliable for cells with small counts. The table refers to residents of the region, who may work in the region or elsewhere.
SOURCE: American Community Survey data, 2006-2010, downloaded from www.census.gov.

Some 80% of the employees of the Turtle Bay Resort live in the KNS region. A recent count of 500 employees' home ZipCodes (provided by TBR) shows 213 (43%) as living in Koʻolau Loa and 189 (38%) in North Shore ZipCodes. The only other region with more than a few employees was Central Oʻahu, with 76 (15%). In sum, about 40% of employees travel to and from the resort from the Koʻolau Loa side, and about 60% travel along the highway on the North Shore.

Major Industries

While agriculture was once the local mainstay, its role is smaller nowadays. In Waialua District, much of the land that once was used by Waialua Sugar is now planted in seed corn. Coffee

production, floriculture and vegetable farming have also developed. Cows and horses are still raised in the region, although the local dairy closed in the 1990s. On the Koʻolau Loa side of the region, the remaining farms are mostly small-scale operations. Aquaculture has been developed in the Kahuku region, focusing on shrimp, with mixed success. Lunch trucks offering shrimp plates have done well, and now are a common stop on circle-island tours.

The major industry in the local economy is tourism. The North Shore is renowned as the home of big-wave surfing, and is a destination for visitors' day trips. The PCC in Lāʻie and Waimea Falls Park also attract visitors on circle-island trips. The Turtle Bay Resort not only serves its overnight guests but attracts tourists staying elsewhere and local residents to its beaches, golf courses, and restaurants.

Retail and other commercial establishments are concentrated in Haleʻiwa. In Koʻolau Loa, only Lāʻie supports a retail center larger than a strip mall. The region had industrial centers at the sugar mills in Waialua and Kahuku. Nowadays, the Kahuku Sugar Mill houses a mix of commercial establishments and civic offices, while the Waialua Mill site is home to a mix of small businesses, including surfboard makers, a soap factory, and food vendors. Coffee, chocolate and soda are manufactured in Waialua.

In the KNS region, much of the upland area is used by the U.S. Army and the Marines for training. The training areas may be reached through roads from Central O`ahu not used by the general public, or by convoys on public highways, or by air, with helicopters traveling over the water most of the way from Marine Corps Base Hawaii Kaneohe Bay, then crossing the shoreline area near Kahuku Point or Kawailoa to reach training areas. Also, a military housing area is located at Helemano, just within the North Shore SCP area.

3.2.8 Economic Trends and Proposed Development

For the region's establishments, the average reported wage in 2009 was $24,263. The ACS employed civilian labor force of about 14,960 is more than twice as large as the job count in Table 3-10: most regional workers must travel outside the KNS region to find work. Reported commute times are longer than the island average (except in the Lāʻie and the Kawailoa CTs).

The two major developments that could affect the local economy and employment are the expansion of Turtle Bay Resort and Envision Lāʻie, a planning process sponsored by Hawaii Reserves, Inc., the landowner. Both would support job growth and provide housing. The Turtle Bay Resort expansion would provide new jobs for residents throughout the KNS region.

Job growth through Envision Lāʻie would be more narrowly targeted, since Lāʻie's job centers are closely tied to Mormon church and educational activities. If new housing is for workers in the Lāʻie job centers, it could address crowding in that community with only limited impact on problems of cost and crowding elsewhere in the region. Some 1,260 units have been proposed to

be built out over 25 years.[25] The proposal nearly doubles the Lāʻie housing stock. It could add far more housing to the regional stock than the Proposed Action.

The new inn at Lāʻie would have up to 224 rooms and limited amenities (e.g., a coffee shop rather than a full restaurant). It would not be a resort comparable to Turtle Bay. It would primarily serve PCC and BYUH visitors and visitors to Koʻolau Loa families.

Work has already been completed on projects within the existing footprints of BYUH and the PCC. The Honolulu City Council approved the Special Management Area permit for the new hotel in 2011. New land use approvals would be needed for the university expansion and for a new residential area towards Malaekahana, so the scope and timing of these is currently unknown.

The leading Haleʻiwa landowner, Kamehameha Schools, completed a Master Plan for its North Shore lands in 2008. It includes renovation and expansion of commercial areas in Haleʻiwa, along with limited new residential development. On Kamehameha Schools land, the Kawailoa Wind project is now beginning construction. It would generate approximately 70 MW of power, and be Hawaiʻi's largest wind power facility. The towers are to be located well inland, and would be far less visible than the facility now operating at Kahuku, which was also built by First Wind.

Other new major projects that have been proposed (and opposed) include:

- Relocation of the Hauʻula fire station to commercial land acquired from local owners;
- A second wind farm project in Kahuku, which has been opposed by local stakeholders because its proponents failed to consult the community but claimed to have done so;
- A 75,000-square foot commercial development near the Sunset Beach supermarket was proposed, but plans are on hold, and the developer, Honu Group Inc., does not mention this project on its website; and
- A small hotel to be located near the shore at Haleʻiwa: This would occupy part of the land that the City and County had bought for park expansion; the proposal has inspired intense discussion in the community.

The North Shore Sustainable Communities Plan, passed by the Honolulu City Council in 2011, incorporates plans for revitalization of Haleʻiwa and Waialua as country towns, with new housing allowed nearby. In Haleʻiwa, the landowner and stakeholders support continuing retail development and creation of a community gathering place. For Waialua, industrial redevelopment at the mill site is supported.

[25] This figure was included in revisions to the Draft Koʻolau Loa SCP supported by several Lāʻie and Kahuku members of the SCP advisory group in 2009 (posted at http://envisionlaie.com/wp-content/downloads/kscp_proposed_amendment.pdf). The developer has not recently provided a revised total for housing to be built at Malaekahana.

3.2.9 Infrastructure

As a two-lane roadway, Kamehameha Highway's size limits traffic flow throughout the KNS region. The Haleʻiwa Bypass (Joseph P. Leong Highway) provided a local response to congestion. At Waimea Bay, road improvements and cliff stabilization were needed after a major rock fall in 2000, but another fall in 2007 resulted in a brief closure.[26] The City and County's Parks and Recreation Department has plans for support parks, notably at Laniakea, which could reduce roadside parking and unmanaged pedestrian crossings.

A new pedestrian and bike path opened in 2011 in Malaekahana, linking Lāʻie and Kahuku, as part of the Envision Lāʻie initiative.

The City and County of Honolulu has been seeking a new municipal sanitary landfill site to replace Waimanalo Gulch. A citizen committee has recently identified criteria for preliminary ranking of potential sites before land owner, city, state and federal guidelines are evaluated. Based on their input, a site immediately upland from the Turtle Bay Resort has emerged as the preferred location for a new landfill.[27] The site is under the control of the federal government, and is part of the Army's Kahuku Training Area. The City and County of Honolulu does not have the authority to take Army land without federal consent. Apparently, no consultation with federal authorities had occurred at the time of the study because the analysis was limited to an evaluation of physical land characteristics and did not take into account land ownership.

3.2.10 Similarities and Differences of the Two SCP Areas

The two SCP areas share "country" lifestyles, but these are realized in different ways in different communities.

The racial data in Table 3-2 show the KNS region, as a whole, being distinctive on the island of Oʻahu for its lower share of Asian residents and its large proportion of White residents. Koʻolau Loa has a higher proportion of Native Hawaiʻian and Pacific Island residents than the island as a whole.

Koʻolau Loa and North Shore stakeholders, working with the City and County's planners, have developed similar long-term visions for their areas:

> … Koʻolau Loa seeks to preserve the region's rural character and its natural, cultural and scenic resources. The community envisions a safe and healthy environment based on strong family values, where residents have access to quality jobs, affordable housing, and ample recreational opportunities within the region. Koʻolau Loa will remain country, characterized by small towns and villages with distinctive identities that exist in harmony with the natural settings, defined by

[26] Park, G. "Waimea Bay Rocked Again." *Honolulu Star-Bulletin.* April 8, 2007. Posted at http://archives.starbulletin.com/2007/04/08/news/story01.html.

[27] *Pacific Business News*, April 25, 2012. http://www.bizjournals.com/pacific/news/2012/04/25/kahuku-sites-now-top-oahu-landfill.html.

> the mountain ridges and scenic open spaces which help to give the region its unique form of organization.[28]
>
> The North Shore in the year 2035 retains the unique qualities that have long defined its attractiveness to residents and visitors alike. Scenic open spaces are protected and maintained, coastal resources are enhanced, and the region's Native Hawaiian heritage, cultural diversity, and plantation past have been carried forward in the revitalization of its communities.[29]

The former vision emphasizes the continuing wellbeing of local communities rooted in existing towns; the latter emphasizes open space, and treats towns as sites to be "revitalized." This difference is not new, and it is not simply a difference between the two SCP Areas within the region. [30] Areas where many residents value their coastal strip and ocean as "country" include Kaʻaʻawa and Punaluʻu in Koʻolau Loa as well as most of the North Shore. Similarly, "community" orientation and the hope of continuity for families and neighborhoods, from the plantation past to an uncertain present and future, is found as much in Waialua as in Kahuku or Lāʻie.

Local stakeholders in Haleʻiwa and Waialua see their communities as distinct towns with economic hubs to be supported, i.e., Haleʻiwa's mix of tourist retail and other businesses, and Waialua's Sugar Mill redevelopment area. Much the same could be said of Kahuku and Hauʻula in Koʻolau Loa, but their commercial areas appear less successful. Lāʻie stands out because its major employers are closely interrelated. The PCC depends on BYUH for much of its workforce, while it provides financial support to the university. Its economic organization follows from its role as a church center.

The growth of surfing and the surf industry has brought a younger population and an orientation to the ocean, more than to land resources, to the North Shore. The high levels of unemployment in the Haleʻiwa and Kawailoa Census Tracts is understandable if many residents live on the North Shore to enjoy the ocean, and do not need to support families or are willing to accept marginal economic conditions so long as they can live there. Many on the North Shore see their environment as a resource for the island and the entire world, not just for their own community. Accordingly, they may be more concerned with environmental protection than with economic sustainability. However, residents of communities throughout the region support both of these values and assess new initiatives in light of them both.

[28] City and County of Honolulu, Department of Planning and Permitting, *Koʻolau Loa Sustainable Communities Plan Five-Year Review: Public Review Draft*. Honolulu, HI: 2010, p. 2-1.

[29] City and County of Honolulu, Department of Planning and Permitting, *North Shore Sustainable Communities Plan: Public Review Draft*. Honolulu, HI: 2010, p.2-2

[30] The Socio-Economic Impact Assessment for the Kuilima EIS made much the same point in 1984:

> "At a very general level, there is an apparent value difference between residents who are primarily concerned with preserving a 'country' feeling and those who are more concerned with preserving a current 'community' for existing family and friends. While most people would like both, they tend to lean to one or the other if forced to choose." (Community Resources, Inc. and A. Lono Lyman, Inc., Appendix J to the Kuilima EIS, page 4).

3.2.11 Comparison of Current Socio-Economic Trends with Trends Discussed in the 1985 Kuilima EIS

The SEIS Lands and the Resort

Before the Kuilima EIS was processed, parts of the site were under short-term agricultural or residential leases. The leases were not renewed, and beach cottages along the eastern half of Kawela Bay on the SEIS lands were demolished. A major difference between the current situation and that of the Kuilima EIS is that the Proposed Action does not involve displacement of private homes or activities.

In the early 1980s, the hotel had low occupancy levels, and development permits did not, in the view of the owners, allow for adequate growth to achieve a prosperous level of operations. After the 1985 EIS was accepted, the owners took steps towards expansion but soon found they could not implement their plans for macro-economic reasons. In the intervening years, the hotel has been refurbished, and has come to have higher occupancy levels. The Ocean Villas have expanded the resort's offerings. Turtle Bay is now a viable resort operation. It has development permits for expansion and the owners plan to implement a phased development plan.

Regional Economy

In the 1980s, the KNS region was characterized by lower incomes and employment than the rest of the City and County of Honolulu, and by a narrow economic base. The region stood out as the center for aquaculture in Hawaiʻi. Tourism was recognized as offering "the greatest promise for providing new employment and business opportunities" on Oʻahu.[31] While the region included major visitor attractions (at PCC and Waimea Valley), the EIS treated residents as more dependent on agriculture and fishing than tourism. Since then, the surf and visitor industries of the region have expanded, and the North Shore's reputation has grown. Only 2.1% of the civilian workforce is in agriculture (as shown in Table 3-11).

Tourism is now the region's leading industry. Household incomes for most of the region approach or exceed the island median. However, regional unemployment remains above the island average. Commute times for most of the region are still longer than for other parts of Oʻahu and are longer than reported in 1980.

Populations and Communities in the Region

Demographic changes include population growth and aging of the overall population (from medians in the region of about 25 years in 1980 to about 32 years of age in 2010). Changes in ethnic composition are not easily specified, since classification schemes for race and ethnicity have changed, but a marked increase in the share of the population identified as (at least in part) White has occurred. However, occupancy rates have changed little.

[31] Community Resources, Inc. and A. Lono Lyman, Inc. *op. cit.*, page 6.

Housing Market

Housing costs on O‘ahu have increased greatly over the last thirty years, and the ratio of housing costs to incomes has increased as well. In parts of the KNS region, rentals to vacationers or surfers have tended to increase rents and limit the inventory available to residents. Elsewhere on O‘ahu, single-family housing and condominiums have been built in large new subdivisions, but housing development in the KNS region has been far slower than in Central O‘ahu and ‘Ewa. Available housing within the KNS region is even more limited and costly than before.

Emerging Trends

The 1985 Kuilima EIS dealt at length with the demographics, economy and aspirations of the region. By that time, the closing of Kahuku Sugar had transformed the economy of Ko‘olau Loa, and it was clear that Waialua Sugar would close in the near future. Tourism was recognized then as a critical source of new jobs for the region.

The SIA emphasized that the City and County *General Plan* guidelines called for slow population and housing growth – but that existing approvals already provided capacity for a population of approximately 30,400 by 2000. (The actual 2000 population, as shown in Table 3-1, was 108% of the estimated capacity.)

The traffic analysis conducted for the 1985 EIS incorporated assumptions of continuing growth of traffic in the region: traffic was seen as increasing faster than population or housing.

These facts can be read in two ways in relation to the current situation in the region. On the one hand, the problems of a limited economic base, inadequate housing supply, and traffic congestion remain. Expansion of the resort is a source of jobs for many and some homes affordable for KNS families. To the extent that the expanded resort will provide recreation and other activities for its visitors, it might not add much to, and might even reduce, the circle-island visitor traffic in the region. However, some observers emphasize traffic congestion and housing demand, and claim that the need for an alternative job base is no longer pressing. They value the existing resort as a regional amenity but question the need for expansion.

The data reviewed above indicate that local job sources fail to meet the employment needs of many KNS residents, limiting employment for some and forcing others to commute long distances or to leave the region to find work. Both local employment demand and traffic congestion indicate that the main themes of the regional socio-economic analysis provided in the Kuilima EIS are still valid.

4 Socio-Economic Effects of the Proposed Action

Major socio-economic effects of resort expansion can be discussed as emerging from economic changes (capital coming to Hawai‘i for resort construction and, later, as visitor spending) that propel population changes (increased numbers of visitors and resort residents, new housing for local workforce families, incomes that support local families and allow successive generations to stay in the region, rather than move to other areas), and fiscal impacts (new government revenues and the cost of meeting increased demand for public services). These effects may then lead to ones that involve interactions between visitors and residents.

As discussed in Section 1.2, the effects of new development can be counted as “impacts” only in relation to an allowed action future baseline. If the baseline – the existing situation and potential development permitted under current laws – involves development, then the “impact” is the difference between permitted and proposed development. At Turtle Bay, the permits now in force allow for development of the Full Build-Out Alternative. The Proposed Action scales down new development, and limits its footprint.

In this chapter, the effects of the Proposed Action are contrasted with those of the No Action Alternative. Effects of the Full Build-Out Alternative and other development alternatives are assessed later.

It is useful to deal first with quantifiable effects. Once these have been discussed, readers are better able to assess whether significant qualitative effects occur. For quantitative and qualitative effects alike, both the development of effects over time and the cumulative effects deserve study. This chapter deals with effects of the Proposed Action; effects of the alternatives are discussed in the next chapter.

The Proposed Action will bring more visitors and workers to the resort. Wages from resort and resort-related jobs will in turn support resident households in the region. For this reason, population and housing effects are discussed below after estimating the number of operations jobs created by visitor spending, both at the resort and elsewhere in the region.

This chapter provides a step-by-step account of the estimation of demographic, economic and fiscal impacts of the Proposed Action. Sources for the analyses are shown as notes to tables. Some are discussed in more detail in Appendix B. The costs and benefits of the Proposed Action are summarized in Chapter 7.

4.1 Employment and Wages

The Proposed Action will bring both short-term jobs during the construction period and continuing operations jobs. Construction will involve an estimated 3,263 direct jobs over 11 years. Construction workers on-site at the resort during that period will number about 237 on average. The number of new continuing operations positions at the resort will climb to about

753. Next, visitor spending will not be confined to the resort, so the attraction of additional visitors to Turtle Bay will support an estimated 443 additional jobs in Hawai‘i by 2025.

Wages from both construction and continuing jobs will support island households. By 2025, the regional increase in wages is expected to be more than $30 million annually (2011 dollars, based on $23.8 million in resort operations wages and $7.4 million in the KNS region for off-site tourism-related work).

Investment in new facilities creates short-term jobs during the construction period and continuing jobs in building and landscape maintenance, security and administration. Visitor spending supports operations jobs on a continuing basis. While both have effects throughout the island economy, construction and construction-related jobs do not have much effect on the regional population size, except by providing nearby, relatively reliable jobs for residents of the region who are already construction workers.

4.1.1 Construction Employment and Wages

Project construction would begin as soon as building permits are granted. Assuming that construction begins in 2014, the completion schedule in Table 4-1 is expected:[32] Construction-related jobs would last until build-out.[33] All construction jobs are estimated as full-time jobs for a given year. These fall into the following categories:

1. On-site construction jobs: workers at the resort. Their number is estimated on the basis of annual construction spending. The actual number of workers on a given day would vary according to the jobs to be done.

2. Other direct construction jobs: Firms responsible for construction have workers at their offices and base yards as well as on-site. As a rule of thumb, on-site workers account for 80% and off-site workers account for 20% of direct construction jobs.

3. Indirect jobs: These are jobs supported when construction firms buy materials and services locally.

4. Induced jobs: These jobs are supported by expenditure of wages of direct and indirect workers. These include, jobs in retail trade, or educational and health services.

The distinction among direct, indirect and induced employment comes from Input-Output analysis. The models developed and maintained by the State Department of Business, Economic Development and Tourism (DBEDT) provide multipliers for indirect and induced jobs by industry. The specific multipliers used are identified in Appendix B. Table 4-2 shows construction spending and the associated workforce for the Proposed Action.

[32] The construction timetables in this report follows from an analysis provided by TBR. It depicts a process of market absorption. It should be viewed as a best estimate of likely demand over several years, rather than a strict, year-by-year, prediction of what will be built and sold at the resort.

[33] This account does not include design and engineering jobs which are not closely tied to the schedule.

Table 4-1: Construction Timetable, Proposed Action

	Cumulative, through 2025	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
New hotel units, for occupancy in year		30	30	30	64	65	60	70	70	70	71	65
New residential units, for occupancy in year												
Resort Residential		131	74	75	47	48	49	49	38	37	27	15
Community Residential		44	25	19	19	19	13	13	8			
Hotel units built by end of year	625	30	60	90	154	219	279	349	419	489	560	625
Residential Units built by end of year												
Resort Residential	590	131	205	280	327	375	424	473	511	548	575	590
Community Residential	160	44	69	88	107	126	139	152	160	160	160	160
Share of infrastructure $$ spent by end of year	100%	35%	45%	46%	52%	59%	65%	94%	96%	97%	99%	100%

SOURCE: TBR.

Table 4-2: Construction-Related Jobs and Wages

	TOTAL	Annual Data 2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Construction Spending (million, 2011 $s)												
Infrastructure	$148.5	$48.0	$14.4	$3.5	$8.9	$10.4	$9.2	$40.2	$4.3	$3.3	$3.4	$2.9
Buildings	$324.4	$46.5	$31.8	$30.4	$32.6	$26.4	$23.1	$29.7	$25.7	$26.0	$27.4	$24.9
Single Family	$297.0	$49.8	$26.4	$26.7	$26.4	$31.0	$32.0	$32.8	$25.3	$22.5	$18.3	$5.9
	$769.9	$144.3	$72.5	$60.6	$67.9	$67.8	$64.3	$102.7	$55.3	$51.9	$49.1	$33.6
Direct Construction Workforce												
Infrastructure	564	183	55	13	34	39	35	153	17	12	13	11
Buildings	1,363	195	133	128	137	111	97	125	108	109	115	104
Single Family	1,336	224	119	120	119	140	144	147	114	101	82	26
	3,263	602	307	261	290	290	276	425	238	223	210	142
On-site Const. workers	2,611	482	245	209	232	232	221	340	191	179	168	113
Construction period (yrs.)	11											
Average annual on-site FTE	237											
Indirect and Induced Jobs	5,482	1,011	515	439	486	487	463	714	400	375	353	238
Wages (million, 2011 $s)												
Direct	$225.3	$41.6	$21.2	$18.0	$20.0	$20.0	$19.0	$29.4	$16.4	$15.4	$14.5	$9.8
Indirect and Induced	$247.7	$45.7	$23.3	$19.8	$22.0	$22.0	$20.9	$32.3	$18.1	$16.9	$16.0	$10.7
Total Wage Impact	$473.0	$87.2	$44.4	$37.9	$42.0	$42.0	$40.0	$61.6	$34.5	$32.4	$30.5	$20.5

NOTES: Construction spending estimated by Belt Collins Hawaii, based on input from TBR. Workforce counts based on recent job counts per construction spending. On-site workforce estimated on assumption that 20% of direct workforce is at baseyards, offices or otherwise off-site. Indirect and induced jobs estimated from Hawaii State Input-Output Model. Wages estimated from data for the construction industry and for all covered employment, for City and County of Honolulu, in 2009, adjusted to 2011 wages in proportion to changes in the Consumer Price Index. The numbers shown are rounded, so totals may differ slightly from the sum of the individual numbers in the table.
SOURCES: DBEDT, 2012, 2011, 2009; DLIR, 2011.

Construction work ends when a structure is built. The job counts for the entire period are person-years of employment, over the 11 years of construction. As shown in Table 4-2, the average on-site construction workforce would number approximately 237 over 11 years.

4.1.2 Operations Employment and Wages

A resort development demands staffing not just for accommodations, but also in food services, landscaping, building services, security and real estate. With an increased visitor population, demand for recreation would create additional jobs as well. Some retail jobs would be on-site at the resort, in hotels, in the new Gathering Place or at the farmer's market.

Operations jobs are expected to continue so long as a resort attracts visitors and residents. Spending at the resort would generate indirect and induced jobs in turn. Table 4-3 shows both direct jobs and indirect and induced ones.

Resort visitors also spend money off-site, for transportation, services, food and goods. The number of jobs involved can be estimated on the basis of statewide data on the jobs supported in the state economy by visitor spending. These jobs are calculated by DBEDT as direct and indirect jobs. For the present analysis, total spending by resort visitors for items other than lodging is estimated, and the associated jobs are counted. Off-site jobs can be estimated by subtracting out the on-site jobs from the total jobs supported by visitor spending, as shown in Table 4-4:

Table 4-3: On-Site Operations Jobs and Related Jobs, Proposed Action

	2025 -- Full Absorption	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Operations Jobs												
Direct Workers												
Hotel	511	25	49	74	126	179	228	285	342	400	458	511
Food and Beverage	140	8	15	22	36	51	64	80	95	110	126	140
Retail	51	3	6	9	14	20	24	30	35	41	46	51
Recreation Services	7	0	1	1	2	2	3	4	4	5	6	7
Landscaping	13	2	3	4	5	6	7	9	10	11	12	13
Security	13	2	3	4	5	6	7	9	10	11	12	13
Realty/Management	19	2	3	5	6	8	10	12	14	16	18	19
Direct Total	753	41	79	117	194	272	344	428	511	593	677	753
Indirect + Induced Workers	785	42	81	120	201	282	357	444	531	618	706	785
Total	1,539	83	160	237	395	554	701	872	1,042	1,211	1,383	1,539
Annual Wages (Million 2011 $s)												
Direct Workers	$23.8	$1.3	$2.5	$3.7	$6.1	$8.6	$10.9	$13.5	$16.1	$18.7	$21.4	$23.8
Indirect and Induced Workers	$35.5	$1.9	$3.7	$5.4	$9.1	$12.7	$16.1	$20.1	$24.0	$27.9	$31.9	$35.5
Total	$59.2	$3.2	$6.1	$9.1	$15.2	$21.3	$27.0	$33.6	$40.1	$46.6	$53.2	$59.2

NOTES: Employment estimated by Belt Collins Hawaii, based on development timetable and employment at Turtle Bay and comparable resorts. Job counts are based on the number of units built or occupied, as described in Appendix B. Sources for indirect and induced jobs and for wage estimates by industry are the same as in the preceding table, using the multipliers for the industries shows in the table. (See Appendix B for multipliers.) The numbers shown are rounded, so totals may differ slightly from the sum of the individual numbers in the table.

SOURCES: DBEDT, 2012, 2011, 2009; DLIR, 2011.

Table 4-4: Off-Site Employment Supported by Visitor Spending

	2025 -- Full Absorption	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Visitors Staying Overnight in New Units												
Total	2,206	221	386	553	729	921	1,102	1,326	1,534	1,753	1,997	2,206
Adjusted total, spending	1,862	154	280	406	562	727	880	1,068	1,248	1,440	1,664	1,862
Spending, Non-lodging												
Per person per day	$104.73	$104.73	$104.73	$104.73	$104.73	$104.73	$104.73	$104.73	$104.73	$104.73	$104.73	$104.73
Annual (Million $s)	$71.2	$5.9	$10.7	$15.5	$21.5	$27.8	$33.7	$40.8	$47.7	$55.0	$63.8	$71.2
Jobs from Visitor Spending												
Total (Direct and Indirect)	765	63	115	167	231	299	362	439	513	592	686	765
minus On-site (DII)	322	24	42	61	95	127	158	192	226	259	293	322
Off-site (DI)	443	39	73	106	137	172	205	246	287	333	393	443
Regional Share	177	16	29	42	55	69	82	99	115	133	157	177
Wages, Off-site (Million $s)	$18.4	$1.6	$3.0	$4.4	$5.7	$7.1	$8.5	$10.2	$11.9	$13.8	$16.3	$18.4
Regional Share	$7.4	$0.7	$1.2	$1.8	$2.3	$2.9	$3.4	$4.1	$4.8	$5.5	$6.5	$7.4

NOTES: Visitor total is all visitors in new hotel and resort residential units. "Adjusted total, spending" counts only half of the visitors in residential units, since (a) some of these may stay for longer periods, and spend less per day, and (b) these seem more likely to patronize big box stores outside the KNS area. Off-site jobs estimated from average non-lodging visitor spending per-person per day in Hawai'i, 2010, and statewide ratio of jobs generated by visitor spending (including direct and indirect jobs) as modeled by DBEDT for 2010. Visitors in the Proposed Action are assumed to spend 110% of average visitors to Hawai'i. Direct jobs generated on-site (excluding accommodations jobs) plus associated indirect and induced jobs are subtracted from the total. For consistency, average wage for visitor spending direct and indirect jobs is also taken from the State model (Data Book Table 7.32) which shows $41.505.50 in household income associated with each visitor-related job (including indirect jobs) as of 2010. Regional share of off-site jobs estimated by Belt Collins Hawaii LLC as 40%, based on visitor spending patterns (by industry) analyzed by DBEDT. The numbers shown are rounded, so totals may differ slightly from the sum of the individual numbers in the table, and shares of totals may reflect unrounded numbers.

SOURCES: DBEDT, 2011a, 2011b.

4.2 Population Growth and Distribution

As of 2025, the Proposed Action is expected to increase the number of people staying overnight at the Turtle Bay Resort (including the hotel and Kuilima Estates) from about 1,267 visitors and residents to approximately 4,167 persons on average (an increase of 2,900). During the daytime, many of these people would go outside the resort, but employees and day visitors would come to the resort. The daytime population growth with the Proposed Action is estimated as from about 1,485 to about 4,401 (an increase of 2,916).

Population growth at Turtle Bay Resort has already been anticipated in government projections for slow increases in the region's resident population.

4.2.1 Population at the Resort

Three different sorts of population effects are discussed in this report. With new hotel units and housing, the number of persons staying overnight on-site increases. During the daytime, many residents and some of the visitors staying on-site will be elsewhere, but the on-site population includes operations workers, construction workers, and day visitors to the resort. Regional population effects are estimated as including (a) new visitors to the resort and resort residents, (b) residents of community housing who come from outside the region, (c) persons who come to the region to take jobs supported by visitor spending, whether jobs at the resort or elsewhere in the region. On-site totals are typically larger than regional totals because many residents living at the resort or, supported by resort-related jobs and living elsewhere in the region, are not new to the region.

Currently, approximately 1,485 persons are at the Turtle Bay Resort at any given time, not counting construction workers. The number of persons present may be greater, when major events such as concerts or the Fourth of July celebrations attract people from outside the resort. Table 4-5 shows the breakout of persons estimated as on-site on, say, a weekday that is also a state holiday, when many residents might remain on-site. Table 4-6 provides a similar account of population with the Proposed Action.

4.2.2 Population Effects throughout the KNS Region

Table 4-7 estimates the new regional resident population anticipated with the Proposed Action, taking into account both new on-site population at the resort and population supported by new jobs throughout the region. The Proposed Action would contribute about a third of resident population growth for the 2025 KNS region, as shown in Table 4-7. (This calculation involves allocating to the region a share of island-wide effects. The shares shown are selected to provide a high but realistic estimate of regional effects.)

Table 4-7 combines counts of resort visitors and new regional residents to estimate the regional de facto population increase associated with the Proposed Action. However, no regional de facto

count of residents and visitors either passing through or staying in the region has been published, so this population cannot be compared either to a current total or projected growth.

Table 4-5: Estimated On-Site Daytime Population, Existing Turtle Bay Resort

	Daily (1)	Around noon (2)
Hotel and Ocean Villas guests	850	638
Kuilima Estates		
FT Residents	223	167
PT residents, visitors	194	146
Day visitors	Varies	96
Operations workforce, by industry		
Accommodations	350	280
Food and Beverage	115	69
Retail	25	13
Recreation Services	25	23
Landscaping	28	25
Security	35	18
Realty/Management	12	12
Subtotal	590	439
Construction workers (3)	14	12
Total		1,497

NOTES: Estimated from data provided by TBR, other operators, traffic study survey, and 2010 U.S. Census data. Day visitors include a few golfers, riders, surfers, and visitors to restaurants, but their numbers can be much larger during conferences, contests or concerts. The numbers shown are rounded, so totals may differ slightly from the sum of the individual numbers in the table. FT = full-time; PT = part-time.

(1) Present at some time for an average day. Not all employees are likely present at the same time.

(2) On-site at the same time, during a typical day, e.g., at noon. Some 75% of guests and residents expected to be present.

(3) Some renovations may be ongoing at any time. The figure used here is a rough estimate of the possible average over time, based on recent traffic counts.

The new on-site population at the resort (in Table 4-6) is larger than the new regional population (in Table 4-7). That is because much of the population new to the resort would come from the region: the community housing would largely serve families from the region.

Table 4-6: Estimated Turtle Bay Resort On-Site Daytime Population, based on Proposed Action

	Existing Resort	2025 -- Full Absorption	New Daytime Population with Proposed Action										
			2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Hotel, Ocean Villa guests	638	1,139	65	130	194	297	400	493	607	721	845	998	1,139
Resort Residential (including Kuilima Estates)													
FT Residents	167	41	9	14	20	23	26	30	33	36	39	40	41
PT residents, visitors	146	516	101	160	221	250	291	334	387	429	470	499	516
Community Residential		479	132	206	263	320	377	416	455	479	479	479	479
Day Visitors	96	180	62	84	86	108	130	151	165	169	172	176	180
Operations workers	439	561	30	59	87	145	202	256	319	380	442	504	561
Construction workers	–	–	245	209	232	232	221	340	191	179	168	113	–
Total	1,485	2,916	645	862	1,102	1,374	1,647	2,020	2,157	2,393	2,614	2,811	2,916

NOTE: Only construction workers involved in new construction (rather than renovation) are included. Day visitors are expected to increase as Kawela Bay and other areas open to the public and as resort amenities become available. Golfers from outside the resort would decrease with fewer holes available on the Fazio Course. The Proposed Action would increase the number of persons on-site to a total of 4,358 after build-out. The population associated with the existing resort accounts for 34% of that total. The numbers shown are rounded, so totals may differ slightly from the sum of the individual numbers in the table.

Table 4-7: Estimated Contribution of Proposed Action to Regional Population Increase

	2010	2025
Regional Population Estimates		
DPP Forecast (2009)	31,880	34,276
2010 Census + Adjusted Forecast (1)	34,452	37,041
Resident Population Groups Associated with Proposed Action		*Islandwide*
A. TBR Resort Recreation Residents		55
B. TBR Community Housing Residents		638
C. Direct Operations Workforce Households (2)		1,613
D. Indirect and Induced Operations Workforce Households (2)		896
E. Off-Site Workforce Households (2)		505
Total (assuming unduplicated counts)		3,707
Potential New Regional Resident Population (3)		*KNS Region*
A. 100% of group		55
B. 30% of group		192
C. 20% of group		323
D. 20% of group		179
E. 40% of group		202
Total		**951**
Share of Projected Regional Population Increase		36.7%
Regional New De Facto Population Change		
New Regional Resident Population with Proposed Action		951
New TBR Visitor and Part-time Population		2,206
Total		3,157

NOTES: See Tables 3-8, 4-3, 4-4, 4-6.

(1) Adjusted estimate applies DPP projected growth rates, but starts from the actual 2010 Census population.

(2) For this calculation, the ratio of workers to residents in KNS households in 2010 was used to estimate workforce household populations.

(3) Regional population growth can occur either when housing opens up for people to move into the region or when jobs open up, making it possible and attractive for workers to move (or move back) to the region. In the case of Community Housing, the estimate is of households whose place in existing housing units will be taken by in-migrants to the region who are not counted in C., D., or E.

Table 4-7 includes the assumption that some 40% of jobs supported by off-site visitor spending would be held by regional residents. That assumption takes into account the facts that much visitor spending goes for transportation and other services that may be based outside the region, and that jobs supported by visitor spending include indirect jobs, e.g., the manufacture of food or clothing purchased by visitors. Most of those indirect jobs would be outside the immediate region.

4.3 Fiscal Effects

Fiscal impacts consist of revenues generated by new development offset by new costs to local government incurred in order to support the new development and associated populations. New revenues can be estimated from new capital brought to Hawai‘i by project development and through visitor spending. New costs can be estimated as a share of the government spending needed to support Hawai‘i’s visitor and resident populations.

The Proposed Action will result in a cumulative net benefit – i.e., total benefits minus total costs – for the period 2014 to 2025 estimated as $163.4 million for the State of Hawai‘i and as $45.6 million for the City and County of Honolulu (in 2011 dollars). After full occupancy has been reached, the annual net benefit for the State will amount to $14.6 million, while the net benefit for the City and County will be about $6.6 million yearly.

4.3.1 Revenues

New revenues for the State of Hawai‘i come from (a) construction spending and construction-related workers’ incomes and spending, (b) cash flows with purchase or rental of real estate, and (c) other visitor spending. These are estimated for the major taxes used to collect such revenues in Tables 4-8 and 4-9. Additional property taxes for the City and County of Honolulu are estimated separately in Table 4-10.

Annual state construction-related revenues amount to nearly $10 million by 2020. Operations-related revenues for the state already exceed $10 million as of that year, and grow as spending by resort visitors increases.

Property tax revenue increases occur as land is redeveloped and new improvements are built. As Table 4-11 indicates, property tax revenues on new resort and residential units would amount to some $4.7 million in 2020, and would continue to increase until, after full absorption, they stabilize at approximately $8.3 million per year. The cumulative collections through 2025 would amount to $50.3 million.

Currently, the City and County of Honolulu collects about $12.4 million in real property taxes annually from residential and resort properties in the KNS region.[34] As of 2025, real property

[34] Estimated taxes compiled by Belt Collins Hawaii from Hawaii Information Service data (derived from City and County of Honolulu Real Property data), June 2012.

taxes on residential and resort units within the Proposed Action would amount to about $8.3 million of additional revenue annually, a major increase in funds available to support municipal services.

The property tax analysis is based on a detailed timetable for development of hotel and residential structures. Estimates of the increase in value of land are based on the new value of land developed, minus an average of values for land subject to redevelopment over time. The analysis omits the value of all new commercial structures and amenities, and increased value of the land they occupy.

Table 4-8: Government Revenues Associated with Construction

All figures are Millions of 2011 $s	Cumulative, through 2024	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Construction cost (1)	$769.9	$144.3	$72.5	$60.6	$67.9	$67.8	$64.3	$102.7	$55.3	$51.9	$49.1	$33.6
Construction-related Wages (2)	$473.0	$87.2	$44.4	$37.9	$42.0	$42.0	$40.0	$61.6	$34.5	$32.4	$30.5	$20.5
Excise Taxes To State (3)												
On Construction	$31.2	$5.8	$2.9	$2.5	$2.8	$2.7	$2.6	$4.2	$2.2	$2.1	$2.0	$1.4
On Spending by Workforce (4)	$12.0	$2.2	$1.1	$1.0	$1.1	$1.1	$1.0	$1.6	$0.9	$0.8	$0.8	$0.5
Excise Taxes to City and County of												
On Construction	$3.5	$0.6	$0.3	$0.3	$0.3	$0.3	$0.3	$0.5	$0.2	$0.2	$0.2	$0.2
On Spending by Workforce (4)	$1.3	$0.2	$0.1	$0.1	$0.1	$0.1	$0.1	$0.2	$0.1	$0.1	$0.1	$0.1
Income Taxes												
Corporate (5)	$1.3	$0.2	$0.1	$0.1	$0.1	$0.1	$0.1	$0.2	$0.1	$0.1	$0.1	$0.1
Personal (6)	$28.8	$5.3	$2.7	$2.3	$2.6	$2.6	$2.4	$3.8	$2.1	$2.0	$1.9	$1.3
Total Revenues from Construction Spending												
State of Hawaii	$73.3	$13.6	$6.9	$5.8	$6.5	$6.5	$6.2	$9.7	$5.3	$5.0	$4.7	$3.2
City and County of Honolulu	$4.8	$0.9	$0.5	$0.4	$0.4	$0.4	$0.4	$0.6	$0.3	$0.3	$0.3	$0.2

NOTES: Since occupancy is expected to be achieved in 2025, Belt Collins has treated 2024 as the last year of construction. Values are rounded, so totals may be slightly different than the sum of the values in the table.

1 Estimated by Belt Collins Hawaii, in millions of mid-2011 dollars.

2 From Table 4-2.

3 The State collects General Excise Tax (4%) and, on O'ahu, an additional tax for transit (0.5%). Act 247 of 2005 directs the State to retain 10% of the County surcharge for administrative costs. Hence the State share of excise taxes is 4.05%, while the City and County share is 0.45%.

4 Excise tax is calculated on disposable income, estimated as 62.6% of wages (from historical spending rates).

5 Corporate income tax estimated (from historical rates) as 0.17% of revenues (data from 2000).

6 Personal income tax estimated as 6.1% of taxable income (from 2005 data).

SOURCES:

DBEDT 2011, 2005; Hawaii State Department of Taxation, 2001, 2008

Table 4-9: Government Revenues Associated with Real Estate Purchases and Visitor Spending

All figures are Millions of 2011 $s	Cumulative, through 2025	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Conveyance Taxes	$5.1	$0.8	$0.5	$0.5	$0.5	$0.5	$0.4	$0.5	$0.4	$0.4	$0.4	$0.3
Taxes on Visitor Accommodations												
Transient Accommodations Tax (Hotel Condominiums and Visitors in Resort Residential Units)	$32.9	$0.8	$1.3	$1.8	$2.2	$2.7	$3.1	$3.6	$4.0	$4.3	$4.5	$4.6
Transient Occupancy Tax (Time Shares)	$16.3	$0.1	$0.5	$0.7	$0.9	$1.1	$1.3	$1.6	$1.9	$2.2	$2.8	$3.2
Taxes on Cash Flows from Visitor Spending												
Excise Taxes												
On Lodging (Visitors only)	$16.0	$0.4	$0.6	$0.9	$1.1	$1.3	$1.5	$1.7	$1.9	$2.1	$2.2	$2.2
On Other Visitor Spending	$17.7	$0.3	$0.5	$0.7	$1.0	$1.3	$1.5	$1.8	$2.1	$2.5	$2.9	$3.2
On On- and Off-Site Workers' Spending	$11.7	$0.1	$0.3	$0.4	$0.6	$0.8	$1.0	$1.2	$1.5	$1.7	$2.0	$2.2
Excise Tax Total	$45.5	$0.8	$1.4	$1.9	$2.6	$3.4	$4.0	$4.8	$5.6	$6.3	$7.0	$7.6
State of Hawai'i Share	$40.9	$0.7	$1.2	$1.7	$2.4	$3.0	$3.6	$4.3	$5.0	$5.7	$6.3	$6.9
City and County of Honolulu Share	$4.5	$0.1	$0.1	$0.2	$0.3	$0.3	$0.4	$0.5	$0.6	$0.6	$0.7	$0.8
Income Taxes												
On- and Off-Site Workers	$25.3	$0.3	$0.6	$0.8	$1.3	$1.7	$2.2	$2.7	$3.2	$3.7	$4.2	$4.7
State of Hawai'i Total	$120.6	$2.7	$4.0	$5.5	$7.2	$9.0	$10.7	$12.7	$14.4	$16.3	$18.2	$19.7
City and County of Honolulu Total	$4.5	$0.1	$0.1	$0.2	$0.3	$0.3	$0.4	$0.5	$0.6	$0.6	$0.7	$0.8

NOTES: All taxes estimated from current rates (excise at 4.5%; TAT at 9.25%; TOT at 7.25% of half of maintenance fee for period of occupancy; conveyance taxes at escalating rates depending on cost and whether buyer is a Hawai'i resident) and historic ratios between earnings or revenues and taxes. Excise tax on workers' income estimated for taxable disposable income. Property sale values and maintenance fees estimated by Belt Collins Hawaii based on information from TBR and review of comparable projects. Values are rounded, so totals may be slightly different than the sum of the values in the table.

Table 4-10: Increased Property Tax Revenues for the City and County of Honolulu, with Proposed Action

	2025 -- Full Absorption	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Land Redeveloped (acres)												
Annual	11	40	23	22	22	21	20	19	13	14	17	11
Cumulative	221	40	62	84	106	127	147	166	179	193	210	221
Value of Redevelopment (Mill $s) (1)												
Residential Construction	$441.0	$84.2	$130.8	$176.3	$210.7	$243.0	$275.0	$320.1	$357.6	$392.3	$422.9	$441.0
Residential Land	$586.8	$118.8	$182.0	$245.9	$309.5	$369.3	$429.9	$481.2	$516.7	$549.1	$577.6	$586.8
Hotel Construction	$175.9	$11.6	$23.1	$34.7	$59.3	$84.3	$107.4	$120.9	$134.4	$148.2	$163.3	$175.9
Hotel Land	$202.7	$9.3	$18.7	$28.0	$41.8	$55.7	$68.1	$84.6	$101.2	$124.0	$165.9	$202.7
Property Taxes (Mill $s)												
Annual Collections (new development built to date)												
Residential	$3.6	$0.7	$1.1	$1.5	$1.8	$2.1	$2.5	$2.8	$3.1	$3.3	$3.5	$3.6
Hotel, Resort	$4.7	$0.3	$0.5	$0.8	$1.3	$1.7	$2.2	$2.5	$2.9	$3.4	$4.1	$4.7
Cumulative Collections	$50.3	$1.0	$2.6	$4.8	$7.9	$11.8	$16.4	$21.8	$27.8	$34.4	$42.0	$50.3

NOTES: Land "redeveloped" is land that changes from existing use as golf or open space to hotel and residential, under or around new structures. Value of new development is taken from est construction costs and review of land values for hotel and resort residential properties in KNS and Ko 'Olina. Land values are net, i.e., the increase in land value, over average current value for properties at Turtle Bay Resort, with redevelopment. The analysis does not deal with commercial space and other amenities in the resort. It is a conservative estimate of new property values taxes, not a complete one. The numbers shown are rounded, so totals may differ slightly from the sum of the individual numbers in the table

(1) For particular years, the value is for development coming on market that year; for absorption, it is the value of the entire project.

4.3.2 Government Costs and Net Benefit

New development may increase costs to government by increasing demand for services, by relocating demand to areas where service delivery is difficult, or by creating demand for new facilities. For a resort, many of these costs can be estimated using average cost analysis. This analysis identifies on a per-person basis the amount that government agencies actually spend. Some costs are treated as for services only to residents; other costs benefit both residents and visitors. The per-person cost is derived by dividing the cost of services by the resident or de facto (residents and visitors actually in-state or on-island on an average day) population in the year the services are provided. This approach estimates new resort-related costs in terms of the number of new residents and visitors served.

The average cost approach does not address the question of whether a new development demands significant new facilities, i.e., situations in which the marginal cost of serving additional residents or visitors is much greater than the average cost. Input from public service agencies and the analysis in the remainder of this chapter suggest that new facilities would not be warranted to serve the new populations associated with the Proposed Action., i.e., that the average cost analysis provides a reasonable estimate of actual costs associated with the Proposed Action.

Table 4-11 provides an average cost analysis for the State of Hawai'i, and Table 4-12 covers the average cost of services by the City and County of Honolulu, based on recent expenditure reports.

Table 4-11: Average Cost Analysis, State of Hawai'i

	FY 2009 spending ($1,000s)	Spending for residents or all?	Resident share	Visitor share
General expenditure, by function:				
General government	$597,210	All	$431.47	$431.47
Education	$3,362,707	Residents	$2,610.22	--
Public welfare	$2,119,481	Residents	$1,645.20	--
Health	$798,026	All	$576.56	$576.56
Highways	$442,421	All	$319.64	$319.64
Public safety	$435,414	All	$314.58	$314.58
Natural resources	$120,693	All	$87.20	$87.20
Culture and recreation	$110,404	All	$79.76	$79.76
Urban redevelopment, housing	179,819	Residents	$139.58	--
Economic development and assistance	$149,075	Residents	$115.72	--
Debt service	$401,722	All	$290.24	$290.24
Other and unallocable	$3,084	All	$2.23	$2.23
Total	$8,220,571	***Total Per Person***	$6,612	$2,102
		Adjusted to 2011	**$6,830**	**$2,171**

NOTES: Average cost is the cost of services delivered over a year's time, calculated per person, for resident or de facto population, depending on function. Some functions, such as highway maintenance, benefit both residents and visitors; for these the per-person share is estimated based on the de facto population. (The de facto population is the number of persons present on an average day, i.e., the average visitor census plus the number of residents actually in-state or, for the City and County of Honolulu, on the islands.) Spending is for the most recent year for which expenditures reported by function in Data Book (Table 9.19). The per-person spending totals are then adjusted in line with changes in the Consumer Price Index (3.29% from 2009 to 2011).

State of Hawaii Population, mid-2009:

Residents	1,288,285
De Facto	1,384,124

SOURCE: DBEDT, *State of Hawaii Data Book 2010; Quarterly Statistical and Economic Report, First Quarter, 2012*

Table 4-12: Average Cost Analysis, City and County of Honolulu

	FY 2009 spending ($1,000s)	Spending for Residents or All?	Resident share	Visitor share
General expenditure, by function:				
General government	$149,994	All	$151.91	$151.91
Public safety	$371,627	All	$376.37	$376.37
Highways	$16,781	All	$17.00	$17.00
Mass transit	$3,863	Residents	$4.04	$0.00
Miscellaneous	$218,130	All	$220.91	$220.91
Sanitation	$3,863	All	$3.91	$3.91
Health and human resources	$71,606	Residents	$74.93	$0.00
Culture and recreation	$73,087	All	$74.02	$74.02
Utilities and other enterprises	$27,758	All	$28.11	$28.11
Capital outlay	$330,581	Residents	$345.93	$0.00
Debt service	$185,164	All	$187.53	$187.53
Total	$1,452,454	***Total per person***	**$1,485**	**$1,060**

NOTES: Average cost calculated for resident or de facto population, depending on function. Some functions, such as road maintenance and public safety, benefit residents and visitors alike. Other functions benefit residents, and may benefit future visitors, but most recent year with expenditures reported by function in City's Consolidated Annual Financial Report.

City and County of Honolulu Population, mid-2010:

Residents	955,636
De Facto	987,406

SOURCES: DBEDT, State of Hawaii Data Book 2010; City and County of Honolulu, Consolidated Annual Financial Report for Fiscal Year 2011. Personal communication, Jan Nakamoto, State Data Center, July 2011.

Revenues would exceed project-related costs for both the state and county. Visitor-related and new resident-related costs to the State of Hawai'i associated with the Proposed Action are estimated as totaling about $28 million through build-out – but revenues for the state would be more than $190 million over that time. Revenues would continue to exceed costs by a large margin in later years.

Similarly, the City and County of Honolulu would see revenues greater than costs throughout the project development period and afterwards. At build-out, the net new revenues would exceed $45 million. The Proposed Action would continue to generate additional revenues from property taxes.

After 2025, the State would continue to collect an estimated $19.7 million (2011 dollars) in taxes annually due to visitor spending at the resort, while the City and County would collect about $8.3 million annually from property taxes. (City and County excise tax revenues are dedicated to the mass transit project and are to be eliminated when project costs are covered.)

Table 4-13: Summary of Government Revenues and Costs, Proposed Action

	Cumulative, through 2025	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
State of Hawai'i													
Revenues (Mill. $s)	$193.9	$13.6	$9.6	$9.9	$12.0	$13.7	$15.2	$20.4	$18.0	$19.4	$21.0	$21.4	$19.7
Average cost, Visitors $2,171													
Average Census, Visitors staying at Resort	12,729	-	221	386	553	729	921	1,102	1,326	1,534	1,753	1,997	2,206
Visitor-Related Costs (Mill. $s)	$27.6	$0.0	$0.5	$0.8	$1.2	$1.6	$2.0	$2.4	$2.9	$3.3	$3.8	$4.3	$4.8
Average cost, Residents $6,830													
Full-time Resort Residents at Resort	416	-	12	19	26	31	35	40	44	48	51	54	55
Resident-Related Costs (Mill. $s)	$2.8	$0.0	$0.1	$0.1	$0.2	$0.2	$0.2	$0.3	$0.3	$0.3	$0.4	$0.4	$0.4
Total Costs	$30.5	$0.0	$0.6	$1.0	$1.4	$1.8	$2.2	$2.7	$3.2	$3.7	$4.2	$4.7	$5.2
Net Revenues > Costs	$163.4	$13.6	$9.0	$8.9	$10.6	$11.9	$13.0	$17.7	$14.8	$15.8	$16.8	$16.7	$14.6
City and County of Honolulu													
Revenues (Mill. $s)	$59.7	$0.9	$1.5	$2.1	$2.9	$3.8	$4.6	$5.7	$6.2	$6.9	$7.6	$8.5	$9.1
Average cost, Visitors $1,060													
Average Census, Visitors staying at Resort	12,729	-	221	386	553	729	921	1,102	1,326	1,534	1,753	1,997	2,206
Visitor-Related Costs (Mill. $s)	$13.5	$0.0	$0.2	$0.4	$0.6	$0.8	$1.0	$1.2	$1.4	$1.6	$1.9	$2.1	$2.3
Average cost, Residents $1,485													
Full-time Resort Residents at Resort	416		12	19	26	31	35	40	44	48	51	54	55
Resident-Related Costs (Mill. $s)	$0.6	$0.0	$0.0	$0.0	$0.0	$0.0	$0.1	$0.1	$0.1	$0.1	$0.1	$0.1	$0.1
Total Costs	$14.1	$0.0	$0.3	$0.4	$0.6	$0.8	$1.0	$1.2	$1.5	$1.7	$1.9	$2.2	$2.4
Net Revenues > Costs	$45.6	$0.9	$1.2	$1.7	$2.2	$2.9	$3.6	$4.5	$4.7	$5.2	$5.7	$6.3	$6.6

NOTES: See Tables 4-8 to 4-12. The values shown are rounded, so totals may differ slightly from the sum of the individual values in the table.

4.4 Social Impacts

4.4.1 Housing

The Proposed Action would address the regional housing problem in four ways:

- Affordable housing will be built for members of the local community to buy or lease;
- With more stable jobs in the region, more residents will want to, and be able to, set up their own households nearby; and
- Resort residential housing will supply mostly luxury market-price homes and condominiums that may appeal to upper income residents as well as visitors.
- Resort residential housing at Turtle Bay Resort could attract some of the visitors who would otherwise stay in illegal transient vacation rental units. By reducing demand from that group, the Proposed Action would tend to discourage illegal rentals, and hence encourage some of the region's landlords to make housing available for residents.

While community housing (and, to a lesser extent, resort housing) would respond to resident housing demand, new workforce incomes will tend to increase demand. Additional wages for operations-related workers would help them establish families and households of their own. Household formation occurs over time, as workers gain families and savings. It can be affected by economic conditions such as housing prices and mortgage rates.

Table 4-14 estimates the first two potential housing effects for the KNS region, as of project absorption. The regional estimate includes both on-site workers and a share of off-site workers whose jobs are supported by visitor spending. Based on surveys of resort workers in West Hawai'i conducted in the 1980s, new incomes appear sufficient, over time, to support new household formation for 15% to 30% of the regional resort workforce.[35]

The table suggests that the regional effect of the Proposed Action is limited and could be positive: new workforce housing creation within the project could be greater than new household formation. Also, the new community housing is expected to be built from the beginning of the construction period, while housing demand due to new operations jobs would grow over time, as working families save for new homes.

[35] Research on population and housing effects of resort development has dealt mainly with the introduction of resorts in rural areas. The present case involves expansion, in an area where skilled resort workers are already present. There is no reason to expect resort expansion to draw a large body of workers from other areas, and to have large effects on housing when the new facilities open. (Also, the market study for the project calls for gradual development of facilities from year to year, not a one-time opening event.) The high estimates based on earlier research may consequently overestimate the extent to which resort expansion affects demand for housing.

The effect of increases in resort residential housing supply on regional housing demand and prices depends on many factors, and is not estimated here. It is expected to be positive, i.e., to increase local supply available to meet resident demand.

Table 4-14: Major Housing Effects Associated with Proposed Action, KNS Region

As of 2025	Proposed Action
New Operations-Related Jobs	
On-site	753
Other direct jobs, KNS region (1)	177
	930
Dependents supported by new KNS workforce (2)	965
Households supported by workforce	556
New household formation over time (3)	
Low estimate (15%)	83
High estimate (30%)	167
New community housing at TBR	160
Housing Impact (Demand for Units):	
Low Estimate	77
High Estimate	(7)

NOTES: On-site jobs estimated in Table 4-3; off-site jobs derived from Table 4-4.

(1) Other direct jobs estimated as 40% of direct and indirect workforce supported by off-resort spending.

(2) Dependency ratios from 2006-2010 Five-year estimates for KNS region:

Population in households	31,111
Workforce	15,275
Average household size	3.41

(3) New housing demand estimated as 15% to 30% of workforce households, based on studies of West Hawaii resorts.

SOURCE: American Community Survey. (www.census.gov)

4.4.2 Public Safety Services and Facilities

Future without Project (No Action Alternative)

For Fiscal Year 2011/2012, the City and County of Honolulu adopted budget allows for the following positions:

- Police: 1,484 patrol officers (about 1.56 per thousand persons in the island of O‘ahu); and
- Fire Protection: 1,018 fire operations positions (about 1.07 per thousand).

The ratio of positions to population provides a basis for estimating need for additional staffing as local populations rise.

Future with Proposed Action

The Proposed Action would account for regional population growth of about 3,157 persons (including both residents and visitors). To provide for that increase, some 4.9 police patrol officers and 3.4 fire operations positions could be needed (extrapolating from recent ratios).[36] That increase is within the growth that can reasonably be forecast given recent DPP expectations.

The population increase does not appear large enough to motivate construction of new public safety facilities.

Redevelopment of the resort would bring increased patrols by resort security. New roadways, park facilities and landscaping would remove large areas of brush from the TBR lands. New construction would be to current fire codes, reducing the risk of fire and increasing access to the entire resort. All of these factors would tend to reduce demand for public safety services due to new development.

4.4.3 Educational Facilities

Schools

The State Department of Education is expected to provide its own projections of demand for school services and facilities associated with the Proposed Action. The estimates in this section offer projections for the Proposed Action and the Development Alternatives based on Census data.

Future without Project (No Action Alternative)

The regional population is expected to grow slowly, so demand for schools would likely increase slightly over the next decades.

Proposed Action

The Proposed Action would affect several groups with school-age dependents. Some, but not all, would have an effect on schools:

[36] The cost of increased fire protection and police protection might be estimated from current expenditures for salaries, overhead and patrol equipment. It is not calculated here, because it has already been estimated using the average cost approach (in Table 4-13).

- **Resort Residents:** New resort housing generates very little or no new public school student enrollment. Most such resort housing is occupied by part-time occupants. Full-time resort housing occupants tend not to have school-age children. They are unlikely to enroll in public schools the few children who live in resort homes.

- **Community Housing Residents:** Community housing at Turtle Bay is intended to serve the needs of existing regional residents, not to attract a new population. Some of those residents would vacate existing housing that then could house other families. Many would move from multi-generational homes, where they would not be so quickly replaced. The total number of households in the region would accordingly increase due to the development of community housing, but the increase would likely be a small fraction of the number of new homes built. The increase in the number of new public school students would similarly be small.

- **Workers in New Resort Jobs:** As estimated in Tables 4-3 and 4-4, operations jobs and visitor spending could increase the regional resident population. Dependents of such new resident workers could attend local schools.

Table 4-15 provides estimates of total regional new enrollment, based on the analysis of regional housing growth over time in Table 4-14. BCH suggests that the likely effect could fall near the midpoint between the low and high estimates.

Table 4-15: Potential New Public School Enrollment, Proposed Action, to 2025

	Proposed Action
New Community Housing	160
New Households Formed by Workers	
Low Estimate	83
High Estimate	167
Potential New K-12 Enrollment	
Low Estimate	49
High Estimate	123

NOTES: Enrollment estimated based on the 2010 ratio of households to Department of Education K through 12 students on O'ahu (37.6 students per 100 households). The low enrollment estimate counts, as generating student enrollment, only 30% of the new community housing units plus the low estimate of new households formed by workers as a new source of students. The high enrollment estimate counts all of the new community housing plus workers' household formation as sources of new students, and assumes that no double counting is involved in combining the two. In both cases, Resort Residential housing is not treated as a source of DOE students. Readers should note that all or nearly all the occupants of community housing are expected to be KNS region residents: this estimate follows standard practice for school impact studies but not the full set of assumptions used in earlier tables.
SOURCES: US Census; Hawai'i State Department of Education enrollment data posted in 2010.

The effect estimated here is regional, not confined to the immediately adjacent schools. It would occur over many years, not immediately. An increase of about 100 students (as compared to the current regional DOE enrollment of 4,826) would amount to about 2% of total enrollment, an amount that would likely not raise problems of capacity for regional schools. Consequently, even the high estimate does not indicate a significant effect on DOE schools.

4.4.4 Preschools

The recent American Community Survey for 2006 to 2010 counted 561 children enrolled in preschool among KNS residents, or 6.14 per 100 households.

Future without Project (No Action Alternative)

The regional population is expected to grow slowly, so demand for preschools would likely increase slightly over the next decades. As noted earlier, demand for preschools has decreased in recent years due to reduced state funding and tight family budgets. Access to preschool education is a theme of the education initiatives supported by the current state administration, so state funding could increase.

Proposed Action

With more resort jobs available, some local workers can avoid long commutes. Some young parents may rejoin the labor force, seeking part- or full-time work near home if they can combine work with child-care that meets their needs and standards.

The same analysis used for school enrollments can be made for preschools. Table 4-16 shows the new preschool enrollment associated with the Proposed Action to be modest. This analysis does not address the question of whether new resort employees would seek child-care facilities near the resort; the UA specifies establishment of such a center on or near the resort.

Table 4-16: Potential New Preschool Enrollment, Proposed Action, to 2025

	Proposed Action
New Community Housing	160
New Households Formed by Workers	
Low Estimate	83
High Estimate	167
Potential New Preschool Enrollment	
Low Estimate	8
High Estimate	20

SOURCE: U.S. Census, American Community Survey, 2006 through 2010.

4.4.5 Health Care

Future without Project (No Action Alternative)

A study published in 2003 reviewed both long-term demand trends and changes in technology and operations affecting usage of hospital beds. While increased demand was expected by 2010 and 2025, the report was "cautiously optimistic" about Hawai'i's ability to meet the population's need for acute and long-term care beds.[37] From 2001 through 2007, O'ahu had approximately 2,513 civilian acute care hospital beds, which were occupied about 67% of the time.[38] That number of beds corresponds to 2.7 beds per thousand persons (in the de facto population). However, the recent closure of a two-hospital corporation serving Honolulu and Leeward O'ahu has aroused new concerns.[39]

The City and County of Honolulu Emergency Medical Service staff currently includes 283.75 positions, or about 0.30 per thousand persons on O'ahu.[40]

Proposed Action

The regional population increase associated with the Proposed Action by 2025 – 951 regional residents and 2,206 visitors – might justify the addition of nine more beds (at historic occupancy levels) to the island's acute care inventory. The population increase associated with the Proposed Action might create demand for an EMS staff position by 2025.[41]

4.4.6 Recreational Opportunities

Resort Recreation

Future without Project (No Action Alternative)

If no further development occurs at Turtle Bay, both golf courses might remain open as 18-hole courses. Tennis and equestrian activities could be unchanged.

Proposed Action

With the Proposed Action, a new clubhouse and a new equestrian center would be built. The Fazio golf course would be redeveloped as part of an integrated 27-hole facility. With the onsite visitor and resort resident population increased by about 195%, demand for golf is likely to

[37] Hawaii Health Information Corporation. "Forecasting Long-Term Care and Acute Care Bed Days in Hawaii: Projections to 2025." Posted at http://hawaii.gov/shpda/resources-publications/shtrend.pdf.
[38] DBEDT, *State of Hawai'i Data Book 2010,* Table 2.26.
[39] A bill to authorize revenue bonds (HB2345) to cover the debts of Hawaii Medical Center was considered in the 2012 State Legislature but was not passed by both chambers. Both island and Mainland corporations have expressed some interest in re-opening one or both of these hospitals.
[40] The estimate is based on the budget passed by the City Council for the current fiscal year.
[41] As noted before for public safety services, the cost of service to new populations due to the Proposed Action was estimated in the average cost analysis.

increase, and usage would increase. The increased demand could affect other courses as well. The Kahuku public course could attract a few more resort residents and visitors. With higher usage, and perhaps higher fees at Turtle Bay, golf tour operators serving the island as a whole would tend to send fewer golfers to Turtle Bay.

Beach and Ocean Activities

Future without Project (No Action Alternative)

With no further action, demand for beach and ocean access at the resort would likely not increase greatly. However, beach, ocean education and beach park maintenance would not be improved. An increase in usage of Kawela Bay is likely, since the site is gaining a reputation as a "secluded" beach where turtles can be seen. Access would not be improved, so most visitors would park along the edges of Kamehameha Highway and walk to the beach around the gate.

Proposed Action

The Proposed Action calls for establishment of parks at Kawela Bay, Turtle Bay, Kuilima Bay, and Kahuku Point, with a total of 12 public shoreline access points. These improvements would help residents and visitors spread along the coastline, rather than congregating near the hotel(s) because stalls at the new parks will reduce the need for beachgoers to park at the hotel. While beach usage would increase significantly with more hotel guests and resort residents, the easily accessible area for beachgoers would also increase. Higher and more consistent usage of these sites would occur. As City and County beach parks, the Kawela and Kuilima Point parks might be staffed by lifeguards, when City and County budgets permit. The resort's operators can be expected to help maintain these sites and the surrounding area, assuring they are kept clean and secure, and helping to lower risks of ocean safety incidents.[42]

Parks and other Recreation Sites

Future without Project (No Action Alternative)

In the future without project alternatives, resident and visitor usage of beach parks and other public recreation sites in the KNS region would probably increase slowly, in line with growth in the island resident and visitor populations. Park usage already creates problems for circulation, especially at times of high surf and surf competitions.

Proposed Action

With the development of new parks at Kawela Bay and the Kahuku Point coast open to the public, Turtle Bay Resort would draw off some of the visitor traffic now clogging the roadside near Laniākea Beach and North Shore surf sites. However, the reduction and how much it might affect the overall traffic and pedestrian congestion issue are difficult to forecast.

[42] No claim is made here that the resort would staff the parks with lifeguards or other full-time staff, only that the presence of beachgoers, surf school staff and/or resort staff, would lower the risk of accidents and harm in ocean sports and that resort operators would be interested in supplementing City and County maintenance activities.

New parks and pathways, along with improved access to beach areas, will make walking, jogging and bicycling more appealing for both resort visitors and their neighbors. Much as the new bikeway between Lāʻie and Kahuku encourages walking and sociability for the residents of those towns, so new trails and resources at the resort can encourage outdoor recreation and social interaction for resort-goers and residents, especially if new trails extend the length of the resort.

4.4.7 Geographic Extent of Effects

On-Site Effects

Construction work would bring a new workforce to the resort by 2015. If, as anticipated, new hotel and residential construction proceeds incrementally in response to market demand, construction would continue through 2024, with an average daytime on-site construction workforce of approximately 237 persons. (After 2024, some work to maintain and repair facilities would likely occur. The timing and extent of such work would depend on design and construction choices still to be made, and are not analyzed herein.)

New operations jobs would be created by 2015 and increase in numbers along with the increase in hotel and resort residential units. After build-out, the new on-site workforce would be about 753 workers, in addition to the current Turtle Bay workforce. The total operations workforce for the resort (including existing jobs) would be about 1,343 workers.

As reported earlier, some resort workers are concerned that new properties at Turtle Bay Resort would be non-union, and that expansion would result in increased workloads for both current and future staff. They ask whether the new hotel properties would be "full-service." Several factors bear on this concern:

- Because the Proposed Action consists of a resort expansion over several years, not a whole new resort created all at once (as the Waikoloa Hilton was), workforce growth would occur regularly over about ten years.

- Time share properties are sometimes thought to demand fewer staff per room for housekeeping and other departments. This may have been true of time share properties in areas such as Waikīkī in the past. Time shares at Turtle Bay will be staffed to support a relaxing resort experience for guests. Also, time shares would support an early marketing staff as well as staff on-site attending to guests.[43]

- Turtle Bay is an isolated resort, so the operator and on-site subcontractors provide a wide range of services and amenities for guests. With more hotel units and housing on-site, demand for resort services would increase.

[43] Time share marketing staff may be on-site, off-site or even out of state. Consequently, this employment effect is not included in the analysis.

- Successful expansion would depend on maintaining and enhancing the resort's reputation. New hotel properties would likely be more upscale than the existing hotel, and stand-alone resort residential units could be comparable to the Ocean Villas and other properties in Kapalua and Wailea on Maui. The operators would need to maintain or improve customer service throughout the resort.

- TBR is considering fair employment rules that could bind future operators to provide jobs with wage scales commensurate with similar jobs in the area.

In light of these factors, it seems likely that the expansion would bring significant job growth and moderately high staffing levels. In 2010, Maui Island had 0.89 accommodations jobs per visitor unit.[44] For the Proposed Action, the accommodations staffing for the new properties is estimated as 0.82 accommodations jobs per hotel unit.[45] This is higher than the current ratio for the Turtle Bay Hotel and Ocean Villas (about 0.70 to 0.75 accommodations jobs per unit).

Both time share and condominium hotel properties are likely to achieve high occupancy levels, much like those currently experienced at Turtle Bay. Time share properties are especially likely to have continuously high occupancy. Time share buyers have already invested in their units, and operators can rent out unsold weeks. With high occupancies would come consistent employment – more full-time jobs, fewer on-call and perhaps fewer part-time jobs.

The Proposed Action (and the Conservation Partner Alternative) surround the existing hotel and residential areas with new properties designed to attract today's visitors and second-home buyers. The Proposed Action increases the population on-site and hence demand for recreational resources. It would refurbish those resources and greatly improve access to beachfront areas. The number of golf holes would actually decrease from 36 to 27. New restaurants and other amenities may attract new day visitors, but this group is not being targeted to increase greatly.

The Gathering Place, combining retail, food and cultural amenities, could draw new day visitors to the resort. Some would spend a short time at the resort; others could combine a visit to the Gathering Place with a half- or full-day trip to the resort beaches. Day visitors' numbers and time on the property could climb during special events. The Gathering Place has been conceived as serving resort guests and residents of the region, not as a new draw attracting visitors from outside the KNS region.

Development of a park at Kawela Bay would affect usage of this resource. The bay is already well known to area residents. It is mentioned in Internet reviews as "secluded," so improved access would both allow more users to reach the beach easily and reduce its status as a mysterious find. However, the beauty of the site, calm waters, and wildlife would likely attract many more beachgoers and ocean users, so recreational use would increase significantly.

[44] Data available from series maintained on DLIR and DBEDT websites: (http://www.hiwi.org/gsipub/index.asp?docid=421; http://hawaii.gov/dbedt/info/visitor-stats/visitor-plant/2010VPI.pdf). Unit count includes visitor condominiums as well as hotels. Job count is for accommodations only, i.e., only part of the workforce at hotels.

[45] This estimate was based on occupancy and staffing at other hotels viewed as offering comparable experiences, not on the global comparison mentioned here. See Appendix B for further discussion.

Effects on the existing properties, owners and residents at Turtle Bay depend first on the fact of new development and secondly on its extent.

First of all, construction would likely bring some traffic, noise, and dust effects. These would be highly controlled. Contractors would be subject to State and City and County regulations limiting these effects. Moreover, the owners of the resort would presumably seek to minimize construction effects on existing properties in the resort, assuring operating income through the construction period. Also, the proposed construction schedule, involving incremental development over several years, points to a process that could restrict construction to delimited areas at any one time.

Construction is expected to last over some 11 years for the Proposed Action, and much longer for the Full Build-Out Alternative. Hotel construction and ongoing operations (at Turtle Bay Hotel and new hotels in the resort) can be successfully combined. This has been evident at the Maui Marriott at Ka‘anapali, where workers transformed the concrete and steel structure floor by floor over several years from a traditional hotel to a time share property. The hotel retained high occupancy levels despite construction impacts.

The Turtle Bay Hotel would become the central property of a larger destination resort. The owner would likely maintain and upgrade it as part of the process of attracting upscale clients to the resort as a whole. While new resort properties may be more exclusive in reputation and achieve higher returns, their success would depend on the entire resort. Again, new amenities and activities would serve Turtle Bay Hotel guests as well as new visitors.

The Kuilima Estates condominiums would be affected by additional factors. The overall effect is not entirely clear:

- With development of new hotels near the shoreline, persons in the condominium units facing the ocean would see more buildings and more resort landscaping. In the case of the Proposed Action, the change is likely to involve an increase of visible landscaping (as opposed to ironwoods and brush at the far side of the Fazio golf course) as much as an increase in visible structures. Current plans call for structures to be spread out within the areas designated for hotel development, and for extensive landscaping. (Kuilima Estates units now have golf course or interior views, not unobstructed ocean views.)

- The Fazio golf course is expected to be refurbished as a nine-hole course. The published concept plan for the Proposed Action shows the entire Fazio Course area as continuing to be a golf course (rather than part being a golf course, and part being used simply as open space). A less cluttered course with appropriate landscaping would result in an improved view amenity for many units with views on and over the golf course.

- Increased activity nearby and the convenience of shopping at the Gathering Place and Farmer’s Market would appeal to many residents, owners and renters.

Some property owners are concerned that the Proposed Action could result in lower values for some or many units in Kuilima Estates. BCH expects that this would not occur, so long as (a) the resort developer takes steps to ensure that visual effects of new development bring attention to the landscaping and open space in the resort and (b) the condominium owners maintain their properties and common areas. The resort owners’ enthusiasm for the “Tomorrow’s Ahupua‘a” concept and acceptance of the role of steward for the Turtle Bay lands suggest that the redevelopment would enhance, rather than lower, the value of private property within the bounds of the resort.

The resort’s neighbors, both in Kuilima Estates and outside the TBR lands, could benefit from improved access to beaches, paths and landscaping with redevelopment. Residents of homes along Kawela Bay would see increased recreational use of the bay, and hence a loss of the feeling of seclusion in their neighborhood.

Regional Effects

Regional effects follow largely from changes in employment at the resort, in off-site employment supported by visitor spending, and in the resort’s contribution to regional traffic congestion. The last issue is analyzed in a separate study for the SEIS. Employment-related issues must be considered in light of (a) the quantity and quality of new jobs, (b) whether the regional population is able to take new jobs on-site and nearby, and (c) implications for housing, public facilities and community life. The first two issues are discussed in this section, while the last is discussed in relation to particular facilities and communities.

Some 753 new operations jobs would be created at the resort as of build-out by 2025. Additional jobs in the region would be due to off-site visitor spending and to the indirect and induced effects of operations employment. The off-site total is estimated as approximately 443 new off-site jobs island-wide, with a regional total of 177 off-site jobs.

The new jobs would likely be in a range of industries supporting resort facilities and activities. Similar jobs at the resort have been described in interviews as the best available in the KNS area, since few employers offer salaries, benefits, and job security found at a unionized resort. Island-wide, the average annual wage for the combined industries is approximately $22,850[46]. Resort workers at Turtle Bay gain union wages and substantial benefits, and many receive tips, over and above their wages.

The region’s workforce can supply workers for both on- and off-site jobs. In addition to the 1,120 persons estimated as unemployed, the local high schools average more than 300 students in their senior class. The local school-leaving population would be far larger than the number of new jobs created annually. Many of these young adults would seek further education and jobs elsewhere. Still, an increase in jobs in the region would offer them the opportunity to stay near their homes – to choose among nearby jobs, long-distance commuting, and relocation to urban areas. In effect, by increasing local demand for workers, resort expansion would benefit the region as a whole.

[46] Wages from “hotel” and “food and beverage” jobs combined, based on 2009 data adjusted to 2011 dollars. Source is State Department of Labor and Industrial Relations, *Employment and Payrolls in Hawaii, 2009*.

The anticipated development schedule for the resort involves building and opening increments over time. This gradual approach would help to support local access to jobs. Sudden creation of a large number of jobs would be more likely to result in hires from outside the region and off-island.

Establishment of a farmers' market on-site and new demand for local foods in resort restaurants and kitchens would help support regional agriculture. It is not clear how large an effect is involved, and any growth in local production would also be due to landowners' efforts to support local farms and to the overall growth of the island market for fresh foods.

The new visitors and employees brought by the Proposed Action will contribute to regional traffic. See the Traffic Impact Assessment Report in the SEIS for further detail on the project's contribution to regional congestion and on traffic management strategies.

As indicated in Table 4-14, the contribution of the Proposed Action to the resident housing stock will be of immediate benefit, and will likely be larger than the new demand generated over time by households supported by project-related jobs.

Island and Statewide Effects

For many decades, Hawai'i leaders have seen the visitor industry as the engine of the local economy, and visitor industry expansion as occurring mainly on the Neighbor Islands. The latter trend has been inflected by resort development at Ko 'Olina. Large new time share projects have succeeded there in recent years. New development at Turtle Bay Resort would similarly offer visitors a resort experience on O'ahu but away from Waikīkī. Continued tourism development is anticipated in both state and county planning projections.

The fiscal analysis shows that all the development alternatives generate new cash flows for the state and county. New revenues would far exceed average cost effects. Consequently, major government spending on infrastructure or public facilities for the region could be justified as funded by regional growth.

4.5 Quality of Life and Community Cohesion

KNS stakeholders interviewed for this study saw their region positively, despite serious traffic congestion and limited job opportunities. None spoke of the region as needing major social changes or community organizing.

Factors affecting quality of life throughout the region include:

- Employment and incomes for residents, both at the resort and in the surrounding region;
- Housing for members of the community;

- Changes in traffic patterns and congestion;
- Increased child care opportunities, aimed to meet the needs of resort workers;
- Reduced commuting, allowing residents more time for their families and for community involvement;
- New support for regional activities and causes from the residents and operators of the resort; and
- Resources and amenities at the resort including access to beach parks and new retail outlets.

If new job growth in the region were concentrated in Lā'ie, in facilities linked to the Church of Jesus Christ of Latter-Day Saints, there would be limited employment opportunities for the rest of the region and little pressure to maintain or increase wages other than the existing union contracts in force at Turtle Bay. Due to incremental regional population growth, long-distance commuting to other parts of O'ahu would likely increase in the absence of new jobs at Turtle Bay Resort.

Trends associated with the Proposed Action affecting local community life include regional employment growth (and hence presumably less commuting), new housing being developed for local residents, an increase in resort and parks resources, along with increases in both visitors and part-time residents, and the spending in the local economy that would accompany them.

The Proposed Action's impacts on traffic congestion are assessed in a separate technical study, and not considered further here.

With new jobs and income associated with the Proposed Action spread throughout the KNS region by 2025, the project would have beneficial economic impacts and could help local communities to draw on more of the time and energy of residents for community activities than would be possible in the No Action future. The proposed new community housing area would increase workforce housing in the immediate area.[47] The impact on resident housing would be positive or absent: the Proposed Action includes much more resident housing than would likely be demanded as a result of job project-related job growth.

The new visitor and part-time resident populations based at the resort would contribute to the region's economy as well as its traffic. Development of the commercial areas and cultural attractions at the Gathering Place would tend to increase the amount of their time spent at the resort, not on the road.

Some full-time resort residents could become active members of the larger community. Their involvement would depend on many factors. Resort residents in other parts of Hawai'i include

[47] This statement follows from (a) assurances by TBR that the community housing would be priced to meet the needs of local workers, not just to meet government pricing rules, and (b) the fact that jobs at TBR have stood out in the region as offering stable employment and, in most cases, excellent benefits.

local benefactors for community institutions along with some notable opponents of new development. Others – probably the large majority of resort homeowners – have little to do with groups and issues outside the boundaries of their home resort. Their consumer behavior would help to support local retailers, encouraging them to stock more items for affluent residents, not just for day visitors.

TBR is developing a non-profit Turtle Bay Foundation to address needs of the community. Future operators and homeowners would, as participants in a master resort association, contribute to the foundation.

Turtle Bay already has an important role in the lives of members of the KNS regional community. With expansion, the resort would also offer a greater range of retail, service and cultural venues for regional residents. Plans for the Gathering Plans and Farmers' Market and for cultural activities are intended to address residents' needs, not just those of short-term visitors.

More resort guests would seek to use beach and ocean resources than now – but access to such resources would greatly improve. Also, many new visitors at Hawai‘i resorts make little use of ocean resources. Some stay at the resort pool; others walk the beach, but do not venture far into the ocean. Consequently, much of the increase in resort visitor numbers with the Proposed Action would be far smaller at the beaches and in the ocean than within the hotels.

4.6 Secondary and Cumulative Impacts of the Proposed Action

In an environmental impact statement, it is important to cover both direct and secondary or cumulative impacts. Secondary and cumulative impacts arise from the interaction of changes due to a project with the existing and expected context. The socio-economic analysis covers all of these effects by considering the existing resort along with proposed new development, and by identifying effects in the regional, island and state contexts.

A major question is whether new developments will have a cumulative impact that overshadows the impact of any one development. In the KNS region, the TBR and Envision Lā‘ie expansions concentrate new development in a fairly small area. They seem more complementary than likely to have reinforcing impacts. The Lā‘ie development would increase enrollments at BYUH and workforce housing for the Lā‘ie community. Again, the hotel in the Lā‘ie project would not be a resort but an amenity supporting BYUH and the PCC. It would have limited amenities and would likely serve a different market than the existing and proposed Turtle Bay Resort hotels.

These two projects should not have significant cumulative effects. They both would address residents' demand for housing – but the demand for housing at reasonable prices is great, and the two projects would encourage workers to live near their work sites, reducing highway commutes. When and if the Envision Lā‘ie project's housing is approved and built out, it could reduce local demand for workforce housing appreciably. However, that project is designed to serve the Lā‘ie community, not provide housing to attract others to the region or address the problems of Kahuku and the North Shore.

Lā‘ie and Kahuku are currently the largest communities in the KNS region. Even with much new housing in the two communities, they would remain distinct both geographically and economically. The development of one or two community housing increments at Turtle Bay Resort would not change the "country" appearance of the region.

The Proposed Action may have an important secondary impact on the regional housing supply. With new resort housing available, many vacationers will be drawn to units at the resort, rather than to illegal transient vacation rentals. Demand for the illegal units will be reduced, and some of these will become available for rental at rates that residents can afford.

5 Socio-Economic Effects of Development Alternatives

For this report, the effects of the Proposed Action and each development alternative are quantified both over the period through 2025, and over the period leading to full occupancy for each alternative. (Full occupancy dates range from 2022 for the Conservation Partner alternative, to 2053 for the Full Build-Out alternative.)

The analysis in this chapter follows the same organization as in the last chapter. To compare operations and fiscal effects of the Development Alternatives, calculations are shown for development through 2025 – i.e., Full Absorption for the Proposed Action and the Resort Residential Alternative, and shortly after Full Absorption for the Community Partner Alternative -- and for the actual year of Full Absorption.

Table 5-1 compares the construction schedules for the four alternatives to 2025. It shows that, while the Full-Build Out alternative will over time involve far more hotel and resort residential units than the Proposed Action, fewer units would be built by 2025.

Table 5-1: Construction Plans, Development Alternatives

	Action and Alternatives			
	Proposed Action	Full Build-out	Resort Residential	Conservation Partner
Through 2025				
Hotel units	625	592	0	440
Residential Units				
Resort Residential	590	468	454	252
Community Residential	160	90	46	48
Build-out year	*2024*	*2052*	*2024*	*2021*

NOTE: When completed, the Full Build-Out Alternative would include 2,500 hotel units, 910 resort residential units, and 90 community residential units. Development schedule estimated by TBR.

5.1 Employment and Wages

5.1.1 Construction Employment and Wages

In Table 5-2, construction spending, employment and wages are shown for the entire construction period for each of the development alternatives. The annual average on-site construction workforce provides a point of comparison among the alternatives. While the Full Build-Out Alternative, when finished, involves far more construction than the other alternatives, the Proposed Action brings the highest average annual construction workforce, simply because the larger project could only be built over a very long time.

Table 5-2: Construction-Related Employment and Wages, Proposed Action and Alternatives

	Proposed Action	Full Build-Out	Resort Residential	Conservation Partner
Construction Spending (million, 2011 $s)				
Infrastructure	$148.5	$215.1	$120.0	$87.8
Buildings	$324.4	$1,138.6	$4.5	$167.3
Single Family	$297.0	$16.2	$304.1	$115.1
Total	$769.9	$1,369.9	$428.5	$370.2
Direct Construction Workforce				
Infrastructure	564	636	456	334
Buildings	1,363	4,782	19	702
Single Family	1,336	73	1,368	518
Total	3,263	5,491	1,843	1,554
On-site Const. workers	2,611	4,393	1,474	1,243
Construction period (yrs.)	11	39	11	8
Average annual on-site FTE	237	113	134	155
Indirect and Induced Jobs	5,482	9,225	3,096	2,611
Wages (million, 2011 $s)				
Direct	$225.3	$379.1	$127.3	$107.3
Indirect and Induced	$247.7	$416.8	$267.2	$118.0
Total	$473.0	$795.9	$394.4	$225.3

NOTE: The values shown are rounded, so totals may differ slightly from the sum of the individual values in the table.
SOURCES: See Tables 4-2, 5-1.

5.1.2 Operations Employment and Wages

The next two tables compare the long-term workforces associated with the development alternatives. Both 2025 and full-occupancy estimates are provided. As of 2025, the Proposed Action would bring the largest operations workforce – but the Full Build-Out would involve far more workers, both on-site and off-, as its visitor numbers and spending grow. The Resort Residential Alternative stands out as generating only modest numbers of new jobs. Moreover, the Resort Residential Alternative would support very few off-site jobs through visitor spending.

Table 5-3: On-Site Employment and Wage Impacts, Proposed Action and Alternatives

	Proposed Action	Full Build-Out	Resort Residential	Conservation Partner
As of 2025				
Operations-Related Workers				
Direct Workers	753	530	48	469
Indirect + Induced Workers	785	559	43	494
Total	1,539	1,089	91	963
Wages (Million 2011 $s)				
Direct Workers	$23.8	$16.8	$1.6	$14.8
Indirect and Induced Workers	$35.5	$25.2	$1.9	$18.5
Total	$59.2	$42.1	$3.5	$33.3
After Full Absorption				
Estimated Absorption	*2025*	*2053*	*2025*	*2022*
Operations-Related Workers				
Direct Workers	753	2,240	48	469
Indirect + Induced Workers	785	2,359	43	494
Total	1,539	4,598	91	963
Wages (Million 2011 $s)				
Direct Workers	$23.8	$71.1	$1.6	$14.8
Indirect and Induced Workers	$35.5	$106.6	$1.9	$18.5
Total	$59.2	$177.6	$3.5	$33.3

NOTE: The values shown are rounded, so totals may differ slightly from the sum of the individual values in the table.
SOURCES: See Tables 4-3, 5-1.

Table 5-4: Off-Site Employment and Wage Impacts Associated with Visitor Spending, Proposed Action and Alternatives

	Off-site Employment from Visitor Spending			
	Proposed Action	Full Build-Out	Resort Residential	Conservation Partner
As of 2025				
Visitors Staying in New Units				
Total	2,206	2,202	483	1,477
Adjusted total, spending	1,862	1,793	242	1,376
Spending, Non-lodging				
Per person per day	$104.73	$89.92	$132.24	$119.01
Annual (Million $s)	$71.2	$49.7	$11.7	$59.8
Jobs from Visitor Spending				
Total (Direct and Indirect)	765	534	125	643
minus On-site (DII)	322	261	91	240
Off-site (DI)	443	273	34	402
Regional Share (40%)	177	109	14	161
	-			
Wages, Off-site (Million $s)	$18.4	$11.3	$1.4	$16.7
Regional Share (40%)	$7.4	$4.5	$0.6	$6.7
After Full Absorption	***2025***	***2053***	***2025***	***2022***
Visitors Staying in New Units				
Total	2,206	5,968	483	1,477
Adjusted total, spending	1,862	5,669	242	1,376
Spending, Non-lodging				
Per person per day	$104.73	$89.92	$132.24	$119.01
Annual (Million $s)	$71.2	$189.3	$11.7	$59.8
Jobs from Visitor Spending				
Total (Direct and Indirect)	765	2,035	125	643
minus On-site (DII)	322	1,103	91	240
Off-site (DI)	443	933	34	402
Regional Share (40%)	177	373	14	161
Wages, Off-site (Million $s)	$18.4	$38.7	$1.4	$16.7
Regional Share (40%)	$7.4	$15.5	$0.6	$6.7

NOTES: See Table 4-4 for approach. Non-lodging visitor spending estimated for the action and alternatives as follows:

	Action	*Full Build-out*	*Res.Res.*	*Cons. Part.*
Relation to average spending	99%	85%	125%	113%
Per-person per day, non-lodging spending	$104.73	$89.92	$132.24	$119.01

The regional share estimate was developed by Belt Collins Hawaii LLC on the basis of visitor spending patterns.
The values shown are rounded, so totals may differ slightly from the sum of the individual values in the table.

5.2 Population Growth and Distribution

5.2.1 Population at the Resort

By 2025, the development alternatives would result in quite distinct on-site populations. At that time, the Full Build-Out Alternative would support a population much like that of the Proposed Action: the difference between the two emerges as Full Build-Out construction continues until 2052, as shown in Table 5-5. The Resort Residential Alternative would bring the smallest new population. With this alternative, the existing resort's population would account for two-thirds of the people on-site. Finally, the Conservation Partner Alternative would bring a smaller on-site population than the Proposed Action. However, that alternative concentrates the population in the central section of the property, so the density would be similar in that area.

5.2.2 Population Effects throughout the KNS Region

Table 5-6 applies to the development alternatives the assumptions developed to estimate the regional population for the Proposed Action. Again, the Resort Residential Alternative stands out as generating smaller visitor and employee populations.

The Full Build-Out Alternative regional population would continue to grow with further development until after 2050. While the regional population associated with that alternative after build-out can be calculated, its share of the regional population cannot, since no regional projections extend so far into the future.

Table 5-5: New On-Site Population, Proposed Action and Alternatives

		New Daytime Population with			
	Existing Resort (No Action Alt.)	Proposed Action	Full Build-out	Resort Residential	Conservation Partner
As of 2025					
Hotel , Ocean Villa guests	638	1,139	1,291	-	957
Resort Residential (including Kuilima Estates)					
FT Residents	167	41	52	43	24
PT residents, visitors	146	516	334	362	151
Community Residential		479	269	138	144
Day Visitors	96	180	190	161	173
Operations workforce	439	561	530	34	350
Construction workforce	-	-	127	-	-
Subtotal	1,485	2,916	2,795	737	1,798
Total at Resort (Combined)	1,485	4,401	4,280	2,223	3,284
Existing share of Combined Total	100%	34%	35%	67%	45%
After Absorption					
Year		*2025*	*2053*	*2025*	*2022*
Hotel , Ocean Villa guests	638	1,139	5,370	-	957
Resort Residential					
FT Residents	167	41	94	43	24
PT residents, visitors	146	516	599	362	151
Community Residential		479	269	138	144
Day Visitors	96	180	323	161	173
Operations workforce	439	561	2,240	34	350
Construction workforce	-	-	-	-	-
Subtotal	1,485	2,916	8,894	737	1,798
Total at Resort (Combined)	1,485	4,401	10,380	2,223	3,284
Existing share of Combined Total	100%	34%	14%	67%	45%

NOTES: Weekday state holiday midday population estimated. Only construction workers involved in new construction (rather than renovations) are included. The values shown are rounded, so totals may differ slightly from the sum of the individual values in the table.
SOURCES: See Table 4-6.

Table 5-6: Regional Population Associated with Proposed Action and Development Alternatives, 2025

all figures are persons, year 2025	*Action and Alternatives* Proposed Action	Full Build-out	Resort Residential	Conservation Partner
Resident Population Groups (Islandwide)				
A. TBR Resort Recreation Residents	55	70	43	24
B. TBR Community Housing Residents	638	359	138	144
C. Direct Operations Workforce Households	1,613	1,135	102	1,004
Indirect and Induced Operations				
D. Workforce Households (islandwide)	896	1,196	92	1,058
E. Off-Site Workforce Households	505	584	74	862
Total (assuming unduplicated counts)	3,707	3,344	448	3,090
Potential New Regional Resident Population				
A. 100% of group	55	70	43	24
B. 30% of group	192	108	41	43
C. 20% of group	323	227	20	201
D. 20% of group	179	239	18	212
E. 40% of group	202	234	30	345
Total	951	877	152	824
Share of Projected Regional Pop. Increase	36.7%	33.9%	5.9%	31.8%
Regional New De Facto Population Change				
Regional Resident Population	951	877	152	824
New TBR Visitor and Part-time Population	2,206	2,202	483	1,477
Total	3,157	3,079	635	2,301

NOTES: The values shown are rounded, so totals may differ slightly from the sum of the individual values in the table. On completion (as of 2053), the Full Build-Out Alternative would involve a Potential New Regional Resident Population of 3,000. The Regional De Facto Population Change associated with that alternative would climb to 8,968.
SOURCES: See Tables 4-7, 5-4

5.3 Fiscal Effects

5.3.1 Revenues

Tables 5-7 through 5-9 estimate government revenues due to construction, sales and operations, and property values with development. They show significant revenue flows for both the State of Hawai‘i and the City and County of Honolulu with development.

5.3.2 Costs

The average cost analysis used in the last chapter can be applied for all the development alternatives. Table 5-10 shows the net revenue (i.e., amount of revenues in excess of costs). The ratio of revenues to costs by 2025 is positive for all development alternatives. As of that point, the net revenues for the City and County of Honolulu are largest with the Proposed Action. Over time, the additional development in the Full Build-Out Alternative would make the return from that alternative the highest for both levels of government.

Table 5-7: Government Revenues Associated with Construction, Proposed Action and Alternatives

All figures are Millions of 2011 $s	*Cumulative, through Build-out* Proposed Action	Full Build-out	Resort Residential	Conservation Partner
Construction cost (1)	$769.9	$1,369.9	$428.5	$370.2
Construction-related Wages (2)	$473.0	$795.9	$394.4	$225.3
Excise Taxes To State (3)				
On Construction	$31.2	$53.5	$17.4	$15.0
On Spending by Workforce (4)	$12.0	$20.2	$10.0	$5.7
Excise Taxes to City and County				
On Construction	$3.5	$5.9	$1.9	$1.7
On Spending by Workforce (4)	$1.3	$2.2	$1.1	$0.6
Income Taxes				
Corporate (5)	$1.3	$2.2	$0.7	$0.6
Personal (6)	$28.8	$48.5	$24.0	$13.7
Total Revenues from Construction Spending				
State of Hawaii	$73.3	$124.5	$52.1	$35.1
City and County of Honolulu	$4.8	$8.2	$3.0	$2.3

NOTE: The values shown are rounded, so totals may differ slightly from the sum of the individual values in the table.
SOURCES: See Table 4-8.

Table 5-8: Government Revenues Associated with Visitor Spending, Proposed Action and Alternatives

All figures are Millions of 2011 $s	Proposed Action	Cumulative Full Build-out	Cumulative Resort Residential	Cumulative Conservation Partner
Through 2025				
Conveyance Taxes	$5.1	$2.4	$9.7	$1.9
Taxes on Visitor Accommodations				
Transient Accommodations Tax (Hotel Condominiums and Visitors in Resort Residential Units)	$32.9	$18.1	$23.2	$26.3
Transient Occupancy Tax (Time Shares)	$16.3	$3.7	$0.0	$6.6
Taxes on Cash Flows from Visitor Spending				
Excise Taxes				
On Lodging (Visitors only)	$16.0	$8.8	$11.3	$12.8
On Other Visitor Spending	$17.7	$11.6	$6.0	$21.5
On On- and Off-Site Workers' Spending	$11.7	$7.3	$1.6	$11.9
Excise Tax Total	$45.5	$27.7	$19.0	$46.2
State of Hawai'i Share	*$40.9*	*$25.0*	*$17.1*	*$41.6*
City and County of Honolulu Share	*$4.5*	*$2.8*	*$1.9*	*$4.6*
Income Taxes				
On- and Off-Site Workers	$25.3	$15.9	$3.5	$41.8
State of Hawai'i Total	$120.6	$65.0	$56.1	$164.6
City and County of Honolulu Total	$4.5	$2.8	$1.1	$7.5
Through Full Absorption *Year:*	***2025***	***2053***	***2025***	***2022***
Conveyance Taxes	$5.1	$7.1	$9.7	$1.9
Taxes on Visitor Accommodations				
Transient Accommodations Tax (Hotel Condominiums and Visitors in Resort Residential Units)	$32.9	$193.3	$13.2	$17.3
Transient Occupancy Tax (Time Shares)	$16.3	$41.6	$0.0	$3.9
Taxes on Cash Flows from Visitor Spending				
Excise Taxes				
On Lodging (Visitors only)	$16.0	$94.0	$6.4	$8.4
On Other Visitor Spending	$17.7	$173.0	$3.4	$13.5
On On- and Off-Site Workers' Spending	$11.7	$121.8	$0.9	$7.4
Excise Tax Total	$45.5	$388.8	$10.7	$29.3
State of Hawai'i Share	*$40.9*	*$349.9*	*$9.7*	*$26.4*
City and County of Honolulu Share	*$4.5*	*$38.9*	*$1.1*	*$2.9*
Income Taxes				
On- and Off-Site Workers	$25.3	$263.2	$2.0	$16.1
State of Hawai'i Total	$120.6	$855.1	$34.5	$65.5
City and County of Honolulu Total	$4.5	$38.9	$1.1	$2.9

NOTES: All taxes estimated from current rates (excise at 4.5%; TAT at 9.25%; TOT at 7.25% of half of maintenance fee for period of occupancy; conveyance taxes at escalating rates depending on cost and whether buyer is a Hawai'i resident) and historic ratios between earnings or revenues and taxes. Excise tax on workers' income estimated for taxable disposable income. Property sale values and maintenance fees estimated by Belt Collins Hawaii based on information from TBR and review of comparable projects. The values shown are rounded, so totals may differ slightly from the sum of the individual values in the table.
SOURCES: See Table 4-9.

Table 5-9: Increased Property Tax Revenues for the City and County of Honolulu, Proposed Action and Alternatives

All $ figures are Millions of 2011 $s	Proposed Action	Cumulative Full Build-out	Cumulative Resort Residential	Cumulative Conservation Partner
Through 2025				
Land Redeveloped (acres)				
Cumulative	221	74	217	123
Value of Redevelopment (Mill $s)				
Residential Construction	$441.0	$146.8	$304.1	$115.1
Residential Land	$586.8	$136.7	$918.7	$281.5
Hotel Construction	$175.9	207.2		$162.8
Hotel/Resort Land	$202.7	$125.7	$0.0	$198.7
Cumulative Property Taxes				
Residential	$26.0	$7.6	$31.3	$12.7
Hotel, Resort	$24.3	$20.3	$0.0	$35.4
Total Collections	$50.3	$27.9	$31.3	$48.1
Through Full Absorption *Year:*	***2025***	***2053***	***2025***	***2023***
Land Redeveloped (acres)				
Cumulative	221	217	217	123
Value of Redevelopment (Mill $s)				
Residential Construction	$441.0	$291.5	$304.1	$115.1
Residential Land	$586.8	$291.0	$918.7	$281.5
Hotel Construction	$175.9	$863.3		162.75
Hotel/Resort Land	$202.7	$547.5	$0.0	$198.7
Cumulative Property Taxes				
Residential	$26.0	$51.4	$31.3	$8.5
Hotel, Resort	$24.3	$359.9	$0.0	$22.0
Total Collections	$50.3	$411.3	$31.3	$30.5

NOTES: Land development totals take into account new hotel and residential parcels. Commercial development, changes from golf course use to open space, and increased commercial land values are not considered. The values shown are rounded, so totals may differ slightly from the sum of the individual values in the table.
SOURCES: See Table 4-10.

Table 5-10: Revenue-Cost Summary, Proposed Action and Alternatives, through 2025

All $ figures are Millions of 2011 $s		Cumulative Proposed Action	Full Build-out	Resort Residential	Conservation Partner
Through 2025					
State of Hawai'i					
Revenues (Mill. $s)		$193.9	$108.3	$108.2	$199.6
Average cost, Visitors	$2,171				
Cumulative Census, Visitor-years at Resort		12,729	13,517	3,989	6,664
Visitor-Related Costs (Mill. $s)		$27.6	$29.3	$8.7	$14.5
Average cost, Residents	$6,830				
Full-time Resort Residents at Resort		416	557	372	210
Resident-Related Costs (Mill. $s)		$2.8	$3.8	$2.5	$1.4
Total Costs		$30.5	$33.1	$11.2	$15.9
Net Revenues > Costs		$163.4	$75.1	$97.0	$183.7
Revenue/Cost Ratio		6.4	3.3	9.7	12.6
City and County of Honolulu					
Revenues (Mill. $s)		$59.7	$69.6	$35.4	$35.7
Average cost, Visitors	$1,060				
Cumulative Census, Visitor-years at Resort		12,729	13,517	9,352	6,664
Visitor-Related Costs (Mill. $s)		$13.5	$14.3	$9.9	$7.1
Average cost, Residents	$1,485				
Full-time Resort Residents at Resort		416	557	372	210
Resident-Related Costs (Mill. $s)		$0.6	$0.8	$0.6	$0.3
Total Costs		$14.1	$15.2	$10.5	$7.4
Net Revenues > Costs		$45.6	$54.4	$24.9	$28.3
Revenue/Cost Ratio		4.2	4.6	3.4	4.8

NOTE: See Tables 4-12 and 4-13 for average cost analyses. Revenue calculations bring together information from Tables 5-7 through 5-9. The values shown are rounded, so totals may differ slightly from the sum of the individual values in the table.

5.4 Social Impacts

5.4.1 Housing

Housing impacts differ among the alternatives because these involve fewer community housing units than the Proposed Action, and because the alternatives vary in the number of workers (and hence workers' households) they support in the region. Both the Proposed Action and the Resort Residential Alternative involve a larger increase in housing supply than in demand. The Full

Build-Out Alternative might generate more demand than housing for residents (based on the high estimate in Table 5-11). The Conservation Partner Alternative would clearly involve more demand for resident housing than the supply of community housing provided.

When construction of the Full Build-Out Alternative is complete around 2053, demand for housing from operations-related workforce households is estimated as 234 to 469 additional units, resulting in a net excess of demand over the supply provided by the resort expansion of 144 to 379 housing units in the KNS region.

Table 5-11: Housing Impacts, Proposed Action and Alternatives

Based on development through 2025	*Action and Alternatives* Proposed Action	Full Build-out	Resort Residential	Conservation Partner
New Operations-Related Jobs				
On-site	753	530	48	469
Other direct jobs, KNS region (1)	177	109	14	161
	930	640	61	630
Dependents supported by new KNS workforce (2)	965	663	64	653
Households supported by workforce	556	382	37	377
New household formation over time (3)				
Low estimate (15%)	83	57	6	57
High estimate (30%)	167	115	11	113
New community housing at TBR	160	90	46	48
Housing Impact (Demand for Units):				
Low Estimate	77	33	40	(9)
High Estimate	(7)	(25)	35	(65)

NOTES: On-site jobs estimated in Table 4-3 and Table 5-3; off-site jobs derived from Table 4-4 and Table 5-4.
(1) Other direct jobs estimated as 40% of direct and indirect workforce supported by off-resort spending.
(2) Dependency ratios from 2006-2010 Five-year estimates for KNS region:
Population in households 31,111
Workforce 15,275
Average household size 3.41
(3) New housing demand estimated as 15% to 30% of workforce households.
SOURCE: American Community Survey. (www.census.gov)

5.4.2 Public Safety Services and Facilities

Following the ratios and projections used above, new public safety services demand associated with the Full Build-Out Alternative could come to about 4.8 police patrol positions and 3.3 fire control positions by 2025; the total public service demand would climb to 14.0 police positions and 9.6 fire positions at completion. The eventual new population with the Full Build-Out might

well justify acquisition of new equipment such as an additional fire truck. It might justify construction of additional space for public safety operations, if perhaps not a new facility.

The Proposed Action and the other development alternatives could justify modest increases in public safety personnel and equipment, but not new facility construction. The Resort Residential Alternative could, based on current staffing ratios, justify 1.0 additional police patrol positions and 0.7 fire control positions. The Conservation Partner Alternative could justify an additional 3.6 police positions and 2.5 fire positions.

The cost of new fire control and police services has already been estimated through the average cost analysis (in Table 5-10).

As noted for the Proposed Action, redevelopment of the resort would bring increased patrols by resort security. New roadways, park facilities and landscaping would remove large areas of brush from the TBR lands. New construction would be to current fire codes, reducing the risk of fire and increasing access to the entire resort. All of these factors would tend to reduce the effects of development on public safety services.

5.4.3 Educational Facilities

The high estimate of potential new school enrollment associated with the other development alternatives is lower than with the Proposed Action, because the Proposed Action includes a larger commitment to Community Housing. Table 5-12 shows that the development alternatives would generate less demand for spaces in the public schools than the Proposed Action as of 2025.

For the Full Build-Out Alternative, construction and increases in operations jobs would continue until about 2053. By that time, total potential regional project-related new school enrollment would be in the range from 98 to 210 students. That range is much larger than those in Table 5-12. Based on the high estimate, project-related enrollments could reach up to 4.4% of the 2011 total regional DOE enrollment. If that enrollment increase occurred on a regional level within a year or two, the DOE might need to take steps to assure that all students can be housed and taught effectively. However, the increase projected here would occur over forty years. In that time, other changes in standards, practices, and demography would intervene, so it is simply not clear whether the eventual project-related growth with the Full Build-Out Alternative (i.e., the growth anticipated under existing permits) would present a small challenge to the regional DOE schools or a large one.

Table 5-12: Potential New Public School Enrollment, Proposed Action and Development Alternatives, to 2025

	Action and Alternatives			
	Proposed Action	Full Build-out	Resort Residential	Conservation Partner
New Community Housing	160	90	46	48
New Households Formed by Workers				
Low Estimate	83	57	6	57
High Estimate	167	115	11	113
Potential New K-12 Enrollment				
Low Estimate	49	32	7	27
High Estimate	123	77	21	61

NOTES: See Table 4-15 for multipliers used to estimate school impacts, and Table 5-11 for housing estimates. See text for discussion of potential enrollment after completion of the Full Build-Out Alternative.

Based on current enrollment levels, demand for new preschool places in the region would be modest by 2025. (See Table 5-13.) By full absorption of the Full Build-Out Alternative, regional demand could climb to about 16 to 34 places.

With more resort employment and renewed state support, enrollments could climb. As noted earlier, these calculations are based on current demand for preschools in the KNS region, and could underestimate demand in more prosperous conditions.

Table 5-13: Potential New Preschool Enrollment, Proposed Action and Development Alternatives, to 2025

	Action and Alternatives			
	Proposed Action	Full Build-out	Resort Residential	Conservation Partner
New Community Housing	160	90	46	48
New Households Formed by Workers				
Low Estimate	83	57	6	57
High Estimate	167	115	11	113
Potential New Preschool Enrollment				
Low Estimate	8	5	1	4
High Estimate	20	13	4	10

NOTES: See Table 4-16 for multipliers used to estimate preschool impacts, and Table 5-11 for housing estimates. See text for discussion of potential enrollment after completion of the Full Build-Out Alternative.

5.4.4 Health Care

The new population associated with the Full Build-Out Alternative by 2025 could create demand for as many as 8.3 acute care beds and 0.9 Emergency Medical staff positions. The demand for

medical services and facilities would be smaller with the Resort Residential Alternative or the Conservation Partner Alternative than with the Proposed Action. After construction of the Full Build-Out Alternative finishes by 2053, demand for health care services for the new population at the resort could climb to 24.2 beds and 2.7 Emergency Medical staff positions.

The eventual demand associated with the Full Build-Out would be large in a region with limited health care facilities. It could make expansion of local health care facilities necessary. However, that demand would be realized over a period of many decades, so the impact of that demand cannot be clearly assessed at this time.

5.4.5 Recreational Opportunities

Under the Full Build-Out Alternative, much the same recreation facilities would exist as with the Proposed Action. Resort visitor demand for golf tee times would be even greater. The potential effects on other courses noted for the Proposed Action would also arise, and would probably be even greater.

In order to reposition the resort as an exclusive, upscale site for the Resort Residential Alternative or the Conservation Partner Alternative, the golf course operator could limit rounds on one course or both, and could offer preferential access to residents of the new resort homes. Consequently, access by hotel guests, nearby residents and golf tours would be limited and could become more expensive.

Since the Conservation Partner Alternative reduces golf at Turtle Bay to the Palmer Course alone, golf access would be even more limited than under the other alternative scenarios.

The Full Build-Out and Resort Residential Alternatives both include a beach club on Kuilima Bay. This would provide a separate venue for resort residents to enjoy beach and ocean activities. With the beach club serving part-time residents, the higher onsite population of the Full Build-Out Alternative might not lead to resource conflicts among residents, resort residents and visitors.

The Conservation Partner Alternative could increase access to Kawela Bay and would likely increase public knowledge of the area, while minimizing adjacent development. The resort and the Partner agency would need to anticipate a major increase in usage of the bay and its park.

As with the Proposed Action, the new park development under the various Development Alternatives could help visitors to spread out along the North Shore. However, the Full Build-Out Alternative includes a much larger on-site visitor population. In this case the beneficial effect of park development for the region could be offset by increased visitor numbers.

5.4.6 Geographic Extent of Effects

On-Site and Near the Resort

The development alternatives would bring new visitors, residents and on-site employees to the resort. The increase would be small in the case of the Resort Residential Alternative, since both occupancy and on-site employment are low with resort residential development. Occupancy levels for hotels with the Full Build-Out Alternative are expected to be somewhat lower than for the other scenarios, but on-site population and employment would still be much higher in this case, due to the size of the Full Build-Out Alternative development. Also, construction workers would be on-site until 2052, under the Full Build-Out scenario, adding to the resort daytime population.

The Conservation Partner Alternative might bring a larger number of day visitors than the Proposed Action and the other alternatives. The unique qualities of Kawela Bay and the coastline could be emphasized by the partner (and likely advertised), and access to shoreline resources would be improved, while few on-site visitors using the resources would compete with day visitors.

For the existing properties, the development alternatives could have distinct effects:

- The Full Build-Out Alternative would involve a much larger resort expansion than the Proposed Action. In order to achieve acceptable levels of occupancy, operators may have to accept lower price points. The resort would then appeal to a larger, but less exclusive, market. The amenities proposed for this alternative would have higher usage with more visitors on-site. Hotel developers and operators might choose to position the hotels at Kawela Bay and towards Kahuku Point as more upscale than the central properties, just as end units in a townhome complex tend to have greater appeal than ones in the middle of a line of units. Consequently, the central area of the resort, including the Turtle Bay Hotel and Kuilima Estates, could benefit less from redevelopment than peripheral sites. Under these circumstances, the risk that redevelopment would emphasize the age and relatively modest architecture of the Kuilima Estates units would be greater than with the Proposed Action. (In this case, the Kuilima Estates owners might invest in improvements to common areas to enhance their properties, and thereby maintain value.)

- With the Resort Residential Alternative, the resort's reputation would rest above all on new, luxurious homes near the ocean and the Palmer course. The existing Kuilima Estates condominiums would be more likely to be seen as no longer in keeping with the rest of the resort, and could suffer from the contrast. (As noted above, the condominium owners could invest to maintain their property values.) Also, improvements in the resort's landscaping and beach access could make these properties more appealing.

  As the only hotel, the Turtle Bay Hotel can be expected to continue to support high occupancies. This alternative would increase demand for existing restaurants and other amenities slightly, but the on-site population increase would be small.

- The Conservation Partner Alternative's effect on existing properties would be much like that of the Proposed Action. However, the Fazio course could be entirely closed, and the open space between the condominiums and the newly developed areas would narrow slightly. Whether these changes would affect the appeal and value of the condominiums would depend on design choices that have not been spelled out yet. Much as with the Resort Residential Alternative, the success of this alternative would depend on positioning new residential properties as luxurious and ocean-oriented. Again, the existing condominiums could suffer from the contrast.

While the Kuilima Estates condominiums might not enjoy increased value and reputation from resort development under the Resort Residential and Conservation Partner Alternatives, they would not lose or gain value simply by being near more expensive homes. No clear impact on their property values appears likely.

Regional Effects

Both the Full Build-Out Alternative and the Conservation Partner Alternative would support many new jobs in the region (approximately 640 and 627 jobs respectively by 2025). New job creation would continue under the Full Build-Out Alternative, reaching a total of about 2,613 regional jobs by 2053. While new job creation demand could be met locally over time, the resort's share of local employment would rise, reaching perhaps 25% of jobs in the region. As noted in the preceding sections, this alternative could eventually increase demand for schools, public safety and health services to a point that additional facilities might be needed. If the State and the City and County responded in a timely manner, the result could involve minimal effects for the region.

In contrast, the Resort Residential Alternative is expected to generate very few off-site jobs through visitor expenditures in the region. It would do little to lower unemployment and would offer few employment choices to local youth.

Table 5-6 shows the estimated new regional populations associated with the Proposed Action and the Development Alternatives.

Island and State Effects of the Development Alternatives

All the development alternatives would generate revenues for local government The Full Build-Out Alternative could eventually lead to demand for new public facilities in the region, i.e., to government costs beyond the average-cost figures discussed earlier. However, by the time the effects of this large alternative were felt, increased revenues associated with the resort would be very large, as estimated in Table 5-10 -- and likely would be more than enough to cover the additional costs of facility expansion, given prudent planning by government agencies.

5.4.7 Quality of Life and Community Cohesion

The three development alternatives could have somewhat different effects on the surrounding communities:

- **Full Build-Out Alternative**: The longer development period and larger visitor population anticipated with the Full Build-Out would have distinctive effects. If major construction stretches over decades, local contractors and construction workers could find nearly continuous work close to home. However, the larger visitor population would mean that some resort and natural resources – golf tee times and enjoyment of offshore waters – would be much less available to local residents over time. The larger visitor population would patronize local shops and restaurants and could contribute to congestion along the streets and shores of the region.

- **Resort Residential Alternative:** In this scenario, the new visitor population would be fairly small and affluent. Resource competition is less of an issue, unless new homeowners attempt to limit local residents' access to beach and marine resources. (BCH expects that the UA, policies of the TBR developer, and community vigilance would guarantee residents' access.) Much as with the Proposed Action, some resort residents could become active members of the regional community.

- **Conservation Partner Alternative:** This scenario depends on an unknown factor, a conservation partner willing and able to invest in the land in order to limit development to the center of the SEIS lands. That partner could affect access to and use of ocean and park resources in ways that cannot be foreseen. The partner could welcome residents, resort residents, and visitors or it could seek to keep the Kawela and Kahuku Point areas little disturbed. To date, no such partner has emerged, despite the urgings of the State government and local stakeholders.

The new visitors and employees brought by the development alternatives will contribute to regional traffic. See the Traffic Impact Assessment Report in the SEIS for further detail on the project's contribution to regional congestion and on traffic management strategies.

5.4.8 Secondary and Cumulative Impacts

When the effects of the development alternatives on regional population, housing and public services are seen in combination with potential effects of the Envision Lāʻie initiative, need for new public facilities appears much more likely. That project could have a large effect on the local resident population, justifying school expansion, before development at Turtle Bay would do so. If the Full Build-Out Alternative and all the housing proposed for Malaekahana were developed, regional demand for school, health, and public safety facilities would increase significantly. On the other hand, if the resort, BYUH and PCC provided new jobs, while the Malaekahana and Turtle Bay community residential areas housed the workers for all three job centers, the combined impact could be limited.

5.5 Comparisons of Likely Socio-Economic Effects of the Proposed Action and Alternatives

5.5.1 Comparison with the Impacts Discussed in the 1985 Kuilima Revised Final EIS

The development proposed in the Kuilima EIS and accepted when permits were issued was substantially larger than the Proposed Action. The Kuilima EIS dealt with a different social context than the current SEIS does. Resort development has also changed in emphasis and risk management. In this section, major changes are noted as broad trends.

Resort Development

In 1985, hotels and condominiums were viewed as separate facilities. In the current marketplace, resorts tend to offer visitors a range of ownership and rental options, from condominium ownership through fractional ownership to rental of overnight accommodations, and may do so in the same structure. Design of hotels as condominium or time-share properties reduces risk for the developer, since the sale of units or time shares can defray costs quickly, and for the operator, since owners of time shares and condos have a vested interest in using their units. Long-term occupancy is typically more secure than it is for stand-alone hotels. Contemporary hotel properties involve a mix of occupancy types, and are likely to have higher occupancy levels than stand-alone hotels.

In 1985, most hotel rooms were bedrooms with attached bathrooms and lanais, with a low percentage of larger suites. Nowadays, studio, one and two-bedroom units with kitchen facilities are common. Often the larger units can be occupied either as a single unit or as two separate rentals (two "keys").

The Kuilima EIS identified a complex mix of positive and adverse socio-economic impacts. The themes noted above help to specify how the effects of the Proposed Action and alternatives differ from the major socio-economic impacts noted in 1985. Table 5-14 compares indicators of the impacts of each scenario. It shows both continuity and change.

Table 5-14: Comparison of Development Impacts, Kuilima EIS, Proposed Action and Alternatives

		Kuilima EIS and UA	*Action and Alternatives -- in Comparison to the With-Project Future in the Kuilima EIS* Proposed Action	Full Build-Out *(2025)*	Full Build-Out *(2053)*	Resort Residential	Conservation Partner	No Action
New Resort Units	Units	3,410	1,215	1,060	3,410	454	692	-
	Keys (1)	Not listed	up to 1,590	NA	NA	NA	NA	-
Workforce / Community Residential Units		90 (2)	160	90	90	46	48	-
Employment	On-site Jobs	2,614	753	530	2,240	48	469	-
Change in the Regional Economy		Development of a tourism "base"	Increase in visitor economy	Increase in visitor economy	Major increase in visitor economy	Increase in visitor economy	Increase in visitor economy	-
Housing "pressures"		Regional problem exists, increased demand with project	Regional problem continues; project housing impact is likely positive	Regional problem continues; project housing impact is negative	Regional problem continues; project housing impact is negative	Regional problem continues; project housing impact is positive	Regional problem continues; project housing impact is negative	Regional problem continues
Increased Presence of Visitors	Visitors	4,783	2,206	2,202	5,968	483	1,477	-
Displacement of Residents	Persons	140	None	None	None	None	None	None
Displacement of Activities	Activities	UA commits resort to work for a Kawela Bay Marine Conservation Area	Resort would follow UA	Resort would follow UA	Resort would follow UA	Resort would follow UA	Resort would follow UA	None
New Recreational Opportunities		Parks, shoreline access	Parks, shoreline access	Parks, shoreline access	Parks, shoreline access (with many more visitors)	Parks, shoreline access	Parks, shoreline access	None

NOTES: NA = Not Available

(1) When a two- or three-bedroom unit is designed so its components can be rented separately, the various components are counted as "keys." Units that cannot be subdivided in this way are counted as single "keys." For this table, resort residential units are also counted as single "keys." TBR has committed to have no more than 1,000 keys for 625 hotel units in the Proposed Action. No similar analysis of hotel room counts has been made for Development Alternatives.

(2) The UA specifies that (a) at least 51% of resort units must be "full-service hotel" units and that (b) workforce housing must be developed, on-site or off-site. The number of workforce housing units must equal 10% of the resort non-hotel units. Workforce housing must be provided at rates affordable by families earning 80% of the County average median household income, under a program supervised by the City and County (now by DPP). The community housing proposed by TBR would at least meet, and probably go farther than, County rules to assure housing is available for local families.

On the one hand, the economic impact of changing the region's economy to a tourism base occurred long ago. On the other hand, housing remains tight and costly in the region. The Proposed Action and the Resort Residential Alternative would provide more new community housing units than resort-related workforce demand; the Full Build-Out Alternative and Community Partner Alternative would generate more demand than new community units.

Apart from the Full Build-Out Alternative, the Proposed Action and Development Alternatives would have smaller socio-economic impacts than those identified in the Kuilima EIS. The current Proposed Action and Development Alternatives no longer create the most obvious adverse impacts (dislocation, possible social consequences of economic transformation) because those impacts occurred some two decades ago.

Critics of the resort expansion have argued that the North Shore's appeal as a visitor destination has already brought far more visitors than were present in the 1980s, so any further resort growth would bring too many visitors. In part, this argument deals with traffic congestion. The traffic study for the SEIS speaks to this concern, separating the future effects of Turtle Bay Resort visitors from other island visitors and residents. In part, it deals with the prosperity and wellbeing of the region and its institutions. This criticism is overstated for several reasons:

- Many in the region view resort employment as valuable, and would welcome additional resort jobs for their children;
- Unemployment is slightly higher in the region than island-wide, and long-distance commuting is more common, so new jobs can help to address current traffic, commuting and quality of life problems;
- The Polynesian Cultural Center is planning to expand, and would presumably welcome more visitors in the region. Waimea Falls Park has barely survived as a viable destination with support from the Office of Hawai'ian Affairs. Once again, a larger regional visitor count could have welcome results for businesses in the area.
- Resort residents and visitors may well have different consumption patterns from day visitors staying in Waikīkī. Resort resident may be willing to spend more on clothes, furnishings, food and entertainment in the region than day visitors. Resort visitors may complement day visitors as customers for local retail outlets.
- Most significantly, recent Hawaii Tourism Authority surveys indicate that close to 75% of all Oahu visitors visit the North Shore independent of activities or development at Turtle Bay Resort. The addition of new resort amenities, legal transient accomodations and new transportation management operations could take traffic off Kamehameha Highway that would otherwise travel to and from and around the North Shore.

Of the various development alternatives, the Full Build-Out comes closest to bringing the future situation painted by the critics, since it would involve, as it builds out, many more visitors than the other alternatives, and a larger concentration of hotels. The Proposed Action and other alternatives combine smaller visitor populations with the development of beach parks. Hence

they would involve far less risk that visitors' presence would adversely affect the region's towns and shores.

5.5.2 Comparison with Regional Trends

Many stakeholders hope that the resort expansion will bring sustained prosperity to the KNS region but not erode the region's "country" atmosphere and public services. The Proposed Action supports those objectives.[48] Quantifiable socio-economic findings for the Proposed Action and alternatives are summarized in Table 5-15 in relation to the current situation or forecast regional trends.

Table 5-15 shows that, by 2025, the Proposed Action creates more jobs and housing than the other development alternatives. It would bring a resident population increase within the forecast growth for the KNS region. After 2025, the Full Build-out Alternative would bring more residents, visitors, jobs and housing demand. The public service demand associated with that alternative would come to be much greater than for the Proposed Action and other development alternatives, and could lead to need for new medical or public safety facilities.

[48] For estimates of the impacts of the resort expansion on regional traffic, see the SEIS appendix on traffic impacts.

Table 5-15: Development Impacts in Regional Context

		Proposed Action, 2025	Full Build-Out, 2025	Full Build- Out, 2053	Resort Residential, 2025	Conservation Partner, 2025	No Action
Employment							
Regional Jobs, 2009	6,203						
New Continuing Jobs at Resort		753	530	2,240	48	469	-
New Continuing Jobs in KNS Region		177	109	373	14	161	-
Total New Continuing Jobs		930	640	2,613	61	630	-
As share of 2009 regional jobs		**15%**	**10%**	**42%**	**1%**	**10%**	**0%**
As share of forecast regional job growth, 2010 to 2025	1,086	**86%**	**59%**	**NR**	**6%**	**58%**	**0%**
Wages (Million $s)							
Regional Wages, 2009	$116.3						
New Continuing Wages at Resort		$23.8	$16.8	$71.1	$1.6	$14.8	$0.0
New Continuing Wages in KNS Region		$7.4	$4.5	$15.5	$0.6	$6.7	$0.0
Total New Continuing Wages		$31.1	$21.4	$86.6	$2.2	$21.5	$0.0
As share of 2009 regional wages		**27%**	**18%**	**74%**	**2%**	**18%**	**0%**
Population							
Forecast Regional Population, 2025	34,969						
Forecast Resident Population increase, to 2025	1,576						
New Regional Residents due to Action or Alternative		951	877	3,000	152	824	-
As share of KNS Population, 2025		**3%**	**3%**	**9%**	**0%**	**2%**	**0%**
As share of forecast growth		**60%**	**56%**	**NR**	**10%**	**52%**	**0%**
Housing							
2010 Household size (popul. in hholds)	3.27						
Forecast Resident Population increase, to 2025	1,576						
New Households in Region (Forecast Regional Population Increase divided by 2010 Household Size	482						
Community Housing at Resort		160	90	90	46	48	0
As share of forecast household growth		**33%**	**19%**	**NR**	**10%**	**10%**	**0%**
Net Project-Related Regional Housing Supply							
Low Estimate		77	33	(144)	40	(9)	0
High Estimate		(7)	(25)	(379)	35	(65)	0
As share of forecast household growth							
Low Estimate		**16%**	**7%**	**NR**	**8%**	**-2%**	**0%**
High Estimate		**-1%**	**-5%**	**NR**	**7%**	**-13%**	**0%**

Continued on next page

Table 5-15 Cont.

		Proposed Action, 2025	Full Build-Out, 2025	Full Build- Out, 2053	Resort Residential, 2025	Conservation Partner, 2025	No Action
Public Schools							
2011 KNS region enrollment	4,826						
New Project-Related Enrollment, 2025							
Low Estimate		49	32	98	7	27	-
High Estimate		123	77	210	21	61	-
As share of 2011 Enrollment							
Low Estimate		**1%**	**1%**	**2%**	**0%**	**1%**	**0%**
High Estimate		**3%**	**2%**	**4%**	**0%**	**1%**	**0%**
Other Public Services							
Police: current number of officers/1,000 persons	1.56						
Fire: current number of officers/1,000 persons	1.07						
Emergency Medical Service: per 1,000	0.30						
Hospital Beds per 1,000 persons	2.70						
		2025	***2025***	***2053***	***2025***	***2025***	***2025***
New regional demand associated with Project (New residents and visitors)		3,157	3,079	8,968	635	2,301	-
Police		4.9	4.8	14.0	1.0	3.6	-
Fire		3.4	3.3	9.6	0.7	2.5	-
Emergency Medical Services		0.9	0.9	2.7	0.2	0.7	-
Hospital Beds		8.5	8.3	24.2	1.7	6.2	-

NOTES: See Tables 5-3, 5-4, 5-6, 5-11, 5-12, and Chapter 3 text on Public Services, for regional conditions and trends. Ratios comparing the 2053 absorption of the Full Build-Out Alternative to forecast 2025 trends are all marked NR, i.e., Not Relevant, since these impacts refer to a much longer time period. The values shown are rounded, so totals may differ slightly from the sum of the individual values in the table.

6 Summary of Benefits and Costs of the Proposed Action

The analysis in the last two chapters has covered a wide range of issues. This chapter reviews the beneficial and adverse effects of the Proposed Action under two main headings: regional social effects and fiscal effects.

6.1 Regional Social Life

The Ko‘olau Loa-North Shore region is famed for “country” atmosphere along with its beaches and surf spots. The Turtle Bay Resort currently fits into that atmosphere in many ways; its beaches and waters are enjoyed by residents as well as visitors. It provides amenities enjoyed by regional residents. It provides jobs on-site. With wages and benefits protected by union contracts, the resort establishes a high standard for local employment practices. Its guests contribute to visitor spending for goods and services throughout the region.

The analysis in earlier chapters has identified several effects of the Proposed Action that would generally be considered beneficial:

- **Job-creation**:
  - Some 3,263 person-years of direct construction employment over 11 years (plus indirect and induced jobs throughout the island), with a total direct payroll exceeding $225 million;
  - An operations workforce estimated as including 753 direct jobs at the resort, with an annual payroll of about $23.8 million (plus indirect and induced jobs), continuing for many years; and
  - Approximately 177 new jobs within the region supported by visitor spending outside the resort, including retail, service and other jobs.

- **Development of new amenities** which could be used by residents and tend to increase visitors’ time at the resort (vs. on the North Shore roadways):
  - New beach parks with parking and shoreline access, greatly improving access to both open coastline and an enclosed bay;
  - An inland park area next to the wildlife preserve;
  - A Gathering Place combining performance space, stores and other uses;
  - An on-site Farmers’ Market;
  - A new golf clubhouse and a new equestrian center;
  - Landscaping and new development set back from the beachfront; roads and trails throughout the resort’s grounds; and
  - Road improvements including two new entries that will take vehicles off Kamehameha Highway earlier.

- **New housing for community residents,** responding to a long-recognized regional need.

- **Attraction of upscale visitors** who value the North Shore as a place to stay, not just to visit for a few hours.

- **Attraction of resort residents and homeowners, a few of whom would likely contribute their support to community causes.** (Elsewhere in Hawai‘i, such contributions can range for funds for local hospitals to fervent support of environmental groups.)

All of these can contribute to a prosperous regional community. With shorter commutes, more residents have time to spend with family and neighbors, and to participate in community life.

Drawbacks of new development may include increased traffic and more visitors in regional communities. The traffic impact assessment for the SEIS estimates both existing traffic congestion and the impact of new resort development. It identifies traffic management strategies to reduce the project’s contribution to this regional problem.

6.2 Fiscal Effects

Revenues for both the state and county would significantly exceed project-related costs with the Proposed Action. Table 6-1 shows the net revenues associated with the Proposed Action.

State revenues would continue to exceed costs by more than $14 million annually in later years. Net project-related revenues for the City and County would continue at a level over $6 million annually from 2025 onward.

Table 6-1: Revenue-Cost Summary, Proposed Action

	Cumulative, through 2025 *Million $ (2011)*
State Revenues	
Excise Tax	$84.1
Income Tax	$55.5
Transient Accommodations Tax	$32.9
Transient Occupancy Tax	$16.3
Conveyance Tax	$5.1
	$193.9
Costs for State	
For Visitors	$27.6
For New Residents	$2.8
	$30.5
Net Benefit (Revenues > Costs)	$163.4
Ratio of Benefits to Costs	6.4
City and County Revenues	
Excise Tax	$9.3
Real Property Tax	$50.3
	$59.7
Costs for City and County	
For Visitors	$13.5
For New Residents	$0.6
	$14.1
Net Benefit (Revenues > Costs)	$45.6
Ratio of Benefits to Costs	4.2

SOURCES: Tables 4-9 to 4-13.

As noted earlier, a new development can stimulate new spending by government agencies on public facilities. The new demand associated with the Proposed Action is not large enough to make such spending necessary, so the average cost approach provides a realistic estimate of the actual costs to government associated with the action.

7 Mitigations

7.1 Mitigations Proposed in Kuilima EIS and UA

Several conditions proposed in the Kuilima UA address socio-economic impacts.[49] These are summarized here, and the ways in which the Proposed Action addresses those conditions are discussed. The owners of the TBR accept the UA as running with the land, and hence would implement these conditions unless the UA is amended by City ordinance.

- UA Condition 3: Development shall "generally be based on" the schedule provided by the developer, although changed economic conditions or other circumstances could affect timing.

  Comment: The original schedule involved a timetable that ended before the present. The Proposed Action provides a new timetable responsive to current and anticipated market conditions. The actual timing of development could change, in response to changing economic conditions.

- UA Condition 3: A minimum of 51% of the 4,000 resort units (including the existing Turtle Bay hotel) shall be operated as full service hotel units.

  Comment: When "units" are counted, 65% of resort units in the Proposed Action (counting the Turtle Bay Hotel) are in hotels. When possible "keys" are counted, the share is 71%. No general definition of "full service hotel units" exists. However, DPP accepts traditional hotels, condominium hotels and time share properties as covered by this term.

  In the Kuilima EIS, hotels are discussed as employing far more workers than condominiums, so the designation of hotels in the Proposed Action as condominium or time share properties raises the question of whether this condition is still being met. It is the overall level of service provided, along with on-site resort amenities, that separate visitor properties with more or less operational employment, not the arrangements for leasing units. The operations employment figures estimated in this report are somewhat lower than those found in the Kuilima EIS. Largely that is because of productivity gains throughout the Hawai'i hotel industry in recent decades. On-site employment is expected to be comparable to that in other resorts in Hawai'i (and higher than that found in many hotels).

[49] The UA also includes conditions dealing with setbacks, other design conditions, roadways and historic/cultural sites, not discussed in this list. Comments in this section express the findings and views of BCH. They may report on commitments of the developer, but they do not constitute such commitments.

- UA Condition 4: Workforce housing shall be provided for sale to residents of the region; the number of workforce housing units shall equal 10% percent of the non-hotel dwelling units in Turtle Bay Resort (not including Kuilima Estates) .

  Comment: The Proposed Action exceeds this requirement by 171% with 160 vs. 59 units (i.e., 10% of 590 resort residential units), both by providing more units and by providing them at prices based on cost and local budgets, not County-wide income levels.

- UA Condition 5: To offset potential loss of access with development, the developer committed to developing parks once the resort expansion was under way. Parks would be dedicated to the City and County; parking and shoreline access would be provided.

  Comment: The Proposed Action and Development Alternatives continue to include these parks, and in the case of the Proposed Action, exceed them by 27.3% providing additional park space and public shoreline accesses for a total of 69.5 acres, 14.9 acres in addition to those required.

  (Some residents who live nearby have expressed a wish that the resort, not the City and County, would be responsible for the parks' maintenance and security. TBR is committed to meeting the terms of the UA. It would be in the interest of hotel operators and resort residents to support the City and County Parks Department in maintaining these parks.)

- UA Condition 7: All major roadways shall be open to the public. The developer shall minimize vehicle usage by means of:
  - Shuttle services to the airport, Waikīkī and PCC; and
  - Employee transportation services for points from Haleʻiwa to Kaʻaʻawa to the resort, provided at a reasonable cost.

  Comment: These transportation services will need to be developed based on the traffic studies for the Proposed Action and consultation with employees.

- UA Condition 11: Developer shall establish a child-care center for employees of the resort; a half acre of land shall be dedicated (in or near the resort) to North Shore Career Training for this purpose.

  Comment: Since the time of the Kuilima EIS, child-care facilities in the region have increased. Meanwhile, the regional population is aging, so the number of current and new resort employees who need child-care may have decreased. Extensive studies were made of the need of employees and others for services (e.g., day care for infants and for toddlers, preschool education, after school care, sick child care, or evening care to help parents on evening shifts).[50] These would need to be updated. North Shore Career Training's operational core, Resort Training Inc., is still in operation.

[50] These studies were conducted for the Kuilima/North Shore Strategy Planning Committee with the support of the Turtle Bay developer. That group has resumed meetings in recent years.

- UA Condition 12: Developer shall establish an employment training program and provide at least $500,000 for this purpose. (The amount cited will be provided in four years from the time that zoning is granted.)

  Comment: The payments identified under this condition were made by the developer to Resort Training Inc. soon after the UA was issued.[51] Since that time, Resort Training Inc. has continued operations. It is currently housed at the Turtle Bay Resort on a complimentary basis. Like other social service providers, it has been affected by budget cuts in recent years, but it is involved in training contracts with local employers. With resort expansion, the operators of new hotels will likely sponsor additional training.

- UA Condition 13: Developer shall work with the Kuilima/North Shore Strategy Planning Committee (KNSSPC) throughout the development of the resort.

  Comment: TBR is working with advisory groups, including KNSSPC, in order to design programs that address regional residents' needs and concerns; TBR has organized over 170 meetings, workshops and open houses with community groups and concerned citizens since 2010.

- UA Condition 14: Developer shall use its best efforts to promote the creation of a Marine Life Conservation District at Kawela Bay.

  Comment: TBR will work to meet this condition. Because it is not clear if such a district would affect local ocean recreation and fishing activities, TBR is recommending the creation of a regional Advisory Council to help determine the best course of action to address this requirement. The developer would seek to explore ways to establish a conservation regime at Kawela Bay in dialogue with others who have a stake in the use and preservation of the bay and its shores.

7.2 Mitigation for Possible New or Intensified Impacts of the Proposed Action

Mitigation measures for socio-economic impacts involve two distinct types of solution. To the extent that the problem is a technical one, and experts are recognized as the source of technical solutions, mitigation measures may consist of technical solutions applied when expert models find appropriate. Many traffic impacts are of this type, since transportation agencies and experts work out solutions based on their experience in dealing with congestion, and the agencies have extensive power to mandate which measures count as appropriate mitigation measures.

More often, socio-economic impacts combine material impacts, perceptions, and interactions. Addressing those impacts demands not just technical solutions but a process of identifying how problems and solutions are perceived, what stakeholders see as an appropriate response, and who can or should participate in mitigating the impact. Effective mitigation measures involve consultation and shared assessment of what works.

[51] Personal communication, Robert Comeau, Executive Director, Resort Training Inc. May 2012.

The vision of the future enunciated in the SEIS combines a holistic view of the land and people, stewardship, and a commitment to consultation with elders, neighbors, and other stakeholders. It identifies relationships and discussions that seem well suited to mitigation as an ongoing process of sustaining the land and people of the area. In other words, the SEIS identifies a promising framework for effective mitigation. Within that framework, three issues stand out as productive ones for further work to craft responses that suit the needs of local stakeholders.

1. **Parks and Sustaining Shorelines and Near-shore Resources.** The Proposed Action would increase the number of visitors in the region, and especially along the shores from Kawela Bay to Kahuku Point. The UA directs the developer to deal with this impact through park dedication. Since City and County park budgets are limited, this action may have the unintended consequence of deeding shore lands to the party least able to patrol, maintain and sustain them as a valued resource. The resort operator, homeowners and residents would likely be interested in assuring peace, quiet and clean enjoyment of the parks. (So, presumably, would their neighbors along the western shore of Kawela Bay.) They would need to establish working agreements with each other and the City and County Department of Parks and Recreation to share both enjoyment of and responsibility for the park areas.

2. **Child Care.** The UA directs the establishment of a child care center. What sort of center is needed, what age children need to be served, and how the center can collaborate with existing preschools and programs in the region remain to be seen. (These questions were examined in discussions with the Kuilima North Shore Strategy Planning group and research done for that group by Community Resources, Inc., but the research is now dated.) The developer, employees who may need support from a child-care center, and local providers can all contribute to developing an effective mitigation strategy, not just fulfilling a legal condition.

3. **Employee and Visitor Shuttle Operations.** The specifics of these operations will be developed based on studies of the traffic situation and input from employees.

7.3 Mitigation for Possible Socio-Economic Impacts of the Alternatives

Because the UA follows the land, it is binding for all development alternatives. The timing of actions such as parks development would need to be revised in the case of the Resort Residential Alternative, since hotel development triggers some UA conditions, and the Resort Residential Alternative involves no new hotels. The developer would comply with all applicable requirements.

The comments in the last section on mitigation measures and process hold true for all the alternatives, although each presents distinct challenges and opportunities. The Full Build-Out Alternative most closely resembles the development plans in the Kuilima EIS, so the Kuilima UA mitigations align well with it. The Proposed Action and other Development Alternatives involve much less new development, and hence may need somewhat different approaches to mitigation.

Full Build-Out Alternative

The Full Build-Out Alternative would involve many more visitors at the resort, and larger and taller structures set closer to the shoreline than with the Proposed Action. Hence potential competition for shore and ocean resources would be greater. It may be appropriate for the resort to take the lead in maintenance of the shoreline and protection of near-shore waters – but questions would likely emerge as to whether the resort is turning a public resource into a private one. Continuing consultation and shared responsibility with other stakeholders would be important.

As noted above, the Full Build-Out Alternative involves greater resident housing demand and a smaller community housing contribution than the Proposed Action, so housing impacts would be greater with this alternative.

Resort Residential Alternative

The Resort Residential Alternative involves smaller impacts based on the numbers of visitors and jobs. Its impacts would instead have more to do with differences between new homeowners, on the one hand, and existing nearby residents (in Kuilima Estates and West Kawela), the hotel, and beachgoers. New owners in the high-end residential development may seek to keep their spaces as exclusive as possible similar to existing Kawela homeowners. Since their homes would be nearer the parks than the hotel is, community associations may take a major role in park management and security. The UA is clear on the need to maintain public access on all major roadways and shoreline access routes. However, homeowners would want assurance that their own property is secure, so the possibility of conflict involving community associations and their security personnel may be an issue. Involvement of the residential community associations in a wider resort operating group may be necessary to minimize or avoid such conflict. TBR expects to form a master resort association in the course of development under this or other alternatives.

Conservation Partner Alternative

The Conservation Partner Alternative would involve social differences and exclusionary tendencies similar to those described for the Resort Residential Alternative. Mitigation measures in this case would depend greatly on the policies and involvement of an unknown party, the Conservation Partner. If that partner emphasizes resource preservation, it may constrain public beachgoers and recreation activities (including surf schools) while assuring nearby residents of peace and quiet. If that partner emphasizes public access to and regulation over shared resources, the result could be a significant increase in the number of visitors at the shoreline parks, and development of new educational programs rather than recreational businesses. A resort operating group or association would no longer be the venue for collaboration among stakeholders. Instead, the agreement between the partner and the resort would set the terms for future decision-making.

No Action Alternative

Compared to the future allowed by existing permits, the No Action Alternative involves few impacts and none of the mitigations specified in the UA. Access to shoreline resources would continue to be limited.

Over the long term, resources such as the Fazio course and shore areas could be degraded by erosion or use without sufficient funding to maintain them. Under the No Action Alternative, the resort, its residents and homeowners might not be able to invest in sustaining and redeveloping them. Hence, while continuing operation of the resort is anticipated, its long-term viability could be less certain than with the Proposed Action.

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Appendix A: Regional Geography

Table A-1: Communities, Districts and Places in the KNS Region

Communities in the Ko'olauloa/North Shore Region, from West to East

	Mokulē'ia	Waialua	Hale'iwa	Kawailoa	Waimea Bay	Pupukea-Sunset Beach	Kawela	Kuilima	Kahuku	Lā'ie	Hau'ula	Punalu'u	Kahana	Ka'a'awa
U.S. Census														
1980	99.01	99.02	100				101			102.02			102.01	
1990	99.01	99.02	100				101			102.02			102.01	
2000	99.01	99.02	100				101			102.02			102.01	
2010	99.04	99.02	100				101			102.02			102.01	
2010 names	Kaena Point	Haleiwa	Kawailoa				Waimea-Kahuku			Laie			Hauula - Kaaawa	
CDPs	Mokuleia	Waialua	Haleiwa			Pupukea	Kawela		Kahuku //	Laie //	Hauulu	Punaluu		Kaaawa
State of Hawaii														
	Waialua (North Shore) District								Ko'olauloa District					
City and County of Honolulu														
	North Shore SCP								Ko'olau Loa SCP					
	North Shore Neighborhood Board, No. 27								Ko'olauloa Neighborhood Board, No. 28					

NOTES: "CDP" = Census Designated Place(s). Parts of the region are not included in any CDP. This is indicated above in two ways. First, some communities are simply not included in CDPs, and are outside the named boxes. Second, CDP boundaries may not be contiguous. In the table. "//" indicates where CDP boundaries of nearby named communities are not contiguous.
CDP boundaries may have changed slightly over time, due to changes in mapping procedures.
The Waialua District is often termed the North Shore District. Other names reflect spelling conventions used by the agencies named in the table.
The State judicial districts are also designated Census Divisions.
2010 Census Tract names are supplied by State Data Center, DBEDT.

Appendix B: Economic, Demographic and Fiscal Notes

B.1 Approach

The quantitative analysis is intended to provide realistic estimates of major socio-economic effects of development at Turtle Bay Resort as compared to the No Action Alternative. It depends on models that have been developed and refined to account for the Hawai‘i economy. It incorporates assumptions about the visitor industry that have been chosen as mid-range or conservative.

Development of the resort as proposed by TBR would occur over many years; development according to alternative scenarios would take more time, in the case of the Full Build-Out Alternative, or less time, for the Conservation Partner Alternatives.

For this analysis, resort development is understood above all as attracting capital from outside the Hawai‘i regional economy. That capital comes first in the form of funds for construction and later as visitors’ expenditures in the course of their vacation experience.

B.1.1 Sources and Assumptions

The quantitative analysis begins with information and assumptions about:

- What will be built (supplied by TBR);
- When will it be built (by TBR);
- What will construction cost (by BCH, based on input from TBR and current cost data from other sources);
- What market will be served, and hence what are likely timeshare, condo and housing prices (by BCH, based on input from TBR, comparative data from other resorts, and analysis of data on resort unit sales and North Shore residential sales); and
- Activities and employment on-site (supplied by TBR and operators).

The account of effects on the Hawai‘i economy relies on sources and models that have been refined over many years in light of both local and global trends:

- The Hawai‘i Input-Output Model, providing estimates of the regional impact of the introduction of new capital to Hawai‘i. This has been developed and refined over decades. The current version incorporates 2007 economic census data as well as DBEDT findings and analysis. The key multipliers used from this model are for indirect and induced jobs associated with growth of jobs in various industries. The Type II multipliers

(i.e., the number of direct, indirect and induced jobs associated with each direct job) used are:

- Construction 2.68
- Retail 1.54
- Real Estate/leasing 2.68
- Accommodations 2.23
- Food service 1.55
- Other services 1.63

All Input-Output analyses deal with the circulation of capital in a regional economy. They may be expressed in terms of jobs, personal income and/or output. However, these are alternative measures of the same economic activity, not separate impacts. Consequently, the current analysis is rooted in estimates of job creation, for which wages can be forecast based on recent wages.

- Hawai‘i Long-Range Population and Economic Projections, also maintained by DBEDT and based on econometric models, providing forecasts of population, employment, visitor counts and visitor spending for the state and counties. DBEDT issued a revised series of projections in 2009 to account for the recession. (More recent Census data and DBEDT projections suggest that the trend analysis remains valid, although population growth from 2000 to 2010 was greater than had been anticipated.)

- The City and County of Honolulu Department of Planning and Permitting’s allocation of the 2009 DBEDT projections to community planning areas and sub-areas, taking into account local development policies, along with developers’ activity and plans.

- Data on employment and wages compiled by the State Department of Labor and Industrial Relations for the state and county economies. Average salaries per industry in 2009 were used, and adjusted to 2011 values in line with changes in the cost of living:

	2009	*2011*
Construction	$65,460	$69,046
Retail	$27,573	$29,084
Real Estate/leasing	$42,687	$45,026
Accommodations	$33,517	$35,354
Food service	$16,136	$17,020
Arts/Recreation	$24,179	$25,504
Other services	$29,713	$31,341
All covered employment	$42,838	$45,185

(“All covered employment” is an average for the entire island economy, and is used for wages in indirect and induced jobs.)

Construction jobs were estimated from the ratio of construction spending in the state economy to full-time construction jobs. The average ratio was 4.4 jobs per million dollars spent (based on data in the *State Data Book* from the 2007 Economic Census). Based on

industry trends, this was adjusted to cover the various types of construction in the Proposed Action and development alternatives as follows:

- Infrastructure/heavy construction: 3.8 jobs per million $
- Buildings 4.2 jobs per million $
- Single-family 4.5 jobs per million $

- Data on relations between income and taxes for both individuals and corporations, maintained by the State Department of Taxation. These ratios are cited in the notes to Tables 4-8 and 4-9.

- Real property tax rates for the year 2011-2012 in the City and County of Honolulu:
  - $3.50 per $1,000 in land or improved value for Residential property, and
  - $12.40 per $1,000 in land or improved value for Hotel and Resort property.

- Information about the visitor industry that has been compiled over many years by the Hawai‘i Visitors Bureau, the State Department of Business, Economic Development and Tourism, and the Hawai‘i Tourism Authority.

- Census data, from the American Community Survey conducted annually since 2005 and from the 2010 Census.

Additional specific assumptions used in this study are identified in the notes to particular tables.

A question of general concern for community stakeholders is whether timeshare and condominium hotel guests would support employment comparable to that of “full service hotels.” The data are complex:

- Spending by hotel visitors can be higher, on a per person per day basis, than spending by condominium or time share visitors[52];

- Much of the difference lies in spending on lodging, spending which is not trip related in the case of condominium and time share-interval owners, and hence not counted in survey-based visitor spending analyses;

- Time shares have higher visitor occupancy rates in two senses: units are occupied more days of the year, and the number of persons per unit is higher in time shares than in hotels;

- At Turtle Bay Resort, the operators would need to establish their new products in competition with other Hawai‘i resorts, notably the new time share operations at Ko

[52] Hospitality Advisors LLC. *County of Maui: Summary Analysis of Economic and Social Impacts on Maui County from Timeshare Conversions: Final Report.* Honolulu, HI, 2006; Hawai‘i Tourism Authority, *2010 Annual Visitor Research Report.* Honolulu, HI 2011, posted at http://hawaii.gov/dbedt/info/visitor-stats/visitor-research/. The Hospitality Advisors study is valuable for two key reasons. By focusing on Maui, it deals with non-urban resorts, more comparable to TBR than either O‘ahu or Statewide samples, in which Waikīkī data predominate. Next, the study separates out lodging and non-lodging expenditures.

‘Olina and Ka‘anapali. To do so, they would need to offer rewarding visitor experiences. The resort already includes a wide range of amenities, which would be refurbished and expanded.

Taking these factors into account, direct employment due to the resort expansion is estimated in two ways. On-site employment is estimated for new occupied units and new amenities based on their likely market position. (The overall positioning can be averaged as Deluxe for the Proposed Action; a mix of Standard and Deluxe for the Full Build-Out Alternative; and Luxury for the Conservation Partner Alternative and (for residential rentals) the Resort Residential Alternative.)[53] Off-site jobs supported by visitor expenditures are estimated from total estimated expenditure-supported jobs minus on-site jobs. The total expenditure figures take into account both resort market position and a discount factor for spending by time share and condominium visitors. (These assumptions are intended as conservative; with a rebound in market demand, spending and hence employment could be higher.)

Specific ratios for operations employment derived from unit construction and occupancy. Occupancy estimates were developed by Belt Collins Hawaii based on experience with Hawaii hotels and resorts:

Occupancy of new units		Persons per unit	Share of this product	Occupancy
Time Share		3.2	100%	90%
Condo	Owners	2.5	15%	30%
	Visitor pool	3.2	85%	50%
Resort Residential				
FT		2.5	5%	75%
PT	Owners	2.5	20%	30%
	Visitor pool	3.5	75%	50%

NOTES: “Occupancy” here refers to the share of the time that units are occupied by residents or visitors. Condos and resort residential units may be bought and held by owners for their own use, or made available for visitor rental as well as the owner’s use.

Community housing units were assumed to be 95% occupied (to allow for time when units are empty before residents move in). Occupied units were assumed to have an average household size of 4.2 persons per unit, based on 2010 Kahuku Census figures.

Taking occupancy into account, and sorting jobs according to whether they are highly sensitive to occupancy levels, the following rates were used for the Proposed Action:

[53] See Hawai‘i Tourism Authority, *2011 Visitor Plant Inventory.* Honolulu, HI, 2012, page 88, posted at http://hawaii.gov/dbedt/info/visitor-stats/visitor-plant/2011VPI.pdf , for the classification of properties by rack rate. For this analysis, comparisons with several existing resort properties, rather than a classification scheme, were used.

	Jobs per	
	Hotel unit	Resort Residential unit
o Hotel	0.82	0.00
o Food and Beverage	0.21	0.01
o Retail	0.07	0.02
o Recreation Services	0.01	0.00
o Landscaping	0.01	0.015
o Security	0.01	0.015
o Realty/Management	0.02	0.03

As noted above, job ratios were adjusted on the basis of occupancy and spending assumptions for the different development alternatives.

B.1.2 Limitations of the Analysis

All monetary values used in the analysis are expressed in constant 2011 dollars, with earlier figures adjusted to 2011 dollars in proportion to changes in the Consumer Price Index for Honolulu. Consequently, the analysis excludes inflation. Information about phasing (and hence the costs and revenues associated with the project over time) is indicated for the Proposed Action by reporting annual development estimates; for the development alternatives, only full-occupancy and 2025 cumulative data are shown.

The timetables for construction follow from current estimates by TBR. For the Proposed Action and all development alternatives, the timing of construction would depend on market conditions affecting both capital markets and resort investment by individuals. The timetables for phasing used in this analysis should be seen as a general guide to future activity, not as binding on the developer.

The fiscal analysis depends on the assumptions that rates of taxation would not change, and that historic ratios of income to tax payments in Hawai‘i, for individuals and corporations, provide a guide to future taxes.

Real property values for land are estimated from the value of existing resort and residential property in the North Shore area. For buildings, value is estimated from approximate construction cost. Since real property assessment is based on market value, not replacement value, this could well underestimate taxable value and tax revenues.

Estimates of construction cost and sales have been averaged for all properties in each subdivision (such as “Resort Residential 1” in a particular development scenario) or hotel. Similarly, when land is developed, the change in land value for real property analysis is estimated on the basis of the new land value minus an average value for land in the resort that could be redeveloped, not on the recent valuation of the specific site within the resort. The accounts of real property values focus on development of new residential and hotel properties, since these involve the major construction costs and increases in land value.

Some possible cash flows have not been studied. They could involve additional construction costs and jobs, or additional tax revenues. They are largely excluded for lack of information about monetary values or timing. (For example, the resort could sell parcels to sub-developers who in turn would build and sell resort residential units. Such land sales are not included in the analysis. Again, many new hotel and resort residential properties would likely be resold during the period of the analysis, but such resales are not considered here.)

Estimates of on-site vs. off-site direct employment depend on assumptions about visitor spending and behavior. Information compiled and analyzed by state agencies provides information about average patterns of behavior and spending. On-site employment can be estimated from information and conservative assumptions about resort facilities and operations. The extent of off-site employment is identified as a residual. The location of off-site direct employment is not specified, although much of that employment could be in the region surrounding the resort.

On-site population estimates may deal with persons staying overnight (and hence count many residents, but few workers) or present at some time during the day (counting most workers, some residents). Estimates of average or future daytime populations take into account the draw of new facilities and the ability of existing resources (e.g., beaches and golf courses) to accommodate new demand, but they are not based on extensive surveys and counts.

This analysis was conducted to assess effects for the Turtle Bay Resort Supplemental Environmental Impact Statement in April 2012, and is not intended as an attestation of value for any other purpose.

While the alternatives vary greatly in size, and hence in the extent of their effects on employment, wages and revenues, they all result in positive net cash flows for the State of Hawai‘i and the City and County of Honolulu.

I

APPENDIX I:

TRAFFIC IMPACT ANALYSIS REPORT

TRAFFIC IMPACT ANALYSIS REPORT

FOR THE PROPOSED

TURTLE BAY RESORT MASTER PLAN

KAHUKU, OAHU, HAWAII

PREPARED FOR

TURTLE BAY RESORT, LLC

PREPARED BY

TMC

THE TRAFFIC MANAGEMENT CONSULTANT

TRAFFIC IMPACT ANALYSIS REPORT

FOR THE PROPOSED

TURTLE BAY RESORT MASTER PLAN

KAHUKU, OAHU, HAWAII

PREPARED FORrE

TURTLE BAY RESORT, LLC

NOVEMBER, 2012

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THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.

SIGNATURE

04/30/2014
EXPIRATION DATE OF LICENSE

PREPARED BY

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FOR THE PROPOSED
TURTLE BAY RESORT MASTER PLAN
KAHUKU, OAHU, HAWAII

I. Introduction

A. Retrospective on the Master Planning of the Turtle Bay Resort

The master planning of the expansion of the Turtle Bay Resort has spanned almost 30 years. The traffic impacts of the Turtle Bay Resort Master Plan have been documented in several studies, which are summarized as follows.

The 1985 Traffic Impact Report for the Proposed Turtle Bay Resort, dated June, 1985, was prepared by Austin, Tsutsumi & Associates, Inc., and was incorporated into the Revised Environmental Impact Statement for the Kuilima Resort Expansion, dated October, 1985 (1985 EIS).

An update of the 1985 EIS traffic study entitled, Traffic Impact Analysis Report for the Proposed Kuilima Resort Expansion, was prepared by The Traffic Management Consultant (TMC), dated July 25, 1991. The 1991 traffic study focused on the access to the Resort.

A subsequent update entitled, the Traffic Impact Analysis Report Update for the Proposed Turtle Bay Resort Master Plan (TIAR Update) was prepared by The Traffic Management Consultant, dated September 9, 2005. The purpose of the TIAR Update was to support the design of the proposed Turtle Bay Resort access intersections along Kamehameha Highway.

TMC prepared Addendum No. 1 to the 2005 TIAR Update, dated February 14, 2006, to analyze the channelization design of the intersection of Kamehameha Highway and Kaihalulu Drive (formerly known as Alpha Road and West Kuilima Drive).

At the request of the City and County of Honolulu Department of Planning and Permitting (DPP), TMC prepared Addendum No. 2 of the 2005 TIAR Update, dated April

21, 2006, to determine if and when Kaihalulu Drive should be widened from two lanes to four lanes.

TMC prepared Addendum No. 3 to the 2005 TIAR Update, dated August 25, 2006, to analyze a second phase of improvements on Kamehameha Highway at the Kaihalulu Drive intersection, and at the Kuilima Drive intersection.

TMC prepared Addendum No. 4 to the 2005 TIAR Update, dated June 27, 2007, to determine the first phase of development, where access would be provided by the improved intersection of Kamehameha Highway and Kuilima Drive.

The 2009 Revised Traffic Impact Analysis Report Update for the Proposed Turtle Bay Resort Master Plan (Revised TIAR Update) was prepared by The Traffic Management Consultant, dated April 16, 2009. The Revised TIAR Update was formally accepted by the State of Hawaii Department of Transportation (DOT) in their letter dated July 9, 2009.

The traffic studies from 1985 through 2009 were all based upon the same overall density for the Turtle Bay Resort Master Plan, i.e., a total of 3,500 new hotel rooms and resort residential units, as approved by Zoning Ordinance. The current Turtle Bay Resort Master Plan is the first effort to significantly reduce the Resort density to 1,375 new hotel rooms (which excludes the existing Turtle Bay Hotel and Ocean Villas), resort residential units (which excludes the existing Kuilima Estates) and community housing units.

In the preparation for this current Traffic Impact Analysis Report, Turtle Bay Resort, LLC and its consultants worked extensively with the State of Hawaii Department of Transportation staff to establish the scope, study area, methodology, and guidelines of this study.

B. Purpose and Scope

The purpose of this traffic study is to analyze the traffic impacts that may result from the development of the Turtle Bay Resort Master Plan, hereinafter referred to as the "Proposed Action" and three (3) Alternatives. This report presents the findings and recommendations of the study. The scope of this study includes:

1. The description of the Proposed Action and the three (3) Alternatives.
2. Traffic count surveys during the weekday and weekend on Kamehameha Highway in the study area, which extends from Turtle Bay Resort west to Haleiwa and east to Kahaluu.
3. An evaluation of the traffic count survey data to establish existing traffic conditions within the study area.
4. The development of the trip generation characteristics for the Proposed Action and the three (3) Alternatives for Turtle Bay Resort.

5. Identification and analysis of the traffic impacts resulting from the full build out and occupancy of the Proposed Action and the three (3) Alternatives.

6. The development and evaluation of traffic improvements, which would mitigate the traffic impacts identified in this study

C. Methodologies

1. Capacity Analysis Methodology

The highway capacity analysis, performed for this study, is based upon procedures presented in the Highway Capacity Manual (HCM), published by the Transportation Research Board, 2010. HCM defines Level of Service (LOS) as "a quality measure describing operational conditions within a traffic stream". Several factors are considered in determining LOS, such as: speed, travel time, freedom to maneuver, traffic interruptions, driver comfort, and convenience. LOS's "A", "B", and "C" are considered satisfactory Levels of Service. LOS "D" is generally considered a "desirable minimum" operating level of service. LOS "E" is an undesirable condition, and LOS "F" is an unacceptable condition.

The Level of Service for a two-lane highway are defined by HCM for three (3) classes of highway. The Class II highway applies to most of Kamehameha Highway in the study area. Class II highways are defined as scenic or recreational routes, where speeds are moderate. The Levels of Service for a Class II two-lane highway are based upon the Percent Time-Spent-Following (PTSF). PTSF is a measure of restricted traffic flows or "platoon" flows, i.e., groups of vehicles following slow-moving vehicles, combined with limited opportunities for passing. Passing opportunities are affected by sight distance limitations and the volume of opposing traffic. As a result, the lower LOS on a Class II two-lane highway can result from low traffic flow relative to the high PTSF.

Intersection LOS is based primarily on average vehicle delay, which is expressed in terms of seconds per vehicle (sec/veh). The LOS delays at a signalized intersection are generally higher than at a stop-controlled intersection due to user expectations. A motorist will tolerate longer delays at signalized intersections, which are generally located on high volume facilities. Stop-controlled intersections are located on lower volume roadways where delay is less predictable, which reduces the driver's tolerance for delay. Table 1 summarizes the LOS criteria.

Table 1. Level of Service Criteria (HCM)

LOS	Two-Lane Highway (Class II)	Intersection Delay	
	PTSF (%)	Signalized Control (sec/veh)	Stop-Control (sec/veh)
A	≤ 35	≤ 10	≤ 10
B	> 35 – 50	> 10 – 20	> 10 – 15
C	> 50 – 65	> 20 – 35	> 15 – 25
D	> 65 – 80	> 35 – 55	> 25 – 35
E	> 80	> 55 – 80	> 35 – 50
F	(volume exceeds capacity)	> 80	> 50

"Volume-to-capacity" (v/c) ratio is another measure of effectiveness, which indicates the relative traffic demand to the roadway's capacity. HCM defines capacity as "the maximum number of vehicles that can pass a given point during a specified period under prevailing roadway, traffic flow, and traffic control conditions." A v/c ratio of 0.50 indicates that the traffic demand is utilizing 50 percent of the roadway's capacity. A v/c ratio in excess of 1.00 indicates that the traffic demand exceeds the capacity of the highway facility. The v/c ratio may be more indicative of the facility utilization in the case of Kamehameha Highway, since it compares traffic demand with the highway capacity. While LOS represents the traffic operations of the two-lane highway, where slow-moving vehicles can increase the platooning effect and affect operating speeds. Worksheets for the capacity analysis, performed throughout this report, are presented in the Appendix.

2. Traffic Simulation

SimTraffic is a traffic simulation software, which is developed by Trafficware Corporation. Traffic simulation is a stochastic process, which can analyze the interactions of individual vehicles on a roadway network over time. SimTraffic was used to analyze the vehicle queuing and the overall operations of the arterial network. The recommended left-turn storage lengths were based upon the 95th percentile queue lengths, which were determined by averaging ten (10) SimTraffic simulations during the peak hour of traffic. Where HCM analysis yielded unrealistic results, SimTraffic was used to verify the traffic analysis.

3. Traffic Signal Warrant Analysis

Traffic signal warrant analyses were prepared for the intersection of Kamehameha Highway and Kuilima Drive. The Manual on Uniform Traffic Control Devices (MUTCD) provides guidelines to determine the necessity for the installation of traffic signals. The MUTCD recommends that, a "traffic control signal should not be installed unless one or more of the factors" are met. However, the MUTCD goes on to state that the "satisfaction of a traffic signal warrant or engineering analysis and judgment must be used to develop alternative traffic controls to improve operations and safety." Warrants 1 and 2 were analyzed for the intersection of Kamehameha Highway and Kuilima Drive. The traffic signal warrant analysis worksheets are attached in the Appendix.

a. Warrant 1, Eight-Hour Vehicular Volume

Warrant 1 is separated into Conditions A and B. Condition A – Minimum Vehicular Volume is considered when the volume of intersecting traffic over an eight-hour period is the principal reason to consider traffic signalization. The minimum volumes on the major and minor streets are required to meet Condition A. Condition A can be met under special conditions at the 80 percent and 70 percent levels of the minimum volumes on the major and minor streets.

Condition B – Interruption of Continuous Traffic is considered when the traffic volume on the major street is so heavy that traffic on the minor street would suffer excessive delays or conflicts entering or crossing the major street. The minimum volumes on the major and minor streets are required to meet Condition B. Condition B also can be met under special conditions at the 80 percent and 70 percent levels of the minimum volumes on the major and minor streets.

b. Warrant 2, Four-Hour Vehicular Volume

Warrant 2 is considered when the volume of intersecting traffic over a four-hour period is the principal reason to consider traffic signalization. The minimum volumes on the major and minor streets are required to meet Warrant 2 for any 4 hours of an average day.

D. Existing Development

The Turtle Bay Resort is located on the northernmost point of the island of Oahu. The 842-acre Resort property extends from Kawela Bay to Marconi Road. Figure 1 depicts the vicinity map. The existing Turtle Bay Resort includes the Turtle Bay Hotel and Ocean Villas, totaling 500 rooms, two 18-hole golf courses, and the 368-dwelling unit Kuilima Estates. Existing access to the Resort is provided via Kuilima Drive. The existing land uses are depicted on Figure 2.

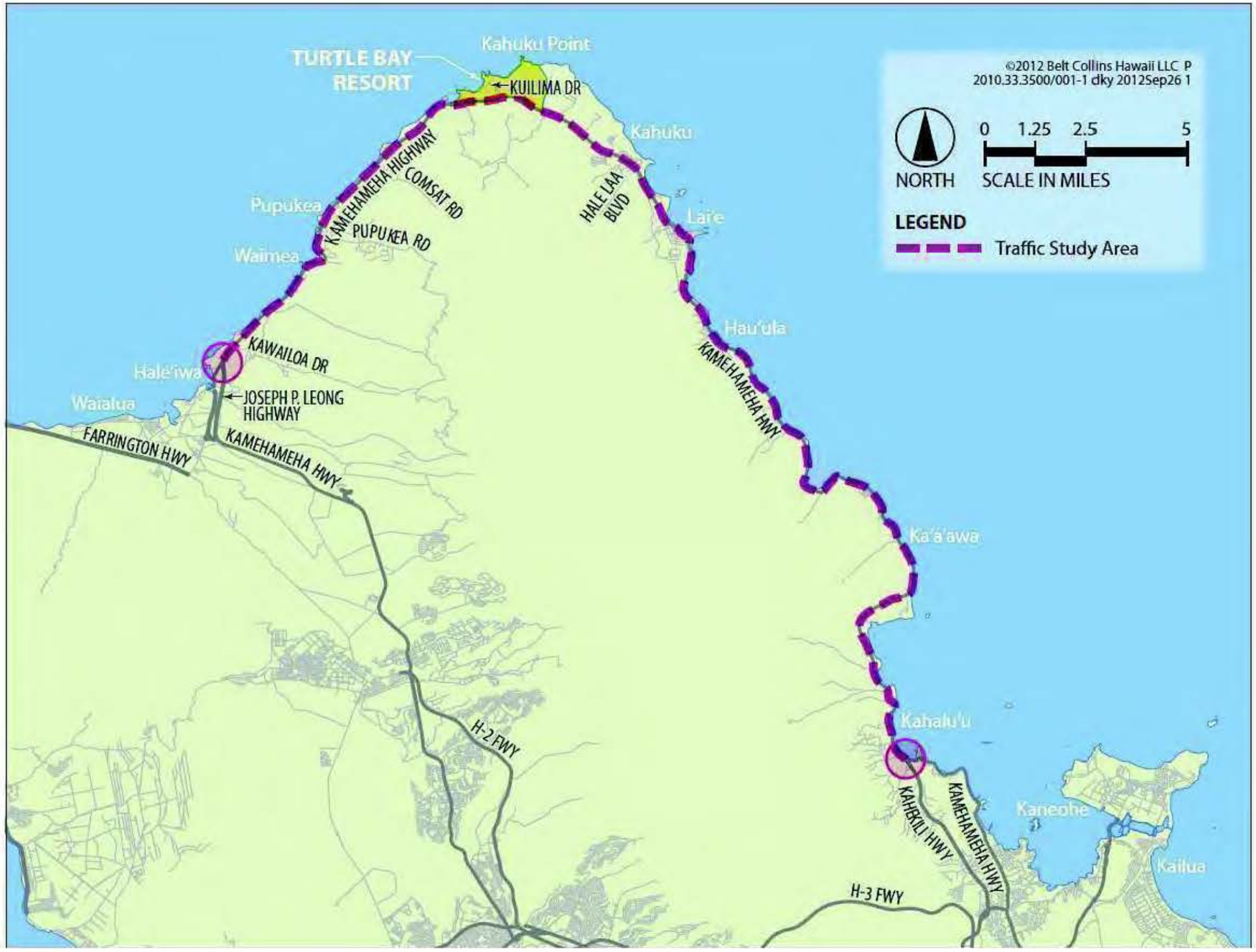


Figure 1. Study Area Map

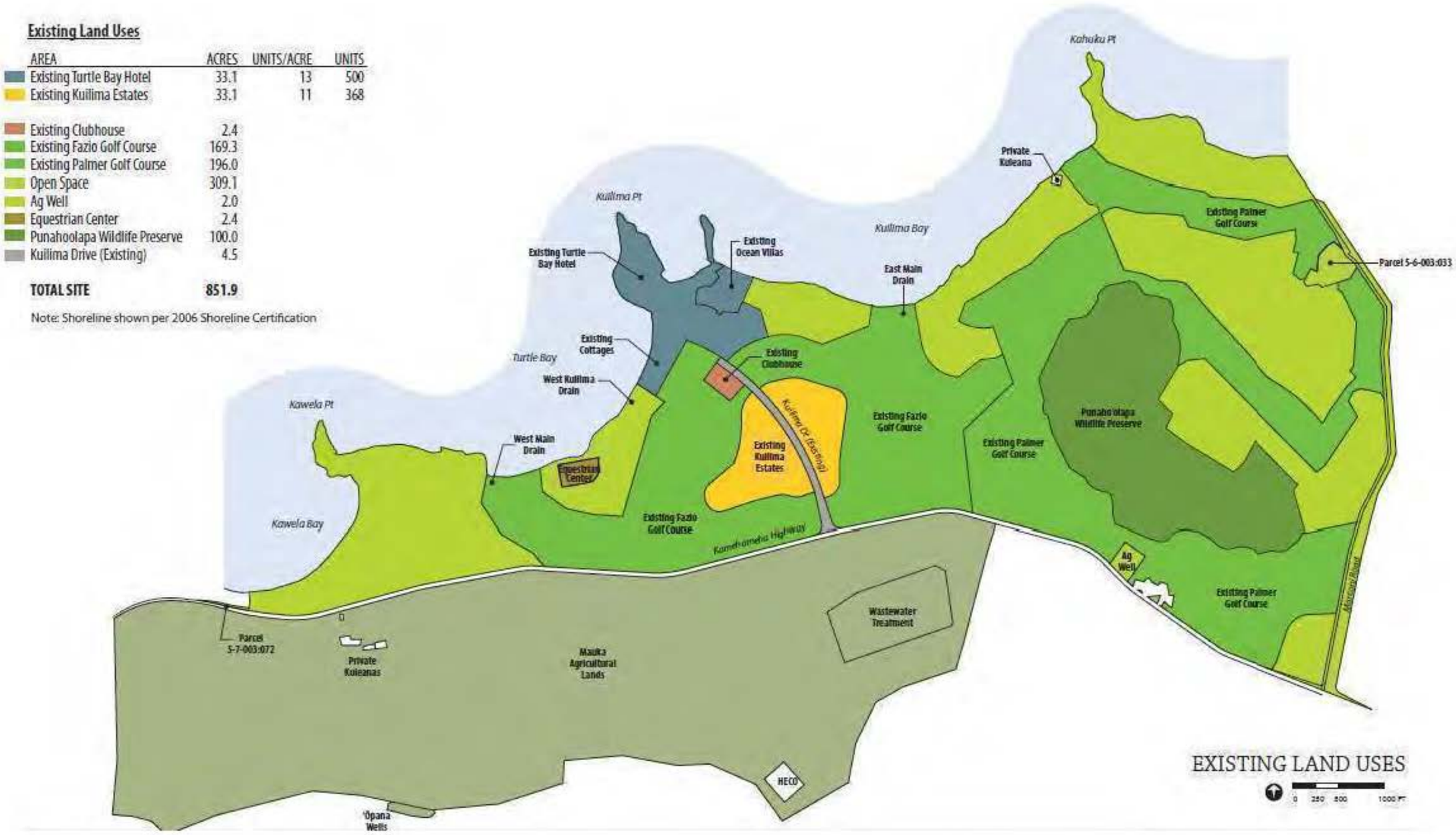


Figure 2. Existing Land Uses

Marconi Road abuts the east edge of Resort golf courses and provides access to properties (owned by others), which are located to the east of the Resort. Two service driveways, which are located on Kamehameha Highway between Kuilima Drive and Marconi Road, provide access to the Palmer Golf Course (G-2). One driveway provides access to the Palmer Golf Course maintenance facility for golf course employees only. The other driveway provides access for large vehicles, which service the golf courses. Both driveways will be maintained for service access under the Proposed Action and the three (3) Alternatives.

II. Proposed Action and Alternative Development Plans

This study analyzes the traffic impacts of the Proposed Action for the Turtle Bay Resort Master Plan at full build out and occupancy by the Year 2025. For the purpose of comparison, the traffic impacts of three (3) Alternatives also are analyzed within the same development time frame. The Proposed Action and the three (3) Alternatives are assumed to begin occupancy in the Year 2015, and reach full build out and occupancy in the Year 2025. Ultimately, market conditions will dictate the actual absorption rates of the various alternative densities. A shorter development timeframe will result in a higher proportion of Turtle Bay Resort traffic relative to the background growth in traffic. The annual increase in traffic may be lower while spreading out over a longer time frame. However, the cumulative traffic will be higher as the background growth in traffic continues in the future, which may require more extensive traffic mitigation measures.

A small shopping village (also known as the Gathering Place) is common to the Proposed Action and the three (3) Alternatives. The shopping village will include 40,000 square feet of gross leasable floor area (SFGLFA) for local retail shops and restaurants. The Proposed Action and the three (3) Alternatives also include a farmers market or similar commercial shopping area on Kaihalulu Drive near Kamehameha Highway.

Also common to the Proposed Action and the three (3) Alternatives is a variety of recreational uses, which may include shoreline parks, a bird sanctuary and wildlife preserve, and an equestrian center. Table 2 summarizes the Proposed Action and the three (3) Alternatives analyzed in this traffic impact analysis report (excludes the existing Turtle Bay Hotel, Ocean Villas, and Kuilima Estates).

Table 2. Land Use Summaries – Proposed Action and Alternatives

Land Use	Proposed Action	Full Build Out	Resort Residential	Conservation Partner
Hotel	625 Rooms	2,500 Rooms	0 Rooms	440 Rooms
Resort Residential	590 Units	910 Units	454 Units	252 Units
Community Housing	160 Units	90 Units	46 Units	48 Units
Shopping Village	40,000 SFGLFA	40,000 SFGLFA	40,000 SFGLFA	40,000 SFGLFA
Farmers Market	7.5 Acres	3.4 Acres	3.4 Acres	6.6 Acres
Recreational Uses	182 Acres	160 Acres	171 Acres	166 Acres

A. Proposed Access

Pursuant to the Proposed Action, access to the Resort is proposed at two existing intersections and one new intersection on Kamehameha Highway. The existing intersection of Kamehameha Highway and Kuilima Drive will continue to provide access to Turtle Bay Hotel, Ocean Villas, and Kuilima Estates. The Kuilima Estates are gated at the four entrances on Kuilima Drive. The Turtle Bay Hotel is currently open to the public. The existing intersection of Marconi Road and Kamehameha Highway will provide access to the east side of the Resort, as well as to the properties east of the Resort.

Pursuant to the Proposed Action, access to the west side of the Resort is proposed via a new roadway (formerly known as Alpha Road and West Kuilima Drive), hereinafter referred to as Kaihalulu Drive. Kaihalulu Drive will intersect Kamehameha Highway at a channelized Tee-intersection. The location of the Kaihalulu Drive intersection at Kamehameha Highway varies between the Proposed Action and the three (3) Alternatives. Kaihalulu Drive will continue east through the Resort, crossing Kuilima Drive. With the exception of the Conservation Partner Alternative, Kaihalulu Drive will continue to the east and intersect Marconi Road. Under the Conservation Partner Alternative, Kaihalulu Drive will terminate at the new Golf Clubhouse. Kaihalulu Drive will be open to the public at its intersection at Kamehameha Highway.

Under the State Land Use Commission Decision and Order, the district boundary reclassification for the Turtle Bay Resort lands is subject to a condition that the Resort fund the design and construction of improvements to Kamehameha Highway. These

improvements were described as intersection improvements at Kuilima Drive, Kaihalulu Drive, and Marconi Road. In the Unilateral Agreement (UA) and Declaration for Conditional Zoning recorded by the Turtle Bay Resort, Condition 7 states that the following traffic improvements are to be made throughout the development of the entire project, at the Resort's cost:

- Channelization of the intersection of Kaihalulu Drive (formerly West Kuilima Drive) and Kamehameha Highway.
- Construction of left-turn storage and deceleration lanes on Kamehameha Highway at Kuilima Drive and Kaihalulu Drive.
- Construction of left-turn storage and deceleration lanes on Kamehameha Highway at Marconi Road (formerly Kahuku Airport Road).
- Signalizing Kamehameha Highway at Marconi Road and Kaihalulu Drive.
- Providing a total of six bus turnouts along the portion of Kamehameha Highway fronting the Resort, to be located near each of the entrances to the Resort on both sides of the highway.

The UA requires approval of the proposed roadway improvements by the City and County of Honolulu Departments of Land Utilization and Transportation Services, and the State Department of Transportation. The City approvals for roadway improvements have since be consolidated under the Department of Planning and Permitting. The entitlement conditions also required the reservation of right-of-way along the Resort highway frontage for the future transportation plan.

Under the Proposed Action and the three (3) Alternatives, Park P-1 lot will be located on Kawela Bay on the west end of the Resort, and will be dedicated to the City and County of Honolulu. Park P-1 lot will have legal access on Kamehameha Highway, about one quarter of a mile west of the Kaihalulu Drive intersection.

The Resort accesses on Kamehameha Highway at Kaihalulu Drive, Kuilima Drive, and Marconi Road are common to the Proposed Action and the three (3) Alternatives, analyzed in this traffic impact analysis report, except in the Conservation Partner Alternative, where the concentration of development around the central core of the existing Turtle Bay Hotel and the limited development on the east side of the Resort will not require the extension of Kaihalulu Drive to Marconi Road. Furthermore, the intersection of Kaihalulu Drive and Kamehameha Highway would be located further east under the Conservative Partner Alternative.

B. Proposed Action

The Proposed Action represents a reduction of over sixty percent (60%) from the previously planned density, which was analyzed in the 1985 EIS through the 2009 Revised TIAR Update. One thousand three hundred and seventy-five (1,375) additional units are planned as compared to the 3,500 units, which is allowed under existing land

use approvals Four (4) new hotels totaling 625 rooms, 590 resort residential units, and 160 affordable community housing units are included in the Proposed Action. The Proposed Action concentrates the higher density development at the central core of the Resort near the existing Turtle Bay Hotel. Lower density resort-residential developments will be located to the east and west of the core of the Resort. Figure 3 depicts the Proposed Action development plan.

C. Full Build Out Alternative

The Full Build Out (FBO) Alternative represents maximization of the development permitted under current land use entitlements and approvals. Five new hotels, totaling 2,500 rooms, 910 new resort residential units, and 90 affordable community housing units are included under the FBO Alternative. The additional 3,500 units under the FBO Alternative is comparable to the density analyzed in the 1985 EIS through the 2009 Revised TIAR Update. The FBO Alternative development plan is depicted on Figure 4.

D. Resort Residential Alternative

The Resort Residential (RR) Alternative represents the development of an exclusive resort residential community, which excludes future hotel development in the Turtle Bay Resort. The Resort Residential Alternative represents the lowest density among the Proposed Action and the three (3) Alternatives with 454 new resort residential units and 46 affordable community housing units. Figure 5 depicts the Resort Residential Alternative development plan.

E. Conservation Partner Alternative

The Conservation Partner (CP) Alternative concentrates all future development in the core of the Resort, and maintains open space along the Resort's coastline at Kawela Bay and on the eastern half of the Resort where the existing golf courses are located. The Conservation Partner Alternative includes 440 new hotel rooms, 252 new resort residential units, and 48 affordable community housing units. The Conservation Partner Alternative development plan is depicted on Figure 6

III. Existing Conditions

A. Roadways

Kamehameha Highway is the primary arterial highway in the North Shore area and Windward Oahu. Kamehameha Highway is a two-way, two-lane highway with posted speeds, which range from 25 miles per hour in the build-up towns along the North Shore and Windward coast to 45 mph along isolated segments of the Highway. In the vicinity of Kuilima Drive, the Kamehameha Highway speed limit is posted at 35 mph. According to DOT traffic data collected in 2011, Kamehameha Hghway carried about 9,700 vehicles per day (vpd), total for both directions, west of Turtle Bay Resort. Further to the west, Kamehameha Highway carried about 16,000 vpd, north of the Joseph P. Leong Highway junction in Haleiwa. To the east, Kamehameha Highway carried approximately 19,000 vpd, north of the Kahekili Highway junction in Kahaluu.

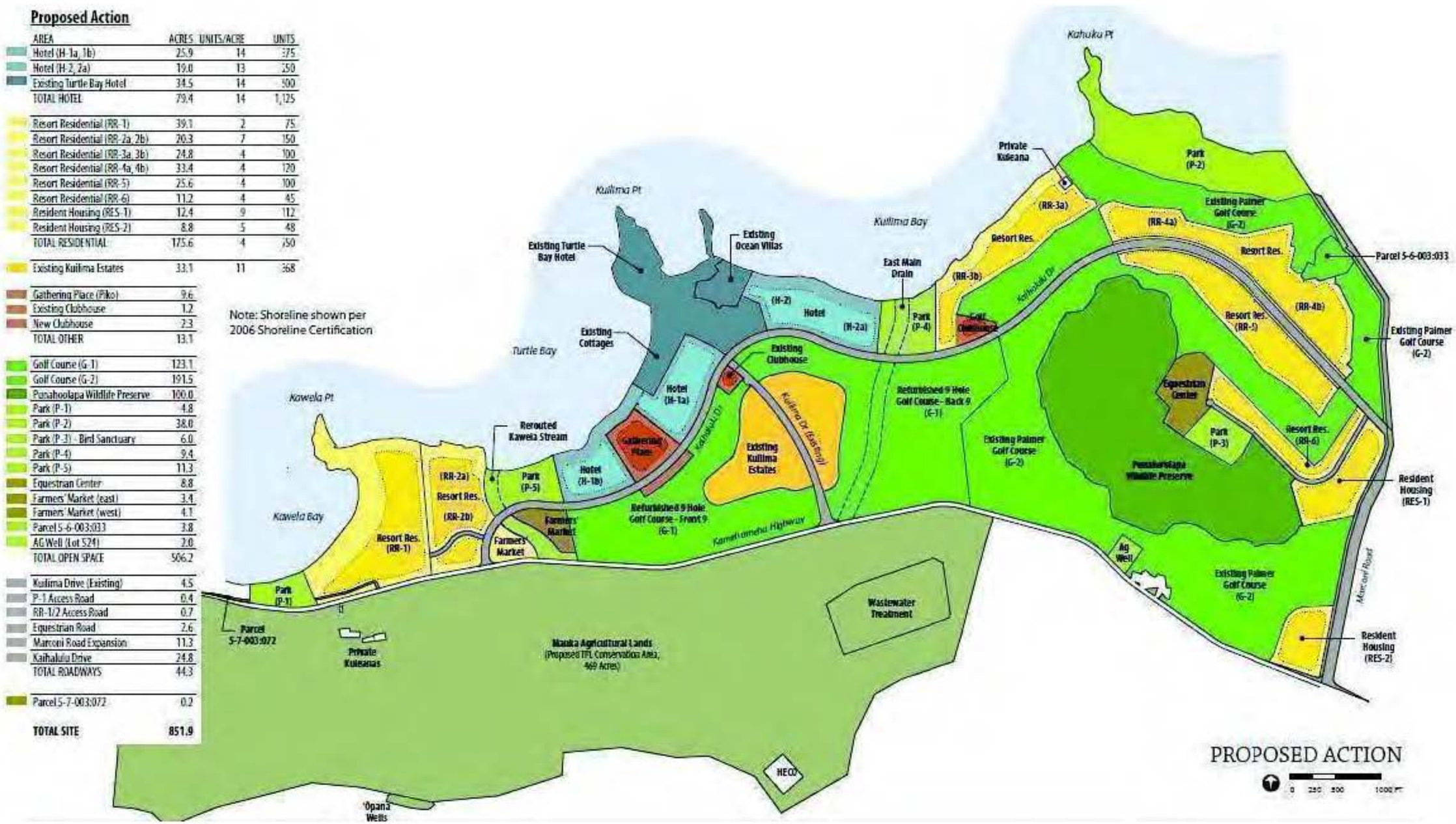


Figure 3. Turtle Bay Resort Master Plan – Proposed Action

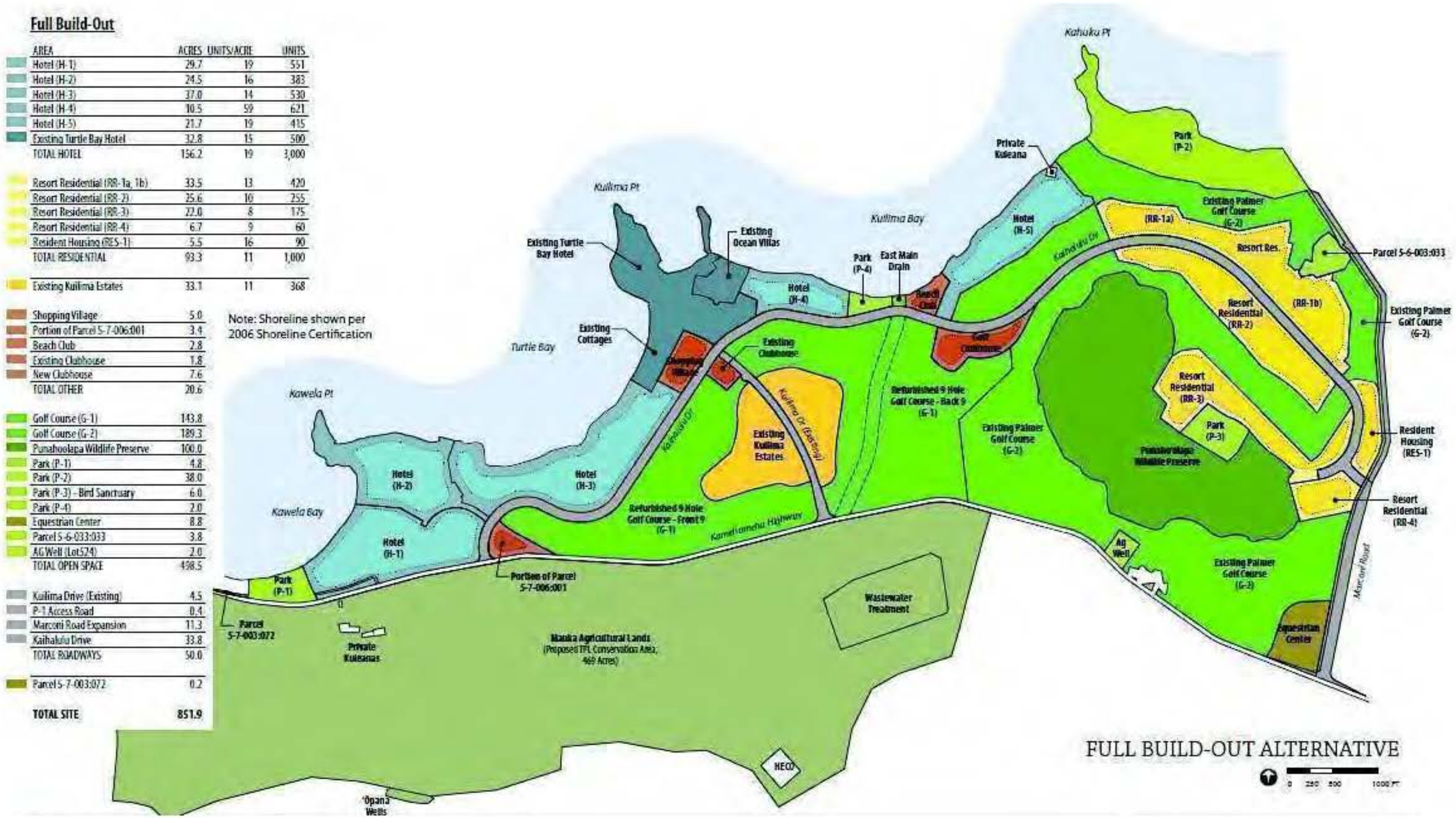


Figure 4. Turtle Bay Resort Master Plan – Full Build Out Alternative

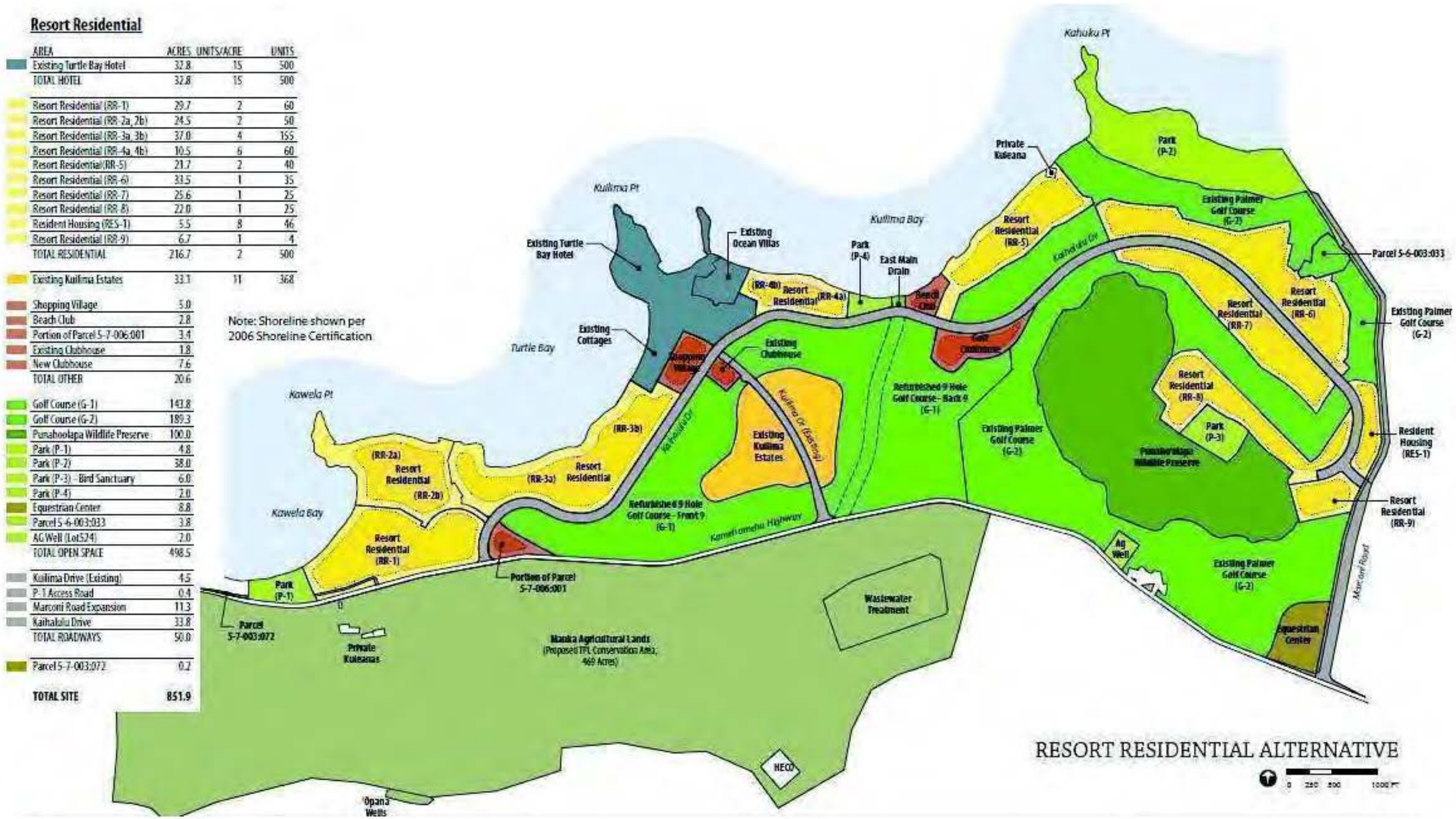


Figure 5. Turtle Bay Resort Master Plan – Resort Residential Alternative

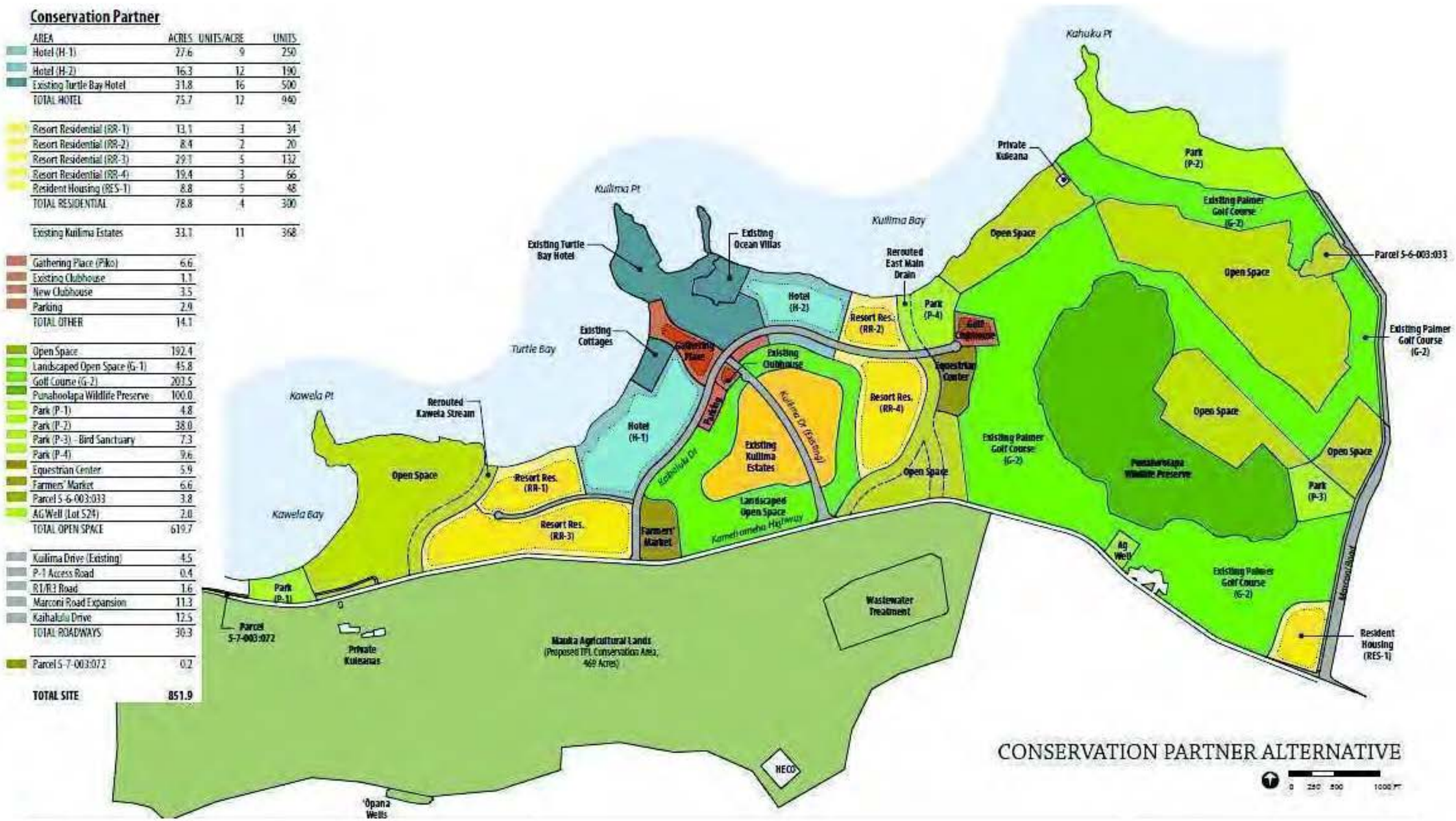


Figure 6. Turtle Bay Resort Master Plan – Conservation Partner Alternative

Kuilima Drive is a two- to four-lane, two-way roadway. Kuilima Drive intersects Kamehameha Highway at a stop-controlled Tee-intersection. Kamehameha Highway currently does not have provisions for exclusive turning lanes at Kuilima Drive. Kuilima Drive provides access to the existing Turtle Bay Resort Hotel and Golf Club and Kuilima Estates. Kuilima Drive carried an average of about 4,200 vpd, total for both directions during the 2011 field investigation for this study.

Marconi Road is a two-lane, two-way roadway, which intersects Kamehameha Highway at a stop-controlled Tee-intersection. Kamehameha Highway currently does not provide exclusive turning lanes at Marconi Road. Marconi Road is a low volume roadway, which provides access to existing residential dwelling units and the coastline.

Joseph P. Leong Highway is a two-way, two-lane high quality highway, which is a continuation of Kamehameha Highway that bypasses Haleiwa Town (also known as the Haleiwa Bypass Highway). At its north junction, the east leg of Kamehameha Highway intersects Kamehameha Highway/Joseph P. Leong Highway at a signalized Tee-intersection. The southbound approach of Kamehameha Highway includes an exclusive right-turn lane, and the northbound approach of Joseph P. Leong Highway includes an exclusive left-turn lane.

Kahekili Highway is a two-way, two-lane high quality highway, which is a continuation of Kamehameha Highway that bypasses Kaneohe Town. The east leg of Kamehameha Highway is stop-controlled at its Tee-intersection with Kamehameha Highway/Kahekili Highway. Southbound Kamehameha Highway does not have provisions for an exclusive left-turn lane to the eastbound Kamehameha Highway. Northbound Kahekili Highway has an exclusive right-turn lane to the eastbound Kamehameha Highway.

B. Existing Peak Hour Traffic Volumes and Operating Conditions

1. Field Investigation and Data Collection

Traffic count surveys were conducted at the Kamehameha Highway intersections at Kuilima Drive and at Marconi Road on November 3, 2011 (Thursday) and on November 5, 2011 (Saturday). The field investigation was conducted during the high surf season on the North Shore, but prior to the Vans Trip Crown of Surfing. Turning movement and vehicle classification traffic counts were taken at the intersection of Kamehameha Highway and Kuilima Drive from 6:00 AM to 6:00 PM during the weekday, and from 9:00 AM to 6:00 PM on Saturday. Turning movement traffic counts also were taken at the intersection of Kamehameha Highway and Marconi Road during the peak periods of traffic.

A week-long traffic count survey was conducted on Kuilima Drive at Kamehameha Highway and at the Turtle Bay Hotel entrance from Sunday, October 30, 2011 to Sunday, November 6, 2011. The purpose of the survey was to develop trip generation characteristics for the resort hotel and resort residential units at Turtle Bay Resort. The traffic count survey was coordinated with a travel interview survey, which was conducted by SMS Research & Marketing Services, Inc. (SMS) at Turtle

Bay Hotel and Kuilima Estates from November 1, 2011 through November 6, 2011. The purpose of the interview survey was to determine the origins and destinations of all traffic entering and exiting the Resort. The results of SMS survey provided the basis for the geographic trip distribution of the Turtle Bay Resort trips.

The limits of the study area were recommended by DOT, during pre-consultation meetings. The study area extends over 35 miles along the North Shore and Windward Oahu between the intersection of Kamehameha Highway and Joseph P. Leong Highway in Haleiwa, and the intersection of Kamehameha Highway and Kahekili Highway in Kahaluu. Peak period traffic count surveys were conducted at these intersections on October 29, 2011 (Saturday) and November 1, 2011 (Monday). The traffic survey data are presented in the Appendix.

While surfing on the North Shore is a major attraction on Oahu, the beach locations are spread out over seven (7) miles and affect traffic only during high surf conditions and surfing contests. In past several years Laniakea (Turtle Beach) has also become a popular attraction due to the daily presence of sea turtles that come ashore. The other major traffic generator in the study area is concentrated in La`ie, which includes the Polynesian Cultural Center (PCC) and Brigham Young University Hawaii (BYU-H). "Envision La`ie" is the long-range plan for PCC, BYU-H, and the surrounding lands, which are owned and managed by Hawaii Reserves, Inc. in affiliation The Church of Jesus Christ of Latter-Day Saints. The planning of Envision La`ie is still being developed at this writing, while Hawaii Reserves, Inc. seeks entitlement and zoning approvals. Without a detailed development proposal, a transportation plan cannot be developed and included in this cumulative traffic analysis. Therefore, Envision La`ie was excluded from this traffic impact analysis.

2. Existing AM Peak Hour of Weekday Traffic

Turtle Bay Resort is located at the northernmost point of the island of Oahu, while the Primary Urban Center of Oahu is located along the south shore of the island. The traditional AM peak period of commuter traffic, which generally occurs between 6:00 AM and 9:00 AM in urban areas, was virtually non-existent in the vicinity of Turtle Bay Resort. Kamehameha Highway peak period traffic was typical of a scenic/recreational route.

The AM peak hour of weekday traffic on Kamehameha Highway, in the vicinity of Turtle Bay Resort, occurred between 11:00 AM and 12:00 Noon. Kamehameha Highway carried about 500 vehicles per hour (vph), total for both directions, which continued to increase in the afternoon. Kamehameha Highway operated at LOS "C", with a v/c ratio of 0.18, west of Kuilima Drive.

The left-turn and right turn movements from Kuilima Drive at Kamehameha operated at LOS "C" and LOS "B", respectively during the AM peak hour of weekday traffic. Marconi Road operated at LOS "B" at Kamehameha Highway.

The typical AM peak hour of commuter traffic also was not evident at the western end of the study area in Haleiwa. The AM peak hour of weekday traffic occurred between 10:45 AM and 11:45 AM at the north junction of the intersection of Kamehameha Highway and Joseph P. Leong Highway. North of Joseph P Leong Highway, Kamehameha Highway carried about 1,100 vph, total for both directions. Kamehameha Highway operated at LOS "D" with a v/c ratio of 0.35 north of Haleiwa. The intersection of Kamehameha Highway and Joseph P. Leong Highway operated at an overall LOS "B" during the AM peak hour of weekday traffic. The individual traffic movements at the intersection operated at satisfactory Levels of Service, i.e. LOS "C" or better.

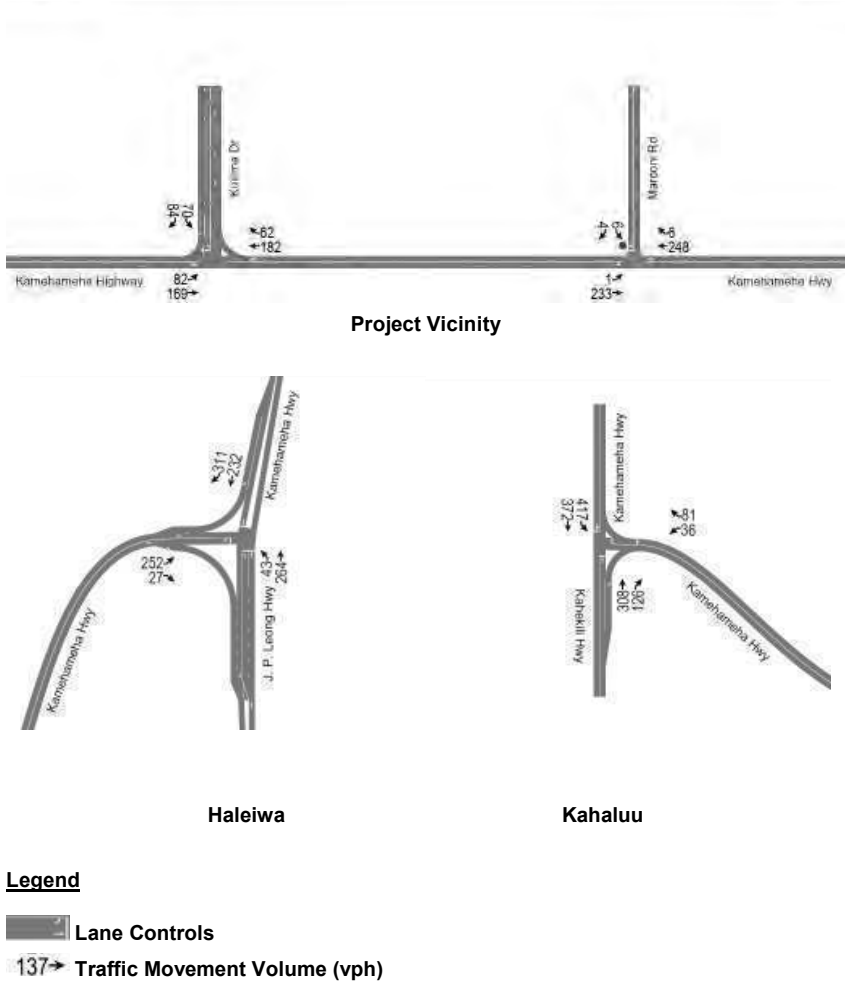
The AM peak hour of weekday traffic at the eastern end of the study area in Kahaluu occurred between 6:45 AM and 7:45 AM. North of Kahekili Highway, Kamehameha Highway carried about 1,200 vph, total for both directions, and operated at LOS "D" with a v/c ratio of 0.41. The predominant traffic movement was on southbound Kamehameha Highway with about 800 vph, which split between continuing onto Kahekili Highway and turning left into Kamehameha Highway. The left-turn movement from eastbound Kamehameha Highway operated at LOS "F" onto Kahekili Highway. However, the left-turn demand was relatively low at less than 40 vph, and the observed delays were much lower than calculated delays when courteous motorists on southbound Kamehameha Highway permitted the left-turn movement from westbound Kamehameha Highway. The other traffic movements at the intersection operated at satisfactory Levels of Service. The existing AM peak hour traffic volumes are depicted on Figure 7.

3. Existing PM Peak Hour Traffic

The typical PM peak hour of commuter traffic, which occurs between 3:00 PM and 6:00 PM in urban areas, also was not evident in the vicinity of Turtle Bay Resort. The PM peak hour of weekday traffic on Kamehameha Highway occurred between 2:00 PM and 3:00 PM. Kamehameha Highway carried about 700 vph, total for both directions in the vicinity of Turtle Bay Resort. West of Kuilima Drive, Kamehameha Highway operated at LOS "C", with a v/c ratio of 0.26.

The left-turn and right turn movements from Kuilima Drive at Kamehameha Highway operated at LOS "C" and LOS "B", respectively during the PM peak hour of weekday traffic. Marconi Road operated at LOS "B" at Kamehameha Highway.

The PM peak hour of weekday traffic in Haleiwa occurred between 2:45 PM and 3:45 PM. Kamehameha Highway carried over 1,400 vph, total for both directions. Kamehameha Highway operated at LOS "D" with a v/c ratio of 0.48 north of Haleiwa. The intersection of Kamehameha Highway and Joseph P. Leong Highway operated at an overall LOS "B" during the PM peak hour of weekday traffic. The individual traffic movements at the intersection operated at satisfactory Levels of Service.



Legend

Lane Controls

137→ **Traffic Movement Volume (vph)**

Figure 7. Existing AM Peak Hour Traffic

he PM peak hour of weekday traffic in Kahaluu occurred between 3:30 PM and 4:30 PM. Kamehameha Highway carried about 1,500 vph, total for both directions. North of the Kahekili Highway intersection, Kamehameha Highway operated at LOS "D" with a v/c ratio of 0.48. The traffic movements at the intersection of Kamehameha Highway and Kahekili Highway operated at satisfactory Levels of Service. Figure 8 depicts the existing PM peak hour traffic volumes.

4. Existing Peak Hour of Weekend Traffic

The weekend peak hour of traffic is represented by a single peak hour on Saturday or Sunday. The existing weekend traffic data in the study area indicated that Sunday traffic was lower than Saturday traffic. Lower Sunday traffic can be attributed, in part, to the fact that PCC does not operate on Sundays. In addition, the Saturday peak hour trip generation rates for hotels, which are developed by the Institute of Transportation Engineers (ITE), are higher than the Sunday peak hour trip rates. During the pre-consultation meetings with DOT, it was mutually agreed that the Saturday peak hour traffic would represent the weekend peak hour traffic in the study area.

The peak hour of weekend traffic in Kahuku occurred between 2:00 PM and 3:00 PM. Kamehameha Highway carried almost 900 vph, total for both directions. Kamehameha Highway operated at LOS "C", with a v/c ratio of 0.29. The left-turn and right turn movements from Kuilima Drive at Kamehameha Highway operated at LOS "D" and LOS "B", respectively during the peak hour of weekend traffic. Marconi Road operated at LOS "B" at Kamehameha Highway.

In Haleiwa, the peak hour of weekend traffic occurred between 11:45 AM and 12:45 PM. Kamehameha Highway carried almost 1,600 vph, total for both directions. Kamehameha Highway operated at LOS "D" with a v/c ratio of 0.53 north of Haleiwa. The queuing on northbound Kamehameha Highway was a result of traffic congestion at Laniakea Beach, where motorists are turning on and off the Highway and stopping for pedestrians cross the Highway. The intersection of Kamehameha Highway and Joseph P. Leong Highway operated at an overall LOS "B" during the peak hour of weekend traffic. The left-turn movement on northbound Joseph P. Leong Highway operated at LOS "D". The other traffic movements at the intersection operated at satisfactory Levels of Service.

The peak hour of weekend traffic in Kahaluu occurred between 2:15 PM and 3:15 PM. Kamehameha Highway carried about 1,500 vph, total for both directions. North of its intersection with Kahekili Highway, Kamehameha Highway operated at LOS "D" with a v/c ratio of 0.50. The traffic movements at the intersection of Kamehameha Highway and Kahekili Highway operated at satisfactory Levels of Service. Figure 9 depicts the existing weekend peak hour traffic volumes. Table 3 summarizes the intersection analysis for the existing peak hours of traffic. Table 4 summarizes the Kamehameha Highway two-lane traffic operations for the existing eak hours of traffic.

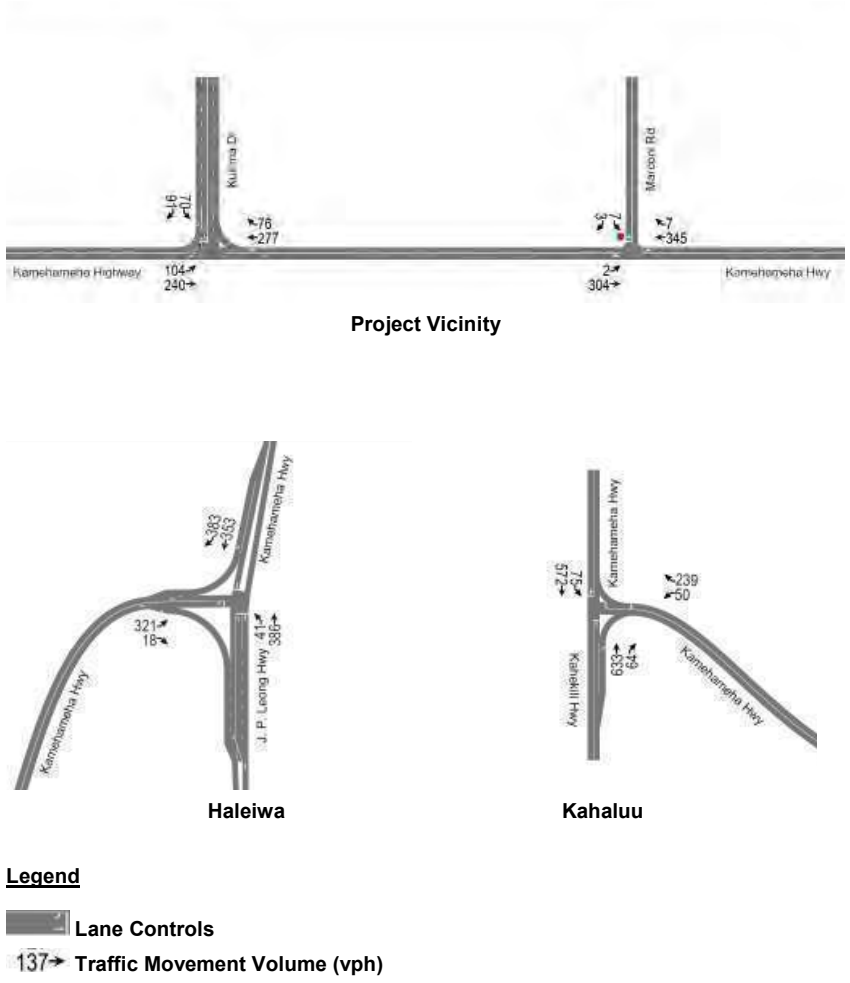
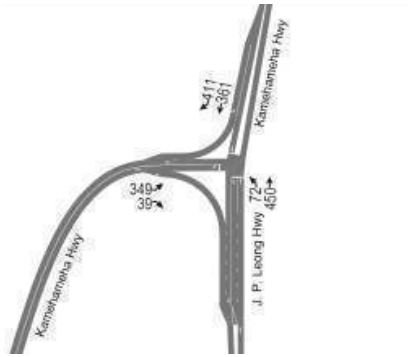


Figure 8. Existing PM Peak Hour Traffic

Project Vicinity



Haleiwa

Kahaluu

Legend

Lane Controls

137→ **Traffic Movement Volume (vph)**

Figure 9. Existing Weekend Peak Hour Traffic

Table 3. Intersection Traffic Analysis Summary - Existing Peak Hour Conditions

Scenario	Kamehameha Hwy Intersection	MOE	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Intersection
Existing AM Peak Hour of Weekday Traffic	Kuilima Drive	LOS	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	C	N/A	B	A
		Delay	8.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	15.8	N/A	10.4	3.8
		v/c	0.07	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.18	N/A	0.11	N/A
	Marconi Rd	LOS	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	B			A
		Delay	7.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	11.5			0.2
		v/c	0.00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.02			N/A
	Joseph P. Leong Hwy	LOS	C	N/A	A	N/A	N/A	N/A	C	A	N/A	N/A	B	A	B
		Delay	24.4	N/A	0.2	N/A	N/A	N/A	26.1	8.3	N/A	N/A	13.9	3.7	12.7
		v/c	0.65	N/A	0.05	N/A	N/A	N/A	0.31	0.31	N/A	N/A	0.30	0.39	N/A
	Kahekili Hwy	LOS	N/A	N/A	N/A	E			N/A	N/A	N/A	B	N/A	N/A	F
		Delay	N/A	N/A	N/A	40.1			N/A	N/A	N/A	12.2	N/A	N/A	78.0
		v/c	N/A	N/A	N/A	N/A			N/A	N/A	N/A	0.55	N/A	N/A	N/A
Existing PM Peak Hour of Weekday Traffic	Kuilima Drive	LOS	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	C	N/A	B	A
		Delay	8.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	22.6	N/A	11.4	3.6
		v/c	0.09	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.26	N/A	0.15	N/A
	Marconi Rd	LOS	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	B			A
		Delay	8.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	13.3			0.3
		v/c	0.01	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.03			N/A
	Joseph P. Leong Hwy	LOS	C	N/A	A	N/A	N/A	N/A	C	A	N/A	N/A	B	A	B
		Delay	25.6	N/A	0.2	N/A	N/A	N/A	32.2	9.3	N/A	N/A	15.8	3.7	13.6
		v/c	0.69	N/A	0.05	N/A	N/A	N/A	0.39	0.38	N/A	N/A	0.45	0.45	N/A
	Kahekili Hwy	LOS	N/A	N/A	N/A	B			N/A	N/A	N/A	A	N/A	N/A	A
		Delay	N/A	N/A	N/A	13.4			N/A	N/A	N/A	9.6	N/A	N/A	2.8
		v/c	N/A	N/A	N/A	0.41			N/A	N/A	N/A	0.09	N/A	N/A	N/A
Existing Weekend Peak Hour of Traffic	Kuilima Drive	LOS	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	D	N/A	B	A
		Delay	8.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	32.6	N/A	12.1	4.3
		v/c	0.14	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.37	N/A	0.17	N/A
	Marconi Rd	LOS	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	B			A
		Delay	8.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	12.1			0.3
		v/c	0.00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.03			N/A
	Joseph P. Leong Hwy	LOS	C	N/A	A	N/A	N/A	N/A	D	B	N/A	N/A	B	A	B
		Delay	25.1	N/A	0.4	N/A	N/A	N/A	42.6	12.3	N/A	N/A	17.7	4.2	15.1
		v/c	0.74	N/A	0.09	N/A	N/A	N/A	0.51	0.50	N/A	N/A	0.51	0.52	N/A
	Kahekili Hwy	LOS	N/A	N/A	N/A	C			N/A	N/A	N/A	A	N/A	N/A	A
		Delay	N/A	N/A	N/A	16.6			N/A	N/A	N/A	9.7	N/A	N/A	2.9
		v/c	N/A	N/A	N/A	0.45			N/A	N/A	N/A	0.10	N/A	N/A	N/A

Table 4. Existing Peak Hour Two-Lane Operations on Kamehameha Highway			
Peak Hour	**Location**	**LOS**	**v/c**
Weekday AM	Haleiwa	D	0.35
	Kahuku	C	0.18
	Kahaluu	D	0.41
Weekday PM	Haleiwa	D	0.48
	Kahuku	C	0.26
	Kahaluu	D	0.48
Weekend	Haleiwa	D	0.53
	Kahuku	C	0.29
	Kahaluu	D	0.50

5. Traffic Signal Warrant Analysis

The existing weekday traffic conditions at the intersection of Kamehameha Highway and Kuilima Drive meet the 70 percent levels for Warrant 1, Conditions A and B, between the hours of 10:00 AM and 4:00 PM. According to the MUTCD, "if the intersection lies within the built-up area of an isolated community having a population of less that 10,000 or speeds on the major highway exceeds 40 mph, the traffic volumes in the 70 percent columns in Table 4C-1 of the MUTCD may be used." The population criterion applies to the Kahuku area. Therefore, Warrant 1, Conditions A and B of the MUTCD were met at the intersection of Kamehameha Highway and Kuilima Drive under existing conditions. The traffic signal warrant worksheet is attached in the Appendix.

IV. Future Traffic Conditions Without Proposed Action

A. Existing Turtle Bay Resort

During the trip generation survey, the reported occupancies for Turtle Bay Hotel ranged from 72 percent to 96 percent. The estimated occupancies for Kuilima Estates ranged from 45 percent to 63 percent. The existing Turtle Bay Hotel traffic, under future traffic conditions without the Proposed Action, was analyzed at occupancy rates of 90 percent and 95 percent during the weekday and weekend peak hours of traffic without the Proposed Action, respectively. Similarly, the existing Kuilima Estates were analyzed at 60 percent occupancies for both the weekday and weekend peak hours of traffic. The occupancy levels were based upon the assumptions, which were recommended by DOT during pre-consultation meetings.

B. Future Roadway Improvements

The Oahu Regional Transportation Plan 2035 (ORTP) mid-range projects through the Year 2020 include the construction of "safety improvements along Kamehameha Highway, from Haleiwa to Kahaluu. Safety improvements include turn lanes, guardrails, signage, crosswalks, etc., to improve safety." The ORTP goes on to state that the "Widening of Kamehameha Highway will only be in areas where needed for storage/turn lanes and safety improvements." Notwithstanding, DOT continues to request reservation or dedication of rights-of-way for future widening of Kamehameha Highway. However, DOT has deferred further planning for the widening in response to community opposition to a four-lane highway.

C. Kahuku Mauka Agricultural Lots

The Kahuku Mauka Agricultural Lots is located on south side of Kamehameha Highway to the east of Turtle Bay Resort. The agricultural subdivision is not part of the Proposed Action because the property is not owned by Turtle Bay Resort. The future access from Kamehameha Highway to the agricultural project will be constructed (by others) opposite Marconi Road, creating a four-legged intersection. Therefore, it is included as part of the cumulative traffic analysis both with and without the Proposed Action and with the three (3) Alternatives.

The traffic assessment of a proposed agricultural subdivision (TMK: 5-6-003: 010, 026, & 032) was prepared by Julian Ng, Incorporated, dated June 6, 2008. The Ng traffic study analyzed the traffic impacts of a 36-lot agricultural subdivision. The Ng study included the findings of another Ng study, Traffic Analysis Report, Kahuku Mauka Agricultural Lots, Phases I & II, dated August 2007.

The current status of the Kahuku Mauka Agricultural Lots was obtained from Bow Engineering & Development, Inc. The 36-lot subdivision plan has been consolidated into a 3-large lot subdivision. The construction of the Kahuku Agricultural Access Road, opposite Marconi Road, is being deferred until the development of the 36-lot subdivision plan resumes. For purpose of this analysis, it is assumed that the Kahuku Mauka Agricultural Lots would be fully developed by the Year 2025. The trip generation and traffic assignments from the Ng studies were incorporated into the future traffic analysis of the study area.

D. Regional Traffic Forecasts

Year 2025 traffic conditions without the Proposed Action are developed to establish the baseline conditions from which to evaluate the traffic impacts of the Proposed Action and the three (3) Alternatives. The Institute of Transportation Engineers (ITE) indicates that an area-wide transportation plan is "often used with large projects that will be developed over a long period of time" (Transportation Impact Analysis for Site Development). ITE goes on to suggest that regional travel forecasts can be more accurate than the straight-line growth projections, based upon historical trends, especially for large developments that occur over a long period of time.

The Oahu Regional Transportation Plan 2035 (ORTP), was prepared for the Oahu Metropolitan Planning Organization (OMPO) in April 2011. The Year 2035 weekday traffic forecasts on the North Shore and Windward Oahu were obtained from OMPO, through the assistance of DOT.

The Year 2025 traffic forecasts on Kamehameha Highway were derived by interpolating between the Year 2035 ORTP model forecasts and the Base Year 2011 DOT data for weekday traffic, assuming a straight-line growth pattern. (Weekend traffic was not analyzed in the ORTP). Three locations on Kamehameha Highway were selected for the regional traffic assessment: northeast of Joseph P. Leong Highway in Haleiwa, west of Kuilima Drive in Kahuku, and northwest of Kahekili Highway in Kahaluu. Table 5 compares the with DOT 2011 traffic data, the ORTP 2035 traffic forecasts, and the interpolated 2025 traffic forecasts used in this study.

Table 5. Existing and Future Weekday Traffic

Location	2011 Traffic (DOT)	2025 Traffic (Interpolated)	2035 Traffic (ORTP)	Average Annual Growth
	Totals	Totals	Totals	Totals
Haleiwa	16,101	16.759	17,229	0.29 %
Kahuku	9,666	11,329	12,516	1.23 %
Kahaluu	19,130	23,012	25,784	1.45 %

Over a 24-year period between the Years 2011 and 2035, the ORTP projected relatively low growth (7 percent) in Haleiwa, and more moderate growth (30-35 percent) in the Kahuku and Kahaluu areas. It should be noted that OMPO reported that the ORTP forecasts included a total of 1,184 resort units at Turtle Bay Resort, i.e., about 300 more resort units than the existing Turtle Bay Hotel, Ocean Villas, and Kuilima Estates. Therefore, use of the ORTP forecast to establish future traffic conditions with and without the Proposed Action can considered to be conservative, i.e., it overestimates the future traffic on the North Shore and Windward Oahu.

The average annual growth rates were applied uniformly to peak hour traffic in the respective areas to establish the Year 2025 peak hour traffic conditions without the Proposed Action. In the vicinity of Turtle Bay Resort, the average annual growth rate was applied only to through and pass-by traffic and not to Turtle Bay Resort traffic.

E. Year 2025 Peak Hour Traffic Analysis Without the Proposed Action

1. Year 2025 AM Peak Hour Traffic Without the Proposed Action

During the Year 2025 AM peak hour of traffic without the Proposed Action, the Kuilima Drive and Marconi Road intersections on Kamehameha Highway are expected to operate at satisfactory Levels of Service. The two-lane section of

Kamehameha Highway is expected to operate at LOS "C", with a v/c ratio of 0.22, in the project vicinity.

The intersection of Kamehameha Highway and Joseph P. Leong Highway in Haleiwa also is expected to operate at satisfactory Levels of Service, during the Year 2025 AM peak hour of traffic without the Proposed Action. North of Haleiwa, Kamehameha Highway is expected to operate at LOS "D", with a v/c ratio of 0.38, during the Year 2025 AM peak hour of traffic without the Proposed Action.

In Kahaluu, the westbound approach of Kamehameha Highway at Kamehameha Highway/Kahekili Highway is expected to operate at LOS "F", during the Year 2025 AM peak hour of traffic without the Proposed Action. Kamehameha Highway is expected to operate at LOS "D", with a v/c ratio of 0.51, in the Kahaluu area. Figure 10 depicts the Year 2025 AM peak hour traffic without the Proposed Action.

2. Year 2025 PM Peak Hour Traffic Without the Proposed Action

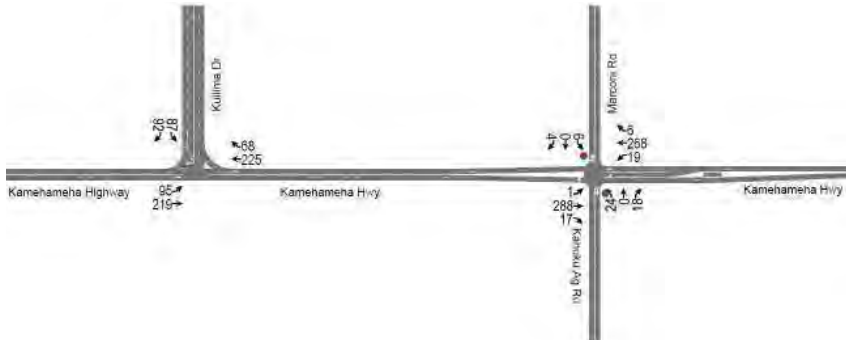
Kuilima Drive is expected to operate at LOS "E" at Kamehameha Highway, during the Year 2025 PM peak hour of traffic without the Proposed Action. The intersection of Kamehameha Highway and Marconi Road is expected to operate at satisfactory Levels of Service. West of Kuilima Drive, Kamehameha Highway is expected to operate at LOS "D", with a v/c ratio of 0.33, during the Year 2025 PM peak hour of traffic without the Proposed Action.

In Haleiwa, the intersection of Kamehameha Highway and Joseph P. Leong Highway also is expected to operate at satisfactory Levels of Service. Kamehameha Highway is expected to operate at LOS "D", with a v/c ratio of 0.52, north of Haleiwa.

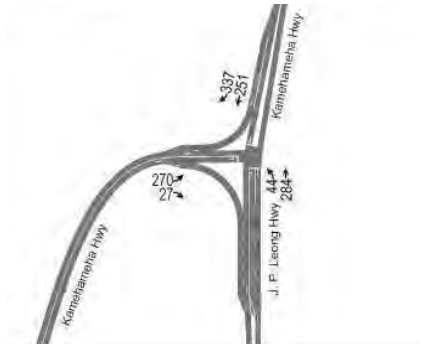
The westbound approach of Kamehameha Highway is expected to operate at LOS "F" at Kamehameha Highway/Kahekili Highway in Kahaluu. North of Kahekili Highway, Kamehameha Highway is expected to operate at LOS "E", with a v/c ratio of 0.60. The Year 2025 PM peak hour traffic without the Proposed Action is depicted on Figure 11.

3. Year 2025 Weekend Peak Hour Traffic Without the Proposed Action

During the Year 2025 weekend peak hour of traffic without the Proposed Action, the left-turn movement from Kuilima Drive onto Kamehameha Highway is expected to operate at LOS "F". Marconi Road and Kahuku Agricultural Road are expected to operate at satisfactory Levels of Service at Kamehameha Highway. Kamehameha Highway is expected to operate at LOS "D", with a v/c ratio of 0.35, in the project vicinity, during the Year 2025 weekend peak hour of traffic without the Proposed Action.



Project Vicinity



Haleiwa

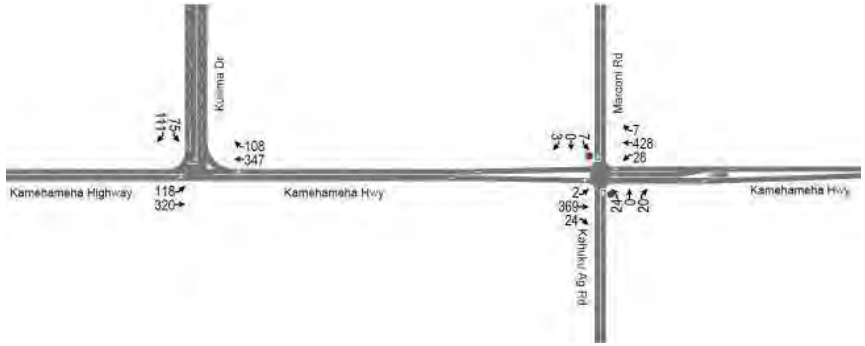
Kahaluu

Legend

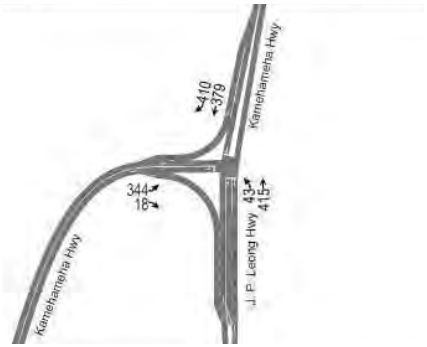
Lane Controls

137→ **Traffic Movement Volume (vph)**

Figure 10. Year 2025 AM Peak Hour Traffic Without the Proposed Action



Project Vicinity



Haleiwa

Kahaluu

Legend

Lane Controls

137→ **Traffic Movement Volume (vph)**

Figure 11. Year 2025 PM Peak Hour Traffic Without the Proposed Action

he left-turn movement from northbound Joseph P. Leong Highway to westbound Kamehameha Highway in Haleiwa is expected to operate at LOS "D". The other traffic movements at the intersection of Kamehameha Highway and Joseph P. Leong Highway are expected to operate at satisfactory Levels of Service. North of Haleiwa, Kamehameha Highway is expected to operate at LOS "D", with a v/c ratio of 0.57, during the Year 2025 weekend peak hour of traffic without the Proposed Action.

The westbound approach of Kamehameha Highway is expected to operate at LOS "F" at Kahekili Highway/Kamehameha Highway in Kahaluu. Kamehameha Highway is expected to operate at LOS "E", with a v/c ratio of 0.61, in the Kahaluu area.

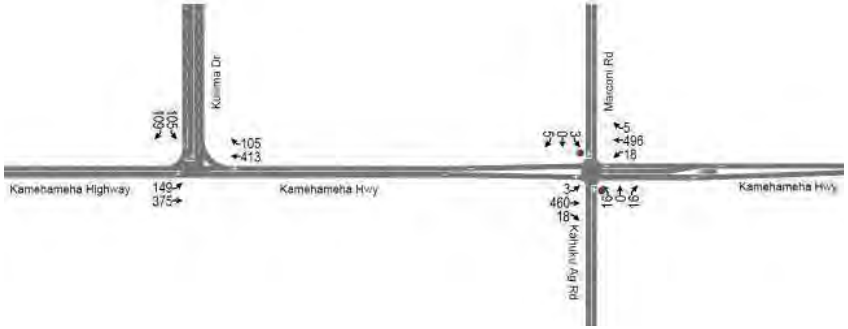
Table 6 summarizes the Kamehameha Highway two-lane traffic operations for the peak hours of traffic without the Proposed Action. Table 7 summarizes the intersection analysis for the peak hours of traffic without the Proposed Action. Figure 12 depicts the Year 2025 weekend peak hour traffic without the Proposed Action.

Table 6. Peak Hour Two-Lane Operations on Kamehameha Highway Without Proposed Action

Peak Hour	Location	LOS	v/c
Weekday AM	Haleiwa	D	0.38
	Kahuku	C	0.22
	Kahaluu	D	0.51
Weekday PM	Haleiwa	D	0.52
	Kahuku	D	0.33
	Kahaluu	E	0.60
Weekend	Haleiwa	D	0.57
	Kahuku	D	0.35
	Kahaluu	E	0.61

Table 7. Intersection Traffic Analysis Summary - Peak Hour Conditions Without Proposed Action

Scenario	Kamehameha Hwy Intersection	MOE	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Intersection
2025 AM Peak Hour of Weekday Traffic Without Proposed Action	Kuilima Drive	LOS	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	C	N/A	B	A
		Delay	8.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	20.2	N/A	10.5	4.2
		v/c	0.09	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.27	N/A	0.13	N/A
	Marconi Rd	LOS	C	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A			A
		Delay	16.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	8.8			1.4
		v/c	0.12	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.02			N/A
	Joseph P. Leong Hwy	LOS	C	N/A	A	N/A	N/A	N/A	C	A	N/A	N/A	B	A	B
		Delay	25.4	N/A	0.2	N/A	N/A	N/A	29.2	8.5	N/A	N/A	14.6	3.7	13.3
		v/c	0.67	N/A	0.05	N/A	N/A	N/A	0.35	0.30	N/A	N/A	0.32	0.42	N/A
	Kahekili Hwy	LOS	N/A	N/A	N/A	F			N/A	N/A	N/A	C	N/A	N/A	F
		Delay	N/A	N/A	N/A	>300			N/A	N/A	N/A	15.6	N/A	N/A	>300
		v/c	N/A	N/A	N/A	>1.2			N/A	N/A	N/A	0.67	N/A	N/A	N/A
2025 PM Peak Hour of Weekday Traffic Without Proposed Action	Kuilima Drive	LOS	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	E	N/A	B	A
		Delay	9.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	36.8	N/A	12.9	4.4
		v/c	0.12	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.41	N/A	0.21	N/A
	Marconi Rd	LOS	C	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A			A
		Delay	22.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	9.2			1.5
		v/c	0.19	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.03			N/A
	Joseph P. Leong Hwy	LOS	C	N/A	A	N/A	N/A	N/A	C	A	N/A	N/A	B	A	B
		Delay	26.6	N/A	0.1	N/A	N/A	N/A	31.2	9.4	N/A	N/A	14.7	3.3	13.3
		v/c	0.72	N/A	0.03	N/A	N/A	N/A	0.30	0.41	N/A	N/A	0.52	0.44	N/A
	Kahekili Hwy	LOS	N/A	N/A	N/A	F			N/A	N/A	N/A	B	N/A	N/A	B
		Delay	N/A	N/A	N/A	75.5			N/A	N/A	N/A	10.6	N/A	N/A	13.7
		v/c	N/A	N/A	N/A	0.98			N/A	N/A	N/A	0.13	N/A	N/A	N/A
2025 Weekend Peak Hour of Traffic Without Proposed Action	Kuilima Drive	LOS	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	F	N/A	B	A
		Delay	9.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	70.8	N/A	13.2	9.4
		v/c	0.15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.75	N/A	0.25	N/A
	Marconi Rd	LOS	C	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A			A
		Delay	22.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	9.3			1.1
		v/c	0.15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.02			N/A
	Joseph P. Leong Hwy	LOS	C	N/A	A	N/A	N/A	N/A	D	B	N/A	N/A	B	A	B
		Delay	28.7	N/A	0.7	N/A	N/A	N/A	47.1	12.7	N/A	N/A	19.8	4.5	16.7
		v/c	0.79	N/A	0.10	N/A	N/A	N/A	0.57	0.52	N/A	N/A	0.57	0.55	N/A
	Kahekili Hwy	LOS	N/A	N/A	N/A	F			N/A	N/A	N/A	B	N/A	N/A	C
		Delay	N/A	N/A	N/A	150.9			N/A	N/A	N/A	10.7	N/A	N/A	22.2
		v/c	N/A	N/A	N/A	1.17			N/A	N/A	N/A	0.15	N/A	N/A	N/A



Project Vicinity

Haleiwa

Kahaluu

Legend

Lane Controls

137→ **Traffic Movement Volume (vph)**

Figure 12. Year 2025 Weekend Peak Hour Traffic Without the Proposed Action

V. Trip Generation Analysis

A. Trip Generation Methodology

The Institute of Transportation Engineers (ITE) has developed trip generation rates for various land use activities, which are published in Trip Generation, 8th Edition. The ITE trip generation methodology was developed from actual data from trip generation studies conducted at developed sites throughout the country and compiled into regression equations or weighted average rates.

While ITE has developed trip rates for a wide variety of land use activities, it cannot account for local characteristics that can have a significant effect on travel behavior, such proximity to employment and shopping opportunities, highway access, transit service, and demographics. The range of data that ITE analyzed reflects the wide variation in travel patterns from the same land use activity in different parts of the country. In lieu of more locally valid data, the ITE trip generation methodology is generally accepted by government agencies and widely used throughout the transportation engineering profession for traffic impact analysis of new developments.

When analyzing the traffic impacts an expansion of an existing development, site-specific trip generation data can be collected from the existing development and applied to the future expansion. Such is the case with the Turtle Bay Resort Master Plan, where the proposed land uses are essentially the same character as the existing Resort, and where most of the local characteristics that affect travel behavior will remain the same. In these cases, ITE recommends the use of local trip generation rates where available to estimate traffic from the new or expanded development. Accordingly, the study has developed trip generation rates, which are based upon locally-collected data from existing land uses and further discussed in the following sections. The ITE methodology was used where the local trip data were not available.

1. Resort Hotel

The existing Turtle Bay Hotel and future hotels in the Turtle Bay Resort Master Plan fall under the ITE category of resort hotel. ITE did not develop a weekday trip rate for a resort hotel. ITE Saturday trip data for a resort hotel were limited to one observation. During the pre-consultation meetings with DOT, it was agreed that the existing trip generation from the Turtle Bay Hotel would provide the most relevant source for estimating traffic volumes from new hotel rooms in the Proposed Action and the three (3) Alternatives.

2. Resort Residential Development

Kuilima Estates and the resort residential units in the Turtle Bay Resort Master Plan can be described under the ITE category of recreational homes. However, DOT has expressed concern over the use of the ITE recreational home trip rates to analyze the traffic impacts of resort residential units. It was agreed that travel characteristics

of the Kuilima Estates were uniquely suited to develop trip generation rates for the resort residential units in the Proposed Action and the three (3) Alternatives.

3. Timeshare Hotel

The Proposed Action, the Full Build Out Alternative, and the Conservation Partner Alternative includes timeshare hotel rooms, in addition to traditional and/or condo-hotel rooms. ITE describes timeshare as developments, where each unit may be purchased by multiple owners with rights of use for specific time periods each year. While the original timeshares were often developed as recreational condominiums or vacation homes, the timeshares for the Turtle Bay Resort Master Plan are planned to be developed as full service hotels, similar to the Aulani Disney Resort in Ko Olina, with vacation club (timeshare) units and traditional hotel rooms. Therefore, the ITE weekday trip rates for timeshares were used to analyze the timeshare hotels in the Proposed Action and the three (3) Alternatives. Since ITE did not provide Saturday trip rates for timeshares, the weekday trip rates for the timeshare hotels were adjusted by ratio between Saturday and the average weekday trip rates developed from the Turtle Bay Hotel trip generation study, as discussed in the following section. The average daily trip rates for the proposed timeshares were derived from the following ITE regression equations:

$Ln(T) = 1.06 \times Ln(X) + 2.09$ (Weekday Traffic)

$Ln(T) = 1.06 \times Ln(X) + 2.09 \times \frac{\text{Turtle Bay Hotel Saturday Rate}}{\text{Turtle Bay Hotel Weekday Rate}}$ (Saturday Traffic)

where, Ln = natural logarithm function

T = average vehicle trip ends

X = number of occupied rooms

4. Shopping Center

The average daily trip rates for the proposed shopping village or "gathering place" were derived from the following ITE regression equations:

$Ln(T) = 0.65 \times Ln(X) + 5.73$ (Weekday Traffic)

$Ln(T) = 0.63 \times Ln(X) + 6.23$ (Saturday Traffic)

where, Ln = natural logarithm function

T = average vehicle trip ends

X = 1,000 square feet of gross leasable floor area

ITE developed hourly variation of shopping center traffic for both the average weekday and Saturdays, which were expressed as percentages of 24-hour traffic for

each hour from 10 AM to 10 PM. The hourly variations were applied to the average weekday and Saturday traffic to determine the hourly traffic volumes.

The total trips generated by a shopping center can be defined as driveway trips, i.e., traffic entering and exiting the project site. A percentage of the peak hour trips generated by a shopping center are considered to be "pass-by" trips, i.e., traffic already on the road stopping at a "secondary" destination. The "new" or primary trips are trips where the primary destination is the shopping center. ITE compiled data from traffic studies that correlated pass-by trips with the gross leasable floor areas of the shopping centers. The results of the analysis were published in the Trip Generation Handbook, June 2004. The ITE average shopping centers pass-by trip percentages of 34 percent and 26 percent, during the weekday PM and Saturday peak periods of traffic, respectively, applied to the hourly traffic volumes generated by the shopping village. Since the shopping village will be planned to cater to Resort guests and residents, and will be located well within the Resort and not directly on Kamehameha Highway, it was assumed that the pass-by trips would be comprised of the Resort guests and residents and not from traffic passing on Kamehameha Highway.

5. Multi-Family (Community) Housing

The Proposed Action and the three (3) Alternatives are expected to include affordable multi-family (community) housing. The community housing is expected to be developed as rental apartment units and/or owner-occupied condominium units. For the purpose of this traffic impact analysis, the ITE trip generation rates for the apartment use were applied to the affordable housing units, since it is more conservative (higher) than the residential condominium use. The ITE peak hour of generator rates were used instead of the peak hour of adjacent street traffic rates, which applies to commuter peak hour traffic. The peak hour trip rates for the rental apartment were derived from the following regression equations:

$T = 0.54 \times X + 2.45$ (AM Peak Hour of Weekday Traffic)

$T = 0.60 \times X + 14.91$ (PM Peak Hour of Weekday Traffic)

$T = 0.41 \times X + 19.23$ (Saturday Peak Hour of Traffic)

where, T = average vehicle trip ends

X = number of dwelling units

6. Recreational Uses

The Proposed Action and the three (3) Alternatives are expected to maintain over 500 acres of open space in the form of the two existing golf courses, beach parks, a wildlife preserve and bird sanctuary, and an equestrian center. The trip generation for the existing golf courses is already included in the existing traffic count data. The average ITE trip rates for beach parks of 0.48 trip per acre, 0.60 trip per acre, and

1.18 trips per acre were used to analyze parks which front the ocean, during the AM, PM, and Weekend peak hours of traffic, respectively.

For lack of specific ITE trip rates for the wildlife preserve, the bird sanctuary, and the equestrian center, the ITE land use designation of County Park was used to represent these uses. The average ITE trip rates for county parks of 0.52 trip per acre, 0.59 trip per acre, and 2.24 trips per acre were used to analyze the various recreational uses, during the AM, PM, and Weekend peak hours of traffic, respectively.

B. Turtle Bay Resort Trip Generation Study

A trip generation study was conducted at the existing Turtle Bay Resort from October 30, 2011 through November 6, 2011, in accordance with ITE recommended practice published in the Trip Generation Handbook, Second Edition. The purpose of the study was to develop trip generation characteristics for "local" trip generation rates for resort hotels and resort residential development in the Turtle Bay Resort Master Plan.

Traffic count data were collected on Kuilima Drive at Kamehameha Highway and at the Turtle Bay Hotel entrance. The traffic count data were reduced to 5-minute intervals to account for internal trips. The differences between the traffic count data at Kamehameha Highway and at the entrance to the Hotel were assumed to be Kuilima Estates trips. Where differences were negative values, the trips were considered internal circulation between the Turtle Bay Hotel and Kuilima Estates, and were not included in the trip generation rates. The Turtle Bay Hotel and Kuilima Estates traffic were correlated with the daily occupancies, which were reported by the Hotel and a rental management company for Kuilima Estates, respectively.

The SMS travel survey discovered a very unique trip generation characteristic of the Turtle Bay Hotel, i.e., pass-by trips, which are normally associated with shopping centers. The Turtle Bay Hotel is located at the farthest point from Waikiki, the Honolulu International Airport, and the population centers of Oahu. It is situated between two of the most popular destinations on Oahu, the Polynesian Cultural Center to the east, and the world famous surfing beaches on the North Shore to the west. The Turtle Bay Hotel has become a well-known rest stop for both visitors and residents driving around island. The SMS survey indicated that over 17 percent of respondents identified themselves as Oahu residents visiting the Resort. The SMS data excluded the residents who were attending special events held at the Resort during the survey period. Tourists visiting the Resort (non-guests) made up an additional 13 percent of the total respondents for a total of 30 percent of the hotel trips. Taking a conservative approach, the visiting tourists were excluded from the pass-by trips, since the future Turtle Bay Resort Master Plan may become a primary destination for tourists driving around the island. The Oahu residents were classified as "Resort pass-by trips", i.e., trips bound for other primary destinations in the region, who take a rest stop at the Resort. Based upon the SMS travel survey, there were an estimated 500 pass-by trips per weekday that stopped or departed the Turtle Bay Hotel between the hours of 8:00 AM and 6:00 PM. During the weekend, the pass-by traffic increased to 920 vehicles per day.

The Oahu resident pass-by trips were deducted from the hotel trip rates and analyzed separately. It was more reasonable to assume that the pass-by trips were a function of the volume of traffic passing on Kamehameha Highway, rather than the number of occupied rooms at the Turtle Bay Hotel. Therefore, the increase in pass-by trips was based upon the regional growth in traffic on Kamehameha Highway. The ITE timeshare trip rates also were adjusted for the pass-by trip rates observed at the Turtle Bay Hotel.

To ensure a more conservative technical analysis and to account for potential deviation between the existing trip generation characteristics and future travel behavior, the Turtle Bay Hotel and Kuilima Estates trips rates were uniformly increased by 10 percent, per the recommendation of DOT staff. Tables 8 and 9 summarize the trip generation data for the Turtle Bay Hotel and the Kuilima Estates, respectively.

Table 8. Existing Turtle Bay Hotel Daily Trip Generation Rate Calculations

Day of the Week	Mon	Tue	Wed	Thu	Fri	Sat
Volume (trips/day)	3,038	3,058	3,122	3,464	3,916	3,936
Occupied Rooms	381	367	360	413	470	478
Occupancy	76 %	73 %	72 %	83 %	94 %	96 %
Daily Trips per Occupied Room	7.97	8.33	8.67	8.39	8.33	8.23
	Weighted Weekday Average = 8.34					8.23
Pass-By Trip Reduction	7.08					6.31
+10% Adjustment Factor	7.79					6.94

Table 9. Existing Kuilima Estates Daily Trip Generation Rate Calculations

Day of the Week	Mon	Tue	Wed	Thu	Fri	Sat
Volume (trips/day)	727	722	622	866	918	820
Occupied Units	165	206	203	230	227	206
Occupancy	45 %	56 %	55 %	63 %	62 %	56 %
Daily Trips per Occupied Unit	4.41	3.50	3.06	3.77	4.04	3.98
	Weighted Weekday Average = 3.74					3.98
+10% Adjustment Factor	4.11					4.38

Kamehameha Highway, in the vicinity of Turtle Bay Resort, carries the lowest traffic volumes in the study area. It is reasonable to assume that the peak hour traffic from the Resort will determine when the peak hours of traffic on Kamehameha Highway are expected to occur. The trip generation characteristics are expressed in terms of daily trips, which are distributed throughout the day on an hourly basis, based upon the trip

generation study. The hourly volumes are added to the future Kamehameha Highway traffic to determine when the peak hours of traffic will occur.

C. Farmers Market Trip Generation Study

A trip generation study was conducted at the Haleiwa Farmers Market at the intersection of Kamehameha Highway and Joseph P. Leong Highway (North Junction) on Sunday, June 10, 2012 between the hours of 9:00 AM and 3:00 PM. The Haleiwa Farmers Market generated almost 1,200 vehicle trips during the survey period. During the peak hour of traffic, the Haleiwa Farmers Market generated 275 vph. It should be noted that the trip generation study was conducted on the closing day of the Haleiwa Farmers Market at that location. The trip generation data can be considered to be conservative, i.e., higher than on normal days.

For the purpose of this traffic impact analysis, it was assumed that the Turtle Bay Resort Farmers Market would be comparable to the Haleiwa Farmers Market in terms of trip generation. To remain conservative, the trip generation data for the Farmers Market was applied to both the weekday and weekend operations. The average ITE shopping center pass-by trip rates of 34 percent during weekday peak periods of traffic and 26 percent during the Saturday peak period also was applied the trip rates to account for the Resort guests and residents shopping at the Turtle Bay Resort Farmers Market.

D. Trip Generation Characteristics

During the pre-consultation meetings with DOT, it was agreed that to remain conservative the trip generation for the hotels would be analyzed at 90 percent occupancy during the weekday and 95 percent occupancy on the weekend for the Proposed Action and the three (3) Alternatives, based upon recent occupancies at the Turtle Bay Hotel. It was further agreed that the trip generation for the resort residential development would analyzed at 60 percent occupancy for both the weekday and weekend, which are considered to be conservative based upon recent market data provided by HVS International Consulting and Evaluation.

The Full Build Out Alternative is expected to generate the highest volumes of traffic during the peak hours of traffic with a total of 3,500 new units. The 500-unit Resort Residential Alternative is expected to generate the least amount of peak hour traffic. The Conservation Partner Alternative has the second lowest trip generation estimate with a total of 740 new units. The Proposed Action is expected to generate the second highest peak hour traffic with a total of 1,375 new units. Table 10 summarizes the trip generation characteristics for the Proposed Action and the three (3) Alternatives.

Table 10. Trip Generation Characteristics

Alternative	Area	Land Use	Units/Area	AM Peak Hour				PM Peak Hour				Saturday Peak Hour			
				Enter (vph)	Exit (vph)	Total (vph)	% of Total	Enter (vph)	Exit (vph)	Total (vph)	% of Total	Enter (vph)	Exit (vph)	Total (vph)	% of Total
Proposed Action	H-1a, H-2	Timeshare Hotel	350	79	93	171	17%	130	130	259	25%	83	97	180	12%
	H-1b, H-2a	Hotel	275	56	65	121	12%	90	75	165	16%	63	71	134	9%
	RR-1, RR-2a, RR-2b, RR-3a, RR-3b, RR-4a, RR-4b, RR-5, RR-6	Resort Residences	590	38	43	81	8%	57	50	106	10%	46	66	112	8%
	RES-1, RES-2	Apartment	160	26	63	89	9%	68	43	111	11%	46	39	85	6%
	Gathering Place	Shopping Center	40,000 SFGLFA	94	104	198	20%	113	102	215	21%	184	176	360	24%
	Farmers Market	Farmers Market	7.5 Acres	98	83	181	18%	3	9	11	1%	80	90	170	12%
	P-1, P-2, P-4, P-5	Beach Park	47.6 Acres	56	39	95	10%	29	57	86	8%	76	89	165	11%
	P-3, Wildlife Preserve, Equestrian Center	County Park	118.6 Acres	44	18	62	6%	24	45	70	7%	157	109	266	18%
	Proposed Action Total Traffic			**491**	**508**	**998**	**100%**	**514**	**511**	**1023**	**100%**	**735**	**737**	**1472**	**100%**
Full Build Out	H-1, H-4, H-5	Hotel	1,578	321	377	698	38%	530	446	976	43%	355	409	764	32%
	H-2, H-3	Timeshare Hotel	913	217	257	474	26%	354	342	696	31%	230	269	499	21%
	RR-1a, RR-1b, RR-2, RR-3, RR-4	Resort Residences	910	58	66	124	7%	97	70	167	7%	71	102	173	7%
	RES-1	Apartment	90	15	36	51	3%	42	27	69	3%	30	26	56	2%
	Gathering Place	Shopping Center	40,000 SFGLFA	94	104	198	11%	112	96	208	9%	184	176	360	15%
	TMK: 5-7-006: Por, 001	Farmers Market	3.4 Acres	98	83	181	10%	2	13	15	1%	80	90	170	7%
	P-1, P-2, P-4, Beach Club	Beach Park	44.8 Acres	39	27	66	4%	21	40	61	3%	54	63	117	5%
	P-3, Wildlife Preserve, Equestrian Center	County Park	114.8 Acres	42	17	60	3%	24	44	68	3%	152	105	257	11%
	Full Build Out Alternative Total Traffic			**884**	**967**	**1852**	**100%**	**1182**	**1078**	**2260**	**100%**	**1156**	**1240**	**2396**	**100%**
Resort Residential	RR-1, RR-2a, RR-2b, RR-3a, RR-3b, RR-4a, RR-4b, RR-5, RR-6, RR--7, RR-8, RR-9	Resort Residences	454	29	33	62	10%	29	34	63	13%	18	49	67	6%
	RES-1	Apartment	46	8	19	27	4%	26	17	43	9%	21	18	38	4%
	Shopping Village	Shopping Center	40,000 SFGLFA	94	104	198	32%	114	101	215	45%	184	176	360	35%
	TMK: 5-7-006: Por, 001	Farmers Market	3.4 Acres	98	83	181	30%	2	8	10	2%	69	97	166	16%
	P-1, P-2, P-4, Beach Club	Beach Park	56.1 Acres	49	34	84	14%	26	50	76	16%	67	79	146	14%
	P-3, Wildlife Preserve, Equestrian Center	County Park	114.8 Acres	42	17	60	10%	24	44	68	14%	152	105	257	25%
	Resort Residential Alternative Total Traffic			**320**	**290**	**612**	**100%**	**221**	**254**	**475**	**100%**	**511**	**524**	**1034**	**100%**
Conservation Partner	H-1	Timeshare Hotel	250	54	64	118	15%	92	83	175	23%	58	61	119	10%
	H-2	Hotel	190	40	45	85	11%	63	51	114	15%	44	46	90	7%
	RR-1, RR-2, RR-3, RR-4	Resort Residences	252	16	19	35	4%	25	21	46	6%	11	28	39	3%
	RES-1	Apartment	48	8	66	28	4%	27	66	44	6%	21	66	39	3%
	Gathering Place	Shopping Center	40,000 SFGLFA	94	104	198	25%	114	101	215	29%	184	176	360	30%
	Farmers Market	Farmers Market	6.6 Acres	98	83	181	23%	2	8	10	1%	69	97	166	14%
	P-1, P-2, P-4	Beach Park	52.4 Acres	46	33	81	10%	25	49	74	10%	70	79	149	12%
	P-3, Wildlife Preserve, Equestrian Center	County Park	113.2 Acres	42	17	59	7%	23	43	67	9%	150	104	254	21%
	Conservation Partner Alternative Total Traffic			**398**	**431**	**785**	**100%**	**372**	**422**	**745**	**100%**	**607**	**657**	**1216**	**100%**

VI. Trip Distribution

A. Travel Survey

SMS conducted an extensive week-long travel survey at the Turtle Bay Resort from Monday, October 31, 2011 through Sunday, November 6, 2011. The travel survey consisted of personal interviews of about 4,800 motorists that entered and exited the Turtle Bay Hotel and Kuilima Estates. The purpose of the travel survey was to determine the origins and destinations of the trips arriving at and departing from the Resort. The trip distribution for this traffic impact analysis was determined from the findings of the travel survey. The methodology and results of the travel survey was documented by SMS in the Quantification of Turtle Bay Resort Traffic Patterns Report, dated December, 2011.

According to the SMS survey, about 43 percent of the Turtle Bay Resort traffic entered or exited the study area, i.e., with origins or destinations in Honolulu, Central Oahu, and Leeward Oahu. About 39 percent of the Turtle Bay Resort traffic remained within the limits of the field investigation, which extended from Haleiwa to Kahaluu. The remaining 18 percent were contained within the fringes of the study area in Haleiwa/Waialua and Windward Oahu.

B. Trip Distribution

The SMS travel survey data were further disaggregated by time period to determine the trip distribution during the peak hours of traffic. The trip distribution for Turtle Bay Hotel traffic was applied to the proposed hotels, and the trip distribution of Kuilima Estates traffic was applied to proposed resort residential developments. The trip distribution of traffic generated by other land uses in the Proposed Action and the three (3) Alternatives were based upon existing peak hour traffic patterns. Table 11 summarizes the trip distribution patterns for the Proposed Action and the three (3) Alternatives in terms of the percentages (%) of total site traffic on Kamehameha Highway along the project site frontage (local traffic) and at the limits of the study area in Haleiwa and Kahaluu.

Table 11. Trip Distribution Summary

Alternative	Local vs. Regional	Direction	AM Peak Hr		PM Peak Hr		Weekend Peak Hr	
			Enter	Exit	Enter	Exit	Enter	Exit
Proposed Action	Local Traffic	EB	59%	46%	53%	41%	57%	42%
		WB	41%	54%	47%	59%	43%	58%
	Regional Traffic	Haleiwa	23%	22%	25%	26%	24%	24%
		Kahaluu	13%	11%	13%	14%	13%	9%
Full Build Out	Local Traffic	EB	61%	45%	52%	38%	56%	42%
		WB	39%	55%	48%	62%	44%	58%
	Regional Traffic	Haleiwa	35%	32%	34%	36%	44%	35%
		Kahaluu	15%	11%	13%	15%	26%	15%
Resort Residential	Local Traffic	EB	57%	47%	54%	43%	57%	42%
		WB	43%	53%	46%	57%	43%	58%
	Regional Traffic	Haleiwa	17%	18%	18%	21%	22%	22%
		Kahaluu	12%	12%	13%	15%	9%	7%
Conservation Partner	Local Traffic	EB	59%	46%	54%	42%	57%	41%
		WB	41%	54%	46%	58%	43%	59%
	Regional Traffic	Haleiwa	22%	21%	25%	27%	25%	23%
		Kahaluu	13%	12%	13%	15%	12%	8%

VII. Traffic Impact Analysis

A. Traffic Improvements

Based upon the conditions in the Unilateral Agreement and Declaration for Conditional Zoning, the following traffic improvements are required at each of the proposed access intersections on Kamehameha Highway:

1. Widen westbound Kamehameha Highway to provide an exclusive right-turn lane.
2. Widen eastbound Kamehameha Highway to provide an exclusive left-turn lane.
3. Widen westbound Kamehameha Highway to provide a right-turn acceleration lane.
4. Construct separate left-turn and right-turn lanes on side street approaches at Kamehameha Highway.

5. Construct a shared left-turn/through lane and an exclusive right-turn lane on Marconi Road at Kamehameha Highway, if the future Kahuku Mauka Agricultural Road is constructed at the time of improvement.

6. Construct bus turnouts in both directions on Kamehameha Highway at each intersection.

7. Signalize the intersections at Kamehameha Highway, when warranted, with protected left-turn phases on Kamehameha Highway.

The intersection of Kuilima Drive and Kamehameha Highway meets traffic signals warrants under existing conditions. The Kuilima Drive intersection would be signalized along with the construction of the auxiliary turning lanes during the initial phase of the Proposed Action or one of the Alternative development plan.

The auxiliary lane improvements at the intersection of Kamehameha Highway and Kaihalulu Drive should be constructed when it is first open to the public. A median left-turn refuge lane should be constructed on the east leg of Kamehameha Highway to facilitate the left-turn movement from Kaihalulu Drive under unsignalized control.

The auxiliary lane improvements at the intersection of Kamehameha Highway and Marconi Road also should be constructed during the initial phase of development of the Proposed Action or the Alternative development plan. If the Kahuku Mauka Agricultural Road is not constructed opposite of Marconi Road, the intersection should remain unsignalized, and a median left-turn refuge lane should be constructed on the east leg of Kamehameha Highway to facilitate the left-turn movement from Marconi Road.

B. Traffic Impact Analysis of the Alternative Development Plans

1. Alternative Development Plan Phasing

In general, the traffic impact analysis of development plans over five (5) years are analyzed in phases to coordinate the traffic improvements with the proposed development schedule. During the pre-consultation meeting with DOT, it was agreed that the Alternatives will not require phased traffic impact analyses unless one of the Alternatives becomes the preferred plan. At that time, this traffic impact analysis will be updated to reflect the phasing of the new preferred plan.

2. Full Build Out Alternative

The Full Build Out Alternative will require the construction of double left-turn lanes on eastbound Kamehameha Highway at Kaihalulu Drive and at Kuilima Drive. Kaihalulu Drive will require four lanes, two lanes in each direction for the Full Build Out Alternative. The Turtle Bay Resort access road intersections at Kamehameha Highway are expected to operate at overall LOS "C" or better, during the peak hours of traffic with the Full Build Out Alternative. The intersection of Kamehameha Highway and Joseph P. Leong Highway in Haleiwa also is expected to operate at LOS "C" or better, during the peak hours of traffic. In Kahaluu, the left-turn

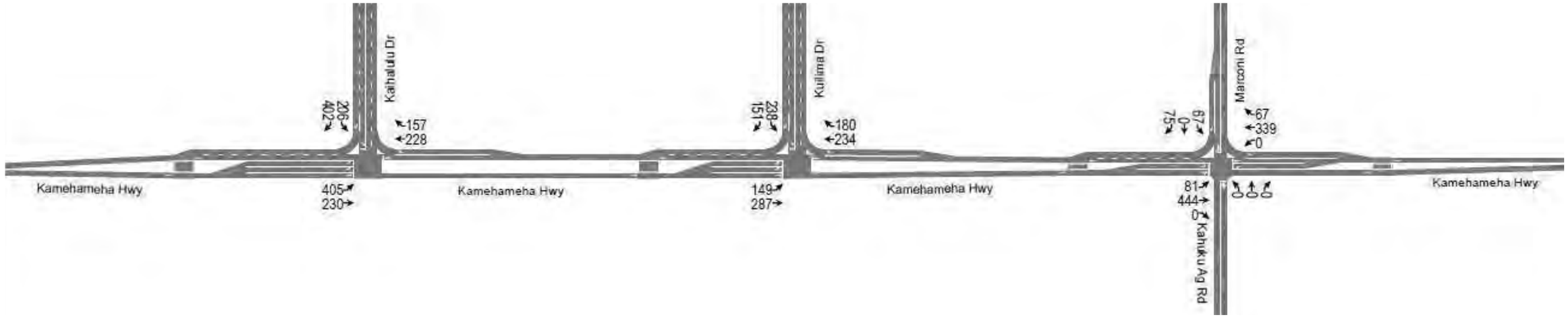
movement from westbound Kamehameha Highway to southbound Kahekili Highway is expected to continue to operate at LOS "F", during the peak hours of traffic. Table 12 summarizes the two-lane traffic analysis of Kamehameha Highway with the Full Build Out Alternative. Table 13 summarizes the intersection analysis for the peak hours of traffic with the Full Build Out Alternative. The AM, PM, and Weekend peak hour assignments of site traffic are depicted on Figures 13, 14, and 15, respectively. Figures 16, 17, and 18 depict the cumulative AM, PM, and Weekend peak hour traffic volumes, respectively, with the Full Build Out Alternative.

Table 12. Peak Hour Two-Lane Operations on Kamehameha Highway With FBO Alternative

Peak Hour	Location	LOS	v/c
Weekday AM	Haleiwa	E	0.62
	Kahuku	D	0.59
	Kahaluu	E	0.61
Weekday PM	Haleiwa	E	0.78
	Kahuku	E	0.73
	Kahaluu	E	0.72
Weekend	Haleiwa	E	0.90
	Kahuku	E	0.79
	Kahaluu	E	0.79

Table 13. Intersection Traffic Analysis Summary - Peak Hour Conditions With FBO Alternative

Scenario	Kamehameha Hwy Intersection	MOE	EBLT	EBTH	EBRT	WBLT	WBTH	WBRT	NBLT	NBTH	NBRT	SBLT	SBTH	SBRT	Intersection
2025 AM Peak Hour of Weekday Traffic With Full Build Out Alternative	Kaihalulu Drive	LOS	C	A	N/A	N/A	C	A	N/A	N/A	N/A	C	N/A	A	C
		Delay	33.9	9.3	N/A	N/A	34.0	4.1	N/A	N/A	N/A	30.3	N/A	7.3	20.9
		v/c	0.68	0.48	N/A	N/A	0.83	0.27	N/A	N/A	N/A	0.52	N/A	0.62	N/A
	Kuilima Drive	LOS	C	B	N/A	N/A	C	A	N/A	N/A	N/A	C	N/A	A	B
		Delay	30.3	11.4	N/A	N/A	22.0	3.4	N/A	N/A	N/A	26.6	N/A	6.0	16.8
		v/c	0.40	0.60	N/A	N/A	0.73	0.28	N/A	N/A	N/A	0.60	N/A	0.33	N/A
	Marconi Rd	LOS	C	B		C	B	A	A			C		A	B
		Delay	32.1	14.7		32.8	18.7	1.6	1.6			25.7		5.6	16.3
		v/c	0.39	0.73		0.21	0.73	0.10	0.18			0.33		0.23	N/A
	Joseph P. Leong Hwy	LOS	C	N/A	A	N/A	N/A	N/A	C	B	N/A	N/A	C	A	B
		Delay	30.6	N/A	0.1	N/A	N/A	N/A	33.7	15.2	N/A	N/A	23.0	5.4	18.2
		v/c	0.83	N/A	0.04	N/A	N/A	N/A	0.41	0.60	N/A	N/A	0.63	0.63	N/A
	Kahekili Hwy	LOS	N/A	N/A	N/A	F			N/A	N/A	N/A	D	N/A	N/A	F
		Delay	N/A	N/A	N/A	>300			N/A	N/A	N/A	26.7	N/A	N/A	82.8
		v/c	N/A	N/A	N/A	>1.2			N/A	N/A	N/A	0.85	N/A	N/A	N/A
2025 PM Peak Hour of Weekday Traffic With Full Build Out Alternative	Kaihalulu Drive	LOS	D	A	N/A	N/A	C	A	N/A	N/A	N/A	D	N/A	C	C
		Delay	47.2	8.3	N/A	N/A	34.5	3.0	N/A	N/A	N/A	38.5	N/A	24.1	26.1
		v/c	0.82	0.51	N/A	N/A	0.87	0.34	N/A	N/A	N/A	0.56	N/A	0.85	N/A
	Kuilima Drive	LOS	D	A	N/A	N/A	C	A	N/A	N/A	N/A	C	N/A	A	C
		Delay	49.9	9.1	N/A	N/A	30.6	2.9	N/A	N/A	N/A	34.7	N/A	7.2	20.7
		v/c	0.74	0.55	N/A	N/A	0.89	0.42	N/A	N/A	N/A	0.68	N/A	0.44	N/A
	Marconi Rd	LOS	D	B		D	C	A	A			D		B	C
		Delay	54.0	14.6		52.0	26.7	2.0	7.0			50.3		11.6	22.9
		v/c	0.55	0.69		0.31	0.89	0.10	0.25			0.54		0.35	N/A
	Joseph P. Leong Hwy	LOS	D	N/A	A	N/A	N/A	N/A	D	B	N/A	N/A	C	A	C
		Delay	47.1	N/A	0.1	N/A	N/A	N/A	49.4	19.3	N/A	N/A	34.2	5.1	25.8
		v/c	0.92	N/A	0.04	N/A	N/A	N/A	0.51	0.70	N/A	N/A	0.83	0.66	0.83
	Kahekili Hwy	LOS	N/A	N/A	N/A	F			N/A	N/A	N/A	B	N/A	N/A	F
		Delay	N/A	N/A	N/A	>300			N/A	N/A	N/A	11.6	N/A	N/A	106.2
		v/c	N/A	N/A	N/A	>1.2			N/A	N/A	N/A	0.18	N/A	N/A	N/A
2025 Weekend Peak Hour of Traffic With Full Build Out Alternative	Kaihalulu Drive	LOS	D	A	N/A	N/A	D	A	N/A	N/A	N/A	D	N/A	C	C
		Delay	49.1	8.5	N/A	N/A	42.0	2.7	N/A	N/A	N/A	46.3	N/A	24.6	29.2
		v/c	0.80	0.56	N/A	N/A	0.94	0.24	N/A	N/A	N/A	0.65	N/A	0.84	N/A
	Kuilima Drive	LOS	D	B	N/A	N/A	C	A	N/A	N/A	N/A	D	N/A	A	C
		Delay	53.8	11.4	N/A	N/A	34.1	2.6	N/A	N/A	N/A	43.7	N/A	6.8	24.2
		v/c	0.75	0.63	N/A	N/A	0.91	0.34	N/A	N/A	N/A	0.79	N/A	0.43	N/A
	Marconi Rd	LOS	D	B		D	D	A	A			D		A	C
		Delay	53.9	16.7		54.1	39.9	2.6	1.0			51.9		9.5	28.6
		v/c	0.71	0.75		0.29	0.94	0.17	0.13			0.67		0.45	N/A
	Joseph P. Leong Hwy	LOS	D	N/A	A	N/A	N/A	N/A	D	C	N/A	N/A	D	A	C
		Delay	48.8	N/A	5.1	N/A	N/A	N/A	53.1	30.9	N/A	N/A	37.6	4.4	29.9
		v/c	0.93	N/A	0.14	N/A	N/A	N/A	0.42	0.88	N/A	N/A	0.88	0.62	N/A
	Kahekili Hwy	LOS	N/A	N/A	N/A	F			N/A	N/A	N/A	B	N/A	N/A	F
		Delay	N/A	N/A	N/A	>300			N/A	N/A	N/A	13.2	N/A	N/A	218.6
		v/c	N/A	N/A	N/A	>1.2			N/A	N/A	N/A	0.23	N/A	N/A	N/A



Project Vicinity

Legend

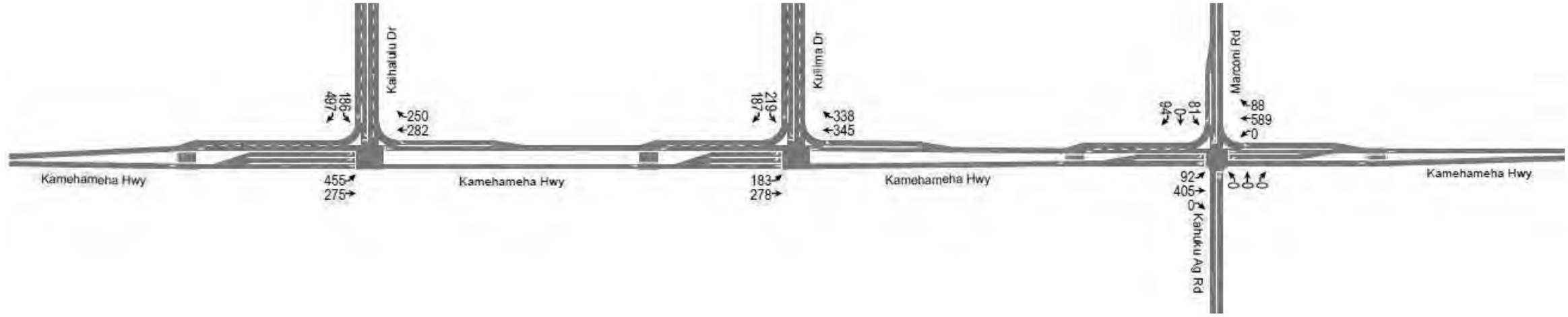
Lane Controls

137→ **Traffic Movement Volume (vph)**

Haleiwa

Kahaluu

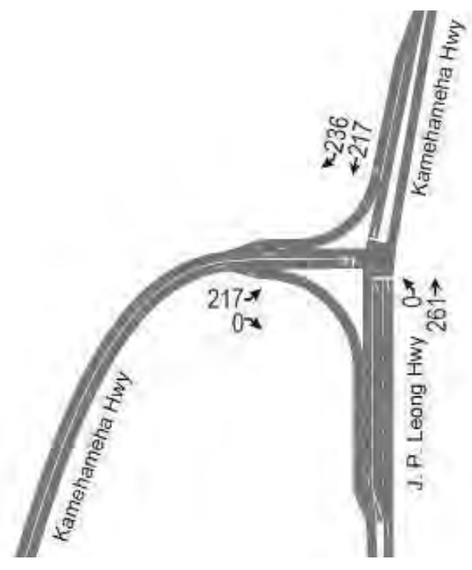
Figure 13. AM Peak Hour Site Traffic Assignment – FBO Alternative



Project Vicinity

Legend

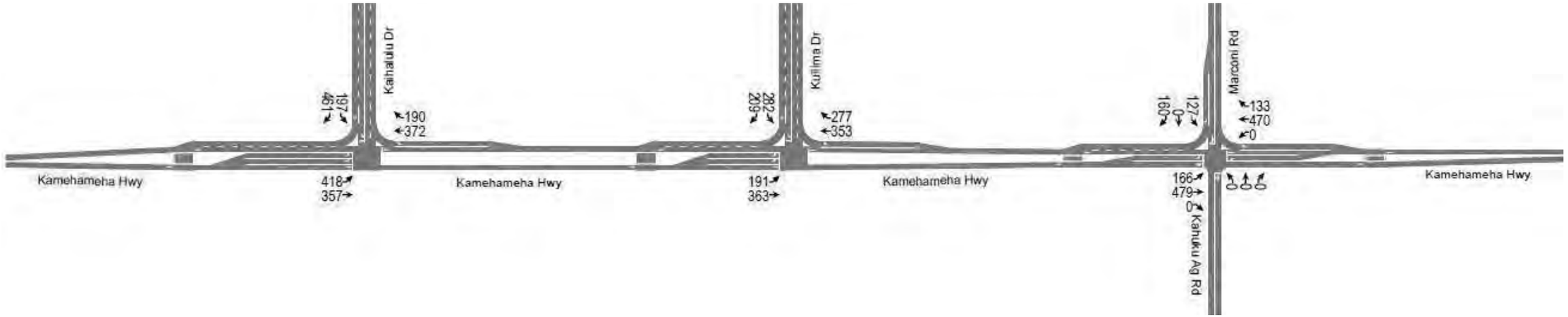
Lane Controls
137→ **Traffic Movement Volume (vph)**



Haleiwa

Kahaluu

Figure 14. PM Peak Hour Site Traffic Assignment – Full Build Out Alternative



Project Vicinity

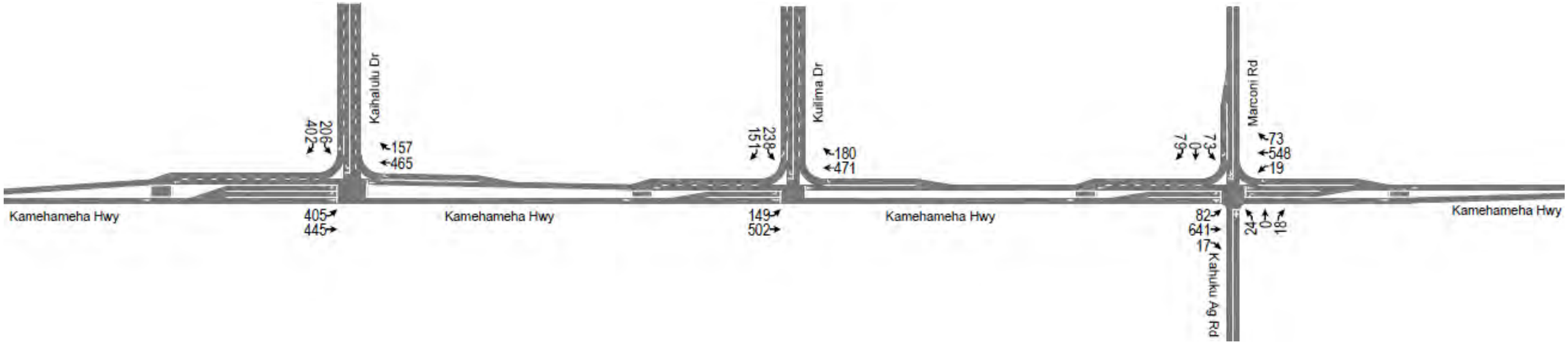
Legend

Lane Controls
137→ **Traffic Movement Volume (vph)**

Haleiwa

Kahaluu

Figure 15. Weekend Peak Hour Site Traffic Assignment – Full Build Out Alternative

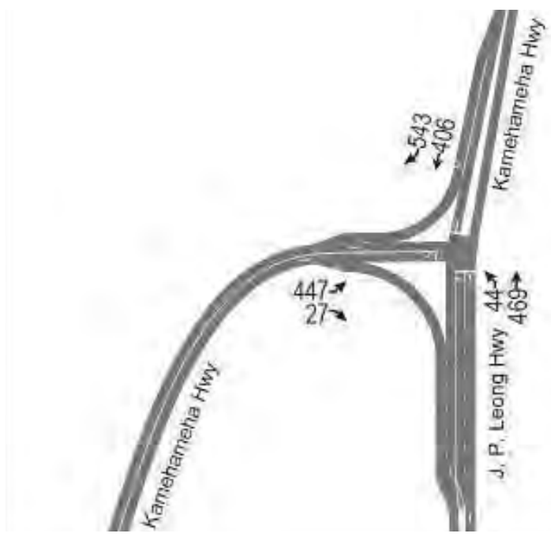


Legend

Lane Controls

137→ **Traffic Movement Volume (vph)**

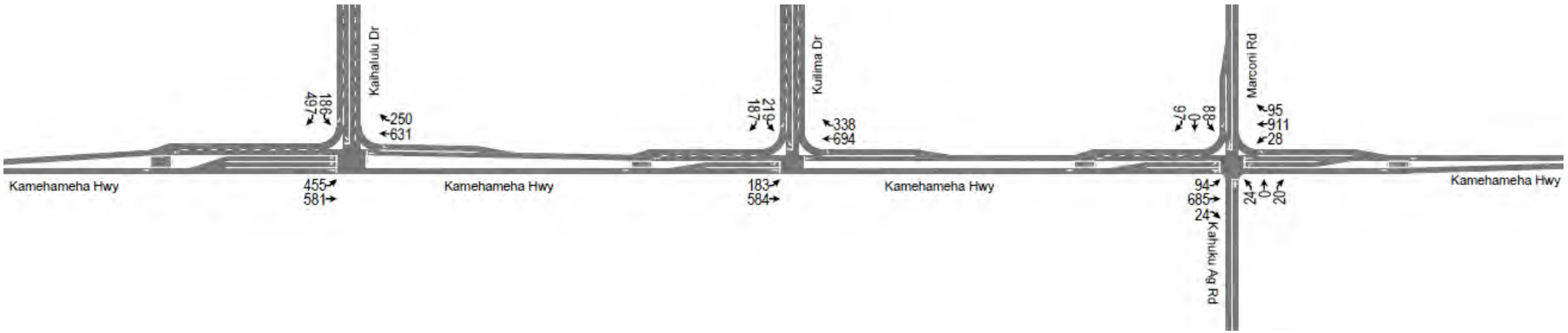
Project Vicinity



Haleiwa

Kahaluu

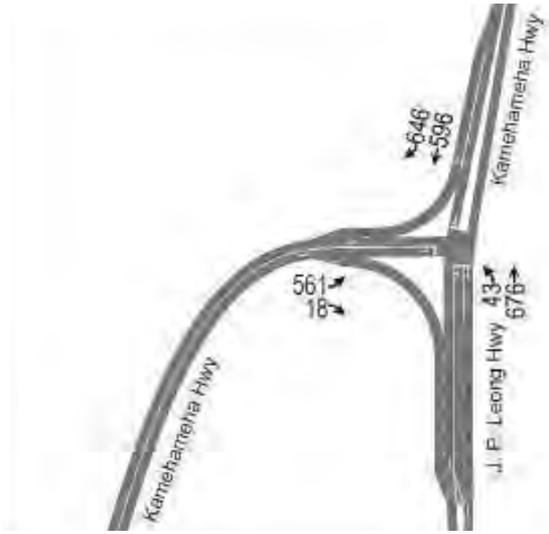
Figure 16. Cumulative AM Peak Hour Traffic FBO Alternative



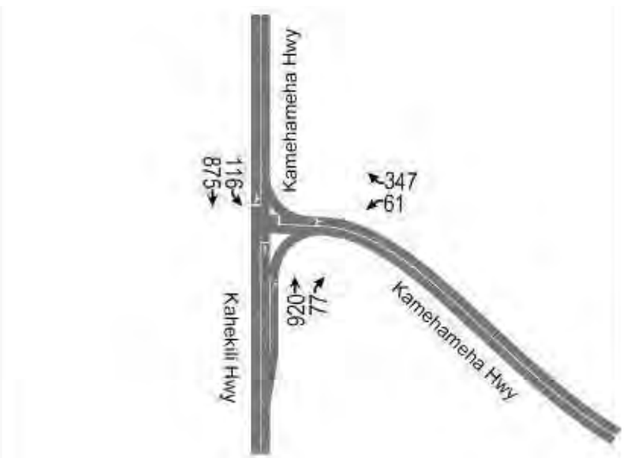
Legend

Lane Controls
137→ **Traffic Movement Volume (vph)**

Project Vicinity

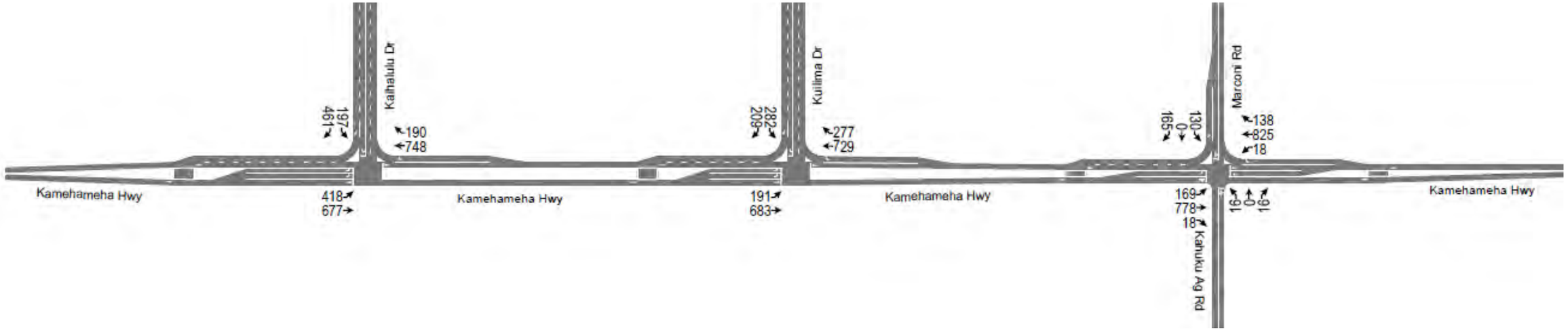


Haleiwa



Kahaluu

Figure 17. Cumulative PM Peak Hour Traffic FBO Alternative

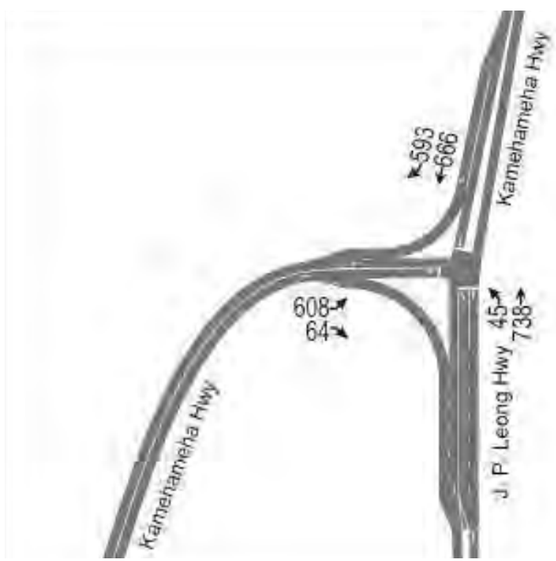


Project Vicinity

Legend

Lane Controls

137→ **Traffic Movement Volume (vph)**



Haleiwa

Kahaluu

Figure 18. Cumulative Weekend Peak Hour Traffic With FBO Alternative

3. Resort Residential Alternative

The Kaihalulu Drive, Kuilima Drive and Marconi Road intersections at Kamehameha Highway are expected to operate at overall LOS "B", during the peak hours of traffic with the Resort Residential (RR) Alternative. In Haleiwa, the intersection of Kamehameha Highway and Joseph P. Leong Highway also is expected to operate at LOS "B", during the peak hours of traffic. The left-turn movement from westbound Kamehameha Highway to southbound Kahekili Highway in Kahaluu is expected to continue to operate at LOS "F" during the peak hours of traffic with the Resort Residential Alternative. Figures 19, 20, and 21 depict the AM, PM, and Weekend assignment of site generated traffic for the Resort Residential Alternative. The cumulative AM, PM, and Weekend peak hour traffic volumes with the Resort Residential Alternative are depicted on Figures 22, 23, and 24, respectively.

The two-lane traffic analysis of Kamehameha Highway with the Resort Residential Alternative is summarized on Table 14. Table 15 summarizes the intersection analysis for the peak hours of traffic with the Resort Residential Alternative.

Table 14. Peak Hour Two-Lane Operations on Kamehameha Highway With Resort Residential Alternative

Peak Hour	Location	LOS	v/c
Weekday AM	Haleiwa	D	0.43
	Kahuku	D	0.34
	Kahaluu	D	0.55
Weekday PM	Haleiwa	D	0.57
	Kahuku	D	0.40
	Kahaluu	E	0.64
Weekend	Haleiwa	E	0.67
	Kahuku	D	0.54
	Kahaluu	E	0.69

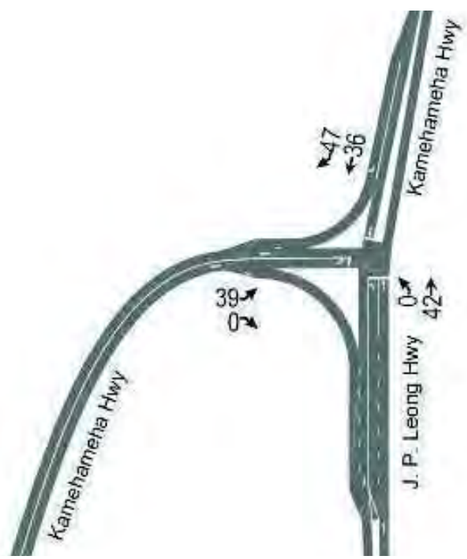
Table 15. Intersection Traffic Analysis Summary - 2025 Peak Hour Conditions With Resort Residential Alternative

Scenario	Kamehameha Hwy Intersection	MOE	EBLT	EBTH	EBRT	WBLT	WBTH	WBRT	NBLT	NBTH	NBRT	SBLT	SBTH	SBRT	Intersection
2025 AM Peak Hour of Weekday Traffic With Resort Residential Alternative	Kaihalulu Drive	LOS	C	B	N/A	N/A	C	A	N/A	N/A	N/A	B	N/A	A	B
		Delay	33.7	11.3	N/A	N/A	30.7	0.9	N/A	N/A	N/A	15.8	N/A	4.8	19.6
		v/c	0.57	0.48	N/A	N/A	0.77	0.12	N/A	N/A	N/A	0.10	N/A	0.23	N/A
	Kuilima Drive	LOS	C	A	N/A	N/A	B	A	N/A	N/A	N/A	B	N/A	A	B
		Delay	22.0	7.8	N/A	N/A	17.6	4.0	N/A	N/A	N/A	19.5	N/A	3.5	12.7
		v/c	0.28	0.42	N/A	N/A	0.59	0.21	N/A	N/A	N/A	0.37	N/A	0.20	N/A
	Marconi Rd	LOS	B	B		C	B	A	A			B		A	B
		Delay	19.3	10.7		22.8	12.9	0.2	1.1			17.7		0.5	11.2
		v/c	0.18	0.57		0.14	0.57	0.07	0.16			0.14		0.11	N/A
	Joseph P. Leong Hwy	LOS	C	N/A	A	N/A	N/A	N/A	C	B	N/A	N/A	B	A	B
		Delay	24.1	N/A	0.1	N/A	N/A	N/A	28.5	10.1	N/A	N/A	16.7	4.3	13.8
		v/c	0.69	N/A	0.05	N/A	N/A	N/A	0.33	0.37	N/A	N/A	0.39	0.47	N/A
	Kahekili Hwy	LOS	N/A	N/A	N/A	F			N/A	N/A	N/A	C	N/A	N/A	F
		Delay	N/A	N/A	N/A	>300			N/A	N/A	N/A	15.0	N/A	N/A	>300
		v/c	N/A	N/A	N/A	>1.2			N/A	N/A	N/A	0.65	N/A	N/A	N/A
2025 PM Peak Hour of Weekday Traffic With Resort Residential Alternative	Kaihalulu Drive	LOS	C	A	N/A	N/A	C	A	N/A	N/A	N/A	C	N/A	A	B
		Delay	33.7	9.0	N/A	N/A	26.2	0.1	N/A	N/A	N/A	23.9	N/A	7.4	18.2
		v/c	0.43	0.49	N/A	N/A	0.78	0.03	N/A	N/A	N/A	0.04	N/A	0.22	N/A
	Kuilima Drive	LOS	C	A	N/A	N/A	C	A	N/A	N/A	N/A	C	N/A	A	B
		Delay	26.7	7.0	N/A	N/A	20.9	3.8	N/A	N/A	N/A	21.6	N/A	4.8	14.0
		v/c	0.41	0.41	N/A	N/A	0.71	0.27	N/A	N/A	N/A	0.38	N/A	0.25	N/A
	Marconi Rd	LOS	C	B		C	B	A	A			B		A	B
		Delay	24.2	13.8		23.4	14.2	0.1	1.2			18.8		1.9	13.3
		v/c	0.24	0.64		0.18	0.67	0.06	0.16			0.21		0.15	N/A
	Joseph P. Leong Hwy	LOS	C	N/A	A	N/A	N/A	N/A	C	B	N/A	N/A	B	A	B
		Delay	29.0	N/A	0.1	N/A	N/A	N/A	31.5	12.0	N/A	N/A	16.8	3.5	14.9
		v/c	0.76	N/A	0.03	N/A	N/A	N/A	0.31	0.58	N/A	N/A	0.60	0.48	N/A
	Kahekili Hwy	LOS	N/A	N/A	N/A	F			N/A	N/A	N/A	B	N/A	N/A	B
		Delay	N/A	N/A	N/A	60.2			N/A	N/A	N/A	10.4	N/A	N/A	11.1
		v/c	N/A	N/A	N/A	0.92			N/A	N/A	N/A	0.12	N/A	N/A	N/A
2025 Weekend Peak Hour of Traffic With Resort Residential Alternative	Kaihalulu Drive	LOS	D	A	N/A	N/A	C	A	N/A	N/A	N/A	C	N/A	A	C
		Delay	47.6	8.8	N/A	N/A	34.2	0.9	N/A	N/A	N/A	33.0	N/A	7.9	22.8
		v/c	0.66	0.53	N/A	N/A	0.87	0.06	N/A	N/A	N/A	0.17	N/A	0.41	N/A
	Kuilima Drive	LOS	C	A	N/A	N/A	C	A	N/A	N/A	N/A	C	N/A	A	B
		Delay	34.8	9.2	N/A	N/A	25.9	3.4	N/A	N/A	N/A	28.3	N/A	6.8	17.8
		v/c	0.50	0.55	N/A	N/A	0.79	0.26	N/A	N/A	N/A	0.54	N/A	0.29	N/A
	Marconi Rd	LOS	C	B		C	C	A	A			C		A	B
		Delay	33.4	10.4		33.8	22.7	3.1	1.0			27.3		7.9	16.8
		v/c	0.49	0.60		0.20	0.79	0.15	0.13			0.36		0.32	N/A
	Joseph P. Leong Hwy	LOS	C	N/A	A	N/A	N/A	N/A	D	B	N/A	N/A	C	A	B
		Delay	31.9	N/A	0.7	N/A	N/A	N/A	48.2	16.3	N/A	N/A	26.5	5.3	19.8
		v/c	0.84	N/A	0.09	N/A	N/A	N/A	0.58	0.66	N/A	N/A	0.72	0.63	N/A
	Kahekili Hwy	LOS	N/A	N/A	N/A	F			N/A	N/A	N/A	B	N/A	N/A	C
		Delay	N/A	N/A	N/A	128.3			N/A	N/A	N/A	10.6	N/A	N/A	19.0
		v/c	N/A	N/A	N/A	1.11			N/A	N/A	N/A	0.14	N/A	N/A	N/A

Legend

Lane Controls
137→ **Traffic Movement Volume (vph)**

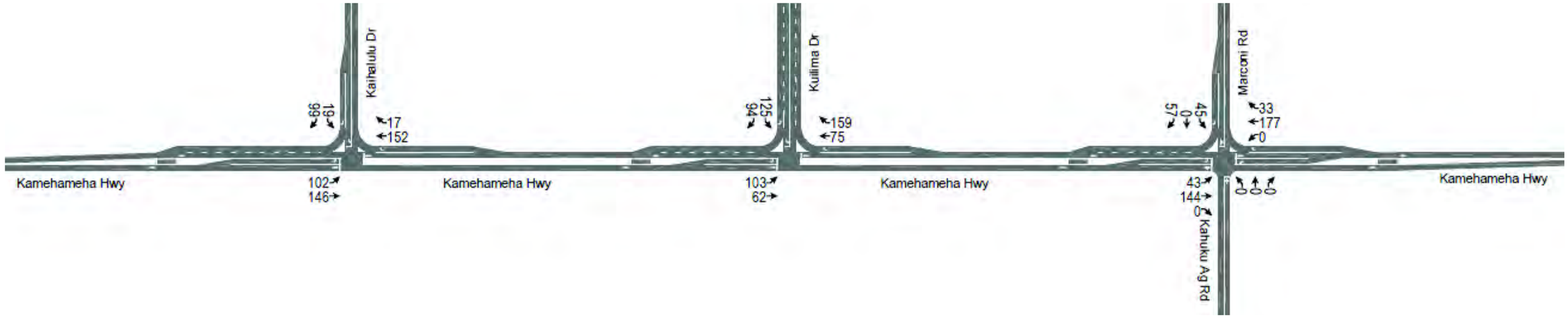
Project Vicinity



Haleiwa

Kahaluu

Figure 19. AM Peak Hour Site Traffic Assignment – Resort Residential Alternative

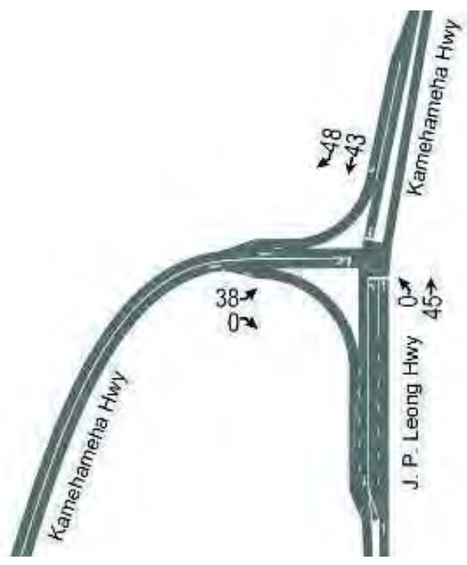


Project Vicinity

Legend

Lane Controls

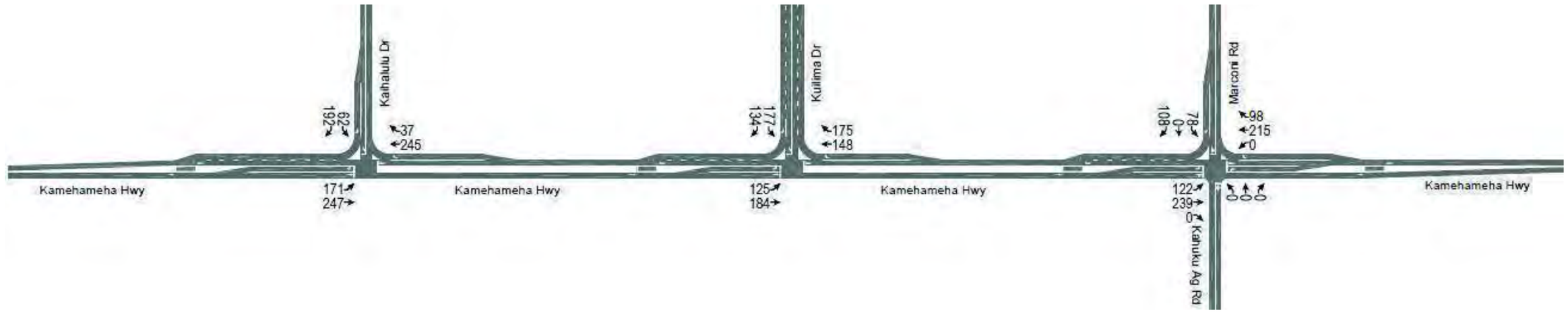
137 **Traffic Movement Volume (vph)**



Haleiwa

Kahaluu

Figure 20. PM Peak Hour Site Traffic Assignment – Resort Residential Alternative

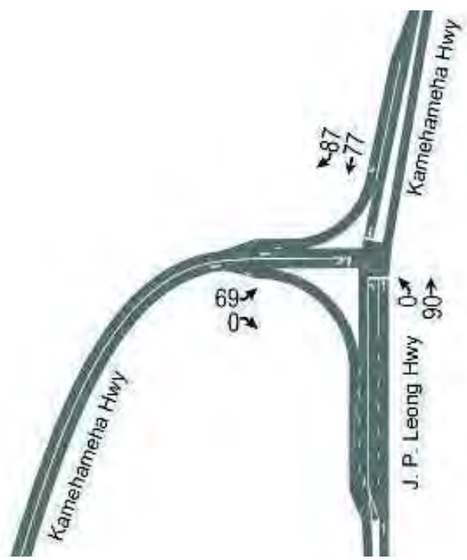


Project Vicinity

Legend

Lane Controls

137→ **Traffic Movement Volume (vph)**



Haleiwa

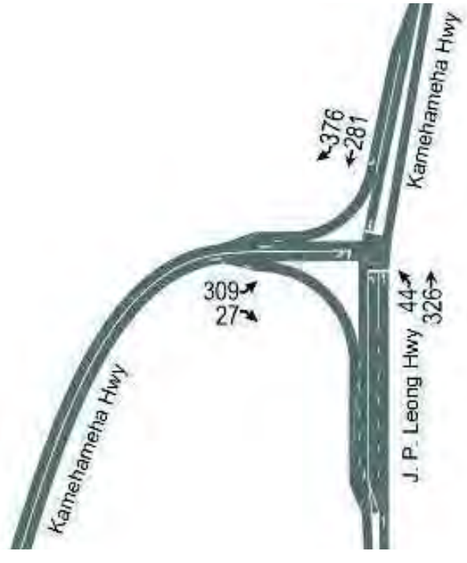
Kahaluu

Figure 21. Weekend Peak Hour Site Traffic Assignment – Resort Residential Alternative

Legend

Lane Controls
137→ **Traffic Movement Volume (vph)**

Project Vicinity



Haleiwa

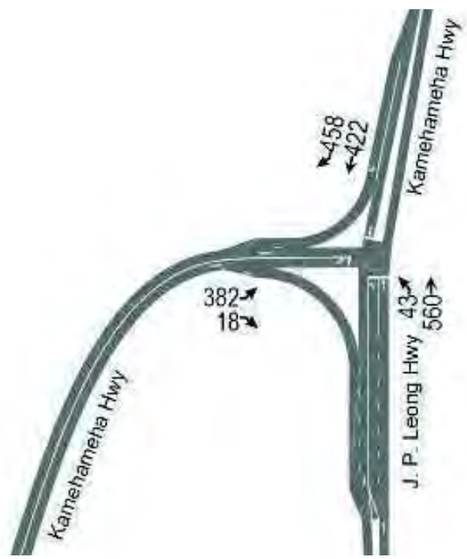
Kahaluu

Figure 22. Cumulative AM Peak Hour Traffic – Resort Residential Alternative

Legend

Lane Controls
137→ **Traffic Movement Volume (vph)**

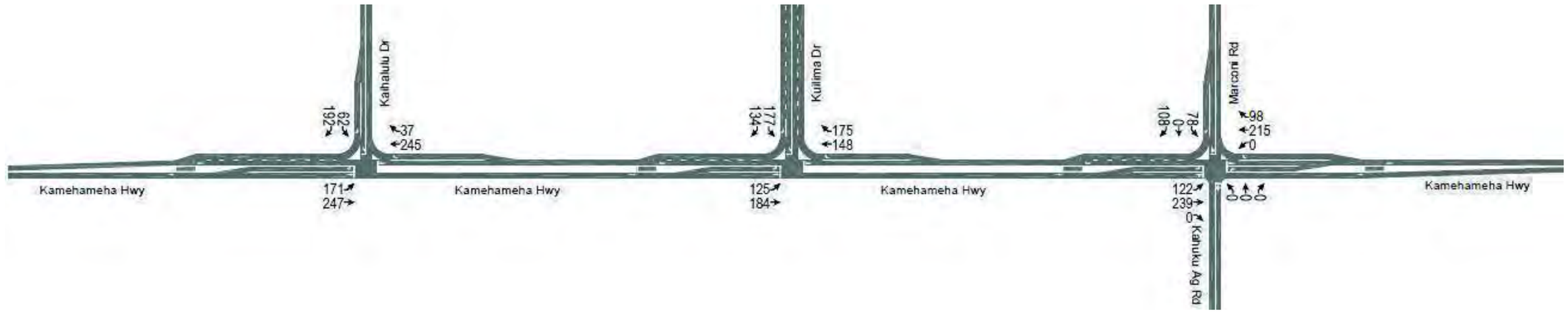
Project Vicinity



Haleiwa

Kahaluu

Figure 23. Cumulative PM Peak Hour Traffic – Resort Residential Alternative



Project Vicinity

Legend

Lane Controls

137→ **Traffic Movement Volume (vph)**

Haleiwa

Kahaluu

Figure 24. Cumulative Weekend Peak Hour Traffic – Resort Residential Alternative

4. Conservation Partner Alternative

The Kamehameha Highway intersections at Kaihalulu Drive, Kuilima Drive, and Marconi Road are expected to operate at overall LOS "C" or better, during the peak hours of traffic with the Conservation Partner (CP) Alternative. The intersection of Kamehameha Highway and Joseph P. Leong Highway is expected to operate at LOS "C" or better, during the peak hours of traffic. The left-turn movement from westbound Kamehameha Highway to southbound Kahekili Highway is expected to operate at LOS "F" during the peak hours of traffic.

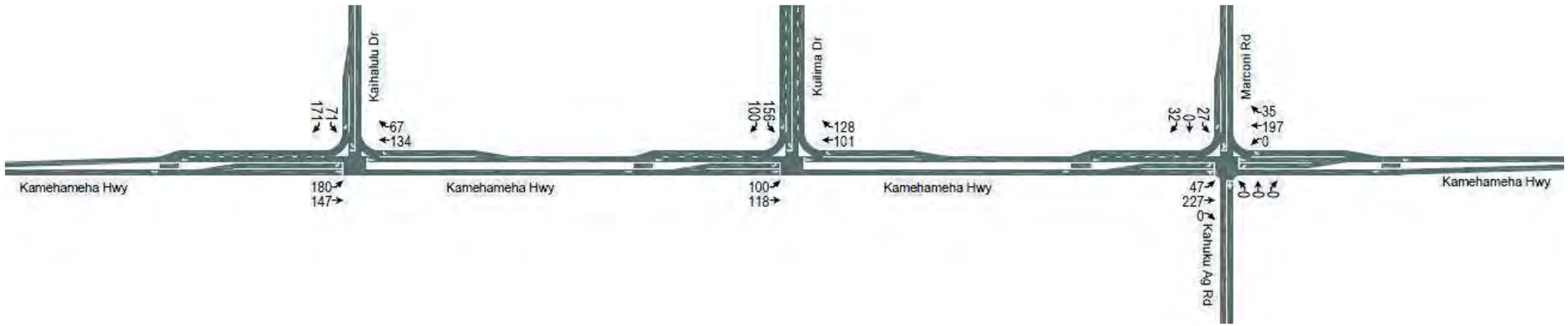
Table 16 summarizes the two-lane traffic analysis of Kamehameha Highway with the Conservation Partner Alternative. Table 17 summarizes the intersection analysis for the peak hours of traffic with the Conservation Partner Alternative. The AM, PM, and Weekend peak hour assignment of site traffic with the Conservation Alternative are depicted on Figures 25, 26, and 27, respectively. Figures 28, 29, and 30 depict the cumulative AM, PM, and Weekend peak hour traffic volumes, respectively, with the Conservation Partner Alternative.

Table 16. Peak Hour Two-Lane Operations on Kamehameha Highway With Conservation Partner Alternative

Peak Hour	Location	LOS	v/c
Weekday AM	Haleiwa	D	0.46
	Kahuku	D	0.37
	Kahaluu	D	0.56
Weekday PM	Haleiwa	E	0.60
	Kahuku	D	0.44
	Kahaluu	E	0.65
Weekend	Haleiwa	E	0.70
	Kahuku	D	0.57
	Kahaluu	E	0.70

Table 17. Intersection Traffic Analysis Summary - 2025 Peak Hour Conditions With Conservation Partner Alternative

Scenario	Kamehameha Hwy Intersection	MOE	EBLT	EBTH	EBRT	WBLT	WBTH	WBRT	NBLT	NBTH	NBRT	SBLT	SBTH	SBRT	Intersection
2025 AM Peak Hour of Weekday Traffic With Conservation Partner Alternative	Kaihalulu Drive	LOS	C	A	N/A	N/A	C	A	N/A	N/A	N/A	C	N/A	A	B
		Delay	33.9	9.0	N/A	N/A	30.2	2.4	N/A	N/A	N/A	21.1	N/A	5.9	19.0
		v/c	0.62	0.42	N/A	N/A	0.76	0.14	N/A	N/A	N/A	0.17	N/A	0.34	N/A
	Kuilima Drive	LOS	C	A	N/A	N/A	C	A	N/A	N/A	N/A	C	N/A	A	B
		Delay	24.7	7.8	N/A	N/A	20.5	4.4	N/A	N/A	N/A	21.1	N/A	4.9	14.1
		v/c	0.37	0.41	N/A	N/A	0.64	0.25	N/A	N/A	N/A	0.43	N/A	0.25	N/A
	Marconi Rd	LOS	C	B		C	B	A	A			B		A	B
		Delay	20.4	10.3		22.7	12.6	0.2	1.2			17.7		0.4	11.0
		v/c	0.19	0.57		0.14	0.59	0.06	0.16			0.13		0.09	N/A
	Joseph P. Leong Hwy	LOS	C	N/A	A	N/A	N/A	N/A	C	B	N/A	N/A	B	A	B
		Delay	23.5	N/A	0.1	N/A	N/A	N/A	28.2	11.1	N/A	N/A	18.0	4.7	14.3
		v/c	0.70	N/A	0.05	N/A	N/A	N/A	0.33	0.42	N/A	N/A	0.44	0.51	N/A
	Kahekili Hwy	LOS	N/A	N/A	N/A	F			N/A	N/A	N/A	C	N/A	N/A	F
		Delay	N/A	N/A	N/A	>300			N/A	N/A	N/A	15.5	N/A	N/A	<300
		v/c	N/A	N/A	N/A	>1.2			N/A	N/A	N/A	0.66	N/A	N/A	N/A
2025 PM Peak Hour of Weekday Traffic With Conservation Partner Alternative	Kaihalulu Drive	LOS	D	A	N/A	N/A	C	A	N/A	N/A	N/A	C	N/A	A	C
		Delay	40.1	8.5	N/A	N/A	31.4	1.8	N/A	N/A	N/A	27.1	N/A	7.3	20.9
		v/c	0.61	0.45	N/A	N/A	0.82	0.09	N/A	N/A	N/A	0.11	N/A	0.34	N/A
	Kuilima Drive	LOS	C	A	N/A	N/A	C	A	N/A	N/A	N/A	C	N/A	A	B
		Delay	31.1	7.4	N/A	N/A	23.1	3.8	N/A	N/A	N/A	22.5	N/A	6.2	15.4
		v/c	0.49	0.42	N/A	N/A	0.74	0.31	N/A	N/A	N/A	0.44	N/A	0.29	N/A
	Marconi Rd	LOS	C	B		C	B	A	A			B		A	B
		Delay	24.1	13.1		26.1	15.9	0.1	1.3			19.2		1.5	13.9
		v/c	0.22	0.65		0.23	0.73	0.05	0.17			0.19		0.15	N/A
	Joseph P. Leong Hwy	LOS	C	N/A	A	N/A	N/A	N/A	C	B	N/A	N/A	B	A	B
		Delay	30.2	N/A	0.1	N/A	N/A	N/A	31.8	11.2	N/A	N/A	18.5	3.6	15.5
		v/c	0.78	N/A	0.03	N/A	N/A	N/A	0.31	0.51	N/A	N/A	0.65	0.51	N/A
	Kahekili Hwy	LOS	N/A	N/A	N/A	F			N/A	N/A	N/A	B	N/A	N/A	B
		Delay	N/A	N/A	N/A	71.7			N/A	N/A	N/A	10.5	N/A	N/A	13.1
		v/c	N/A	N/A	N/A	0.97			N/A	N/A	N/A	0.12	N/A	N/A	N/A
2025 Weekend Peak Hour of Traffic With Conservation Partner Alternative	Kaihalulu Drive	LOS	D	A	N/A	N/A	C	A	N/A	N/A	N/A	D	N/A	A	C
		Delay	50.4	8.1	N/A	N/A	34.9	2.9	N/A	N/A	N/A	35.4	N/A	8.4	23.4
		v/c	0.73	0.52	N/A	N/A	0.88	0.09	N/A	N/A	N/A	0.23	N/A	0.48	N/A
	Kuilima Drive	LOS	D	B	N/A	N/A	C	A	N/A	N/A	N/A	C	N/A	A	C
		Delay	46.3	10.0	N/A	N/A	32.9	3.4	N/A	N/A	N/A	26.5	N/A	6.0	20.7
		v/c	0.68	0.53	N/A	N/A	0.86	0.30	N/A	N/A	N/A	0.48	N/A	0.32	N/A
	Marconi Rd	LOS	C	B		C	C	A	A			C		A	B
		Delay	33.4	10.5		31.7	23.7	2.9	1.1			28.0		8.3	17.2
		v/c	0.48	0.61		0.16	0.81	0.14	0.13			0.34		0.31	N/A
	Joseph P. Leong Hwy	LOS	C	N/A	A	N/A	N/A	N/A	D	B	N/A	N/A	C	A	C
		Delay	34.4	N/A	0.7	N/A	N/A	N/A	49.1	17.7	N/A	N/A	28.8	5.5	21.3
		v/c	0.87	N/A	0.09	N/A	N/A	N/A	0.58	0.70	N/A	N/A	0.77	0.65	N/A
	Kahekili Hwy	LOS	N/A	N/A	N/A	F			N/A	N/A	N/A	B	N/A	N/A	F
		Delay	N/A	N/A	N/A	>300			N/A	N/A	N/A	11.8	N/A	N/A	89.7
		v/c	N/A	N/A	N/A	>1.2			N/A	N/A	N/A	0.19	N/A	N/A	N/A

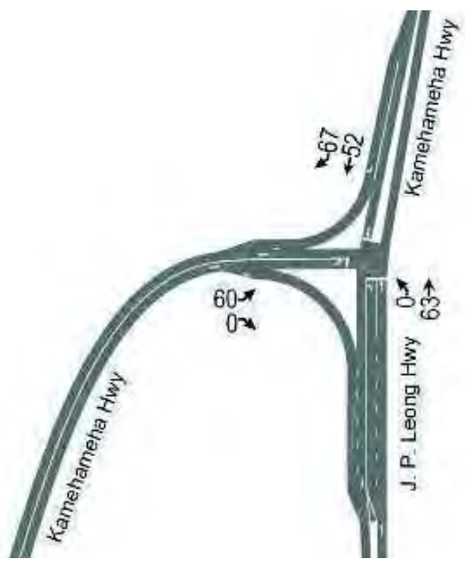


Legend

Lane Controls

137→ **Traffic Movement Volume (vph)**

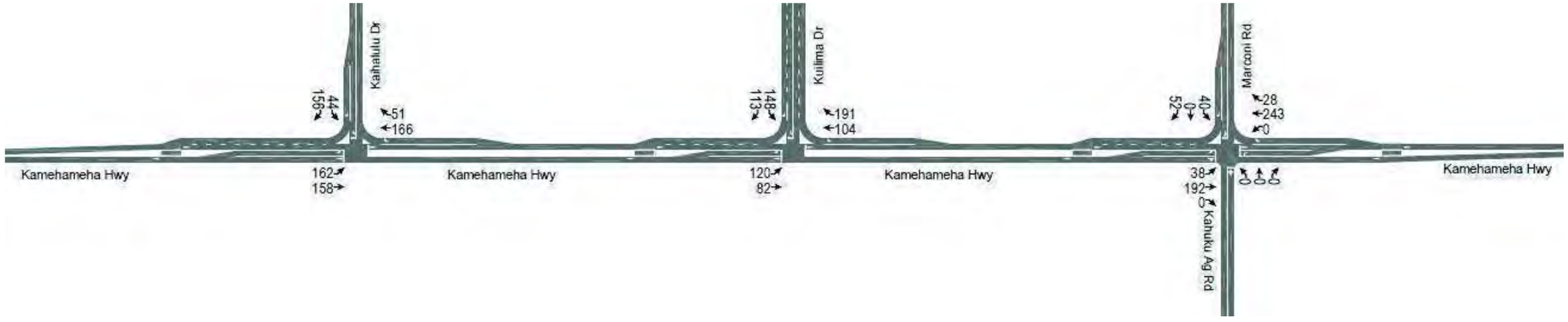
Project Vicinity



Haleiwa

Kahaluu

Figure 25. AM Peak Hour Site Traffic Assignment – Conservation Partner Alternative

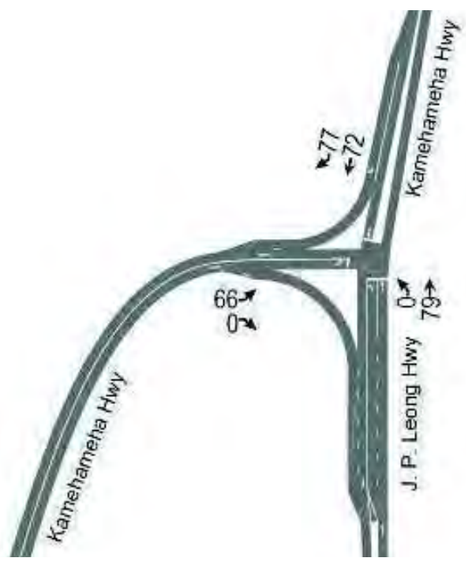


Project Vicinity

Legend

Lane Controls

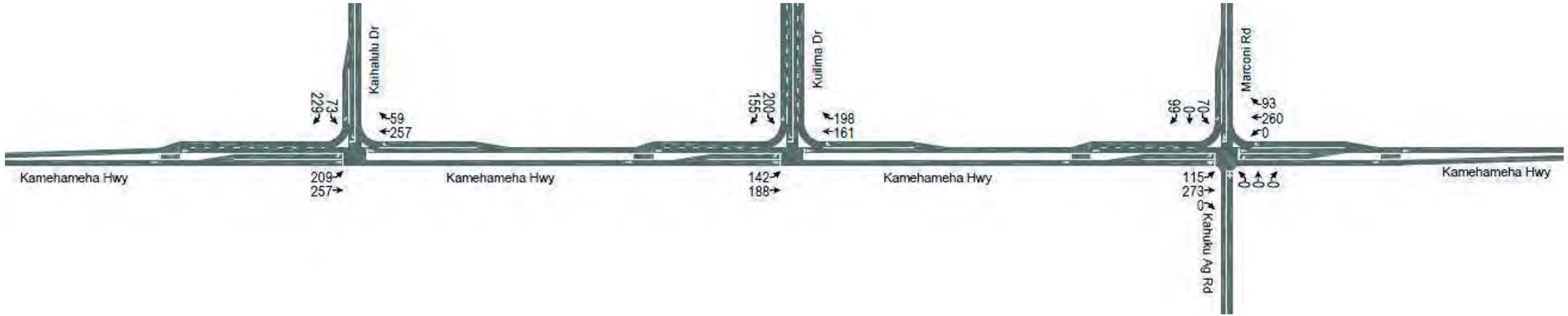
137→ **Traffic Movement Volume (vph)**



Haleiwa

Kahaluu

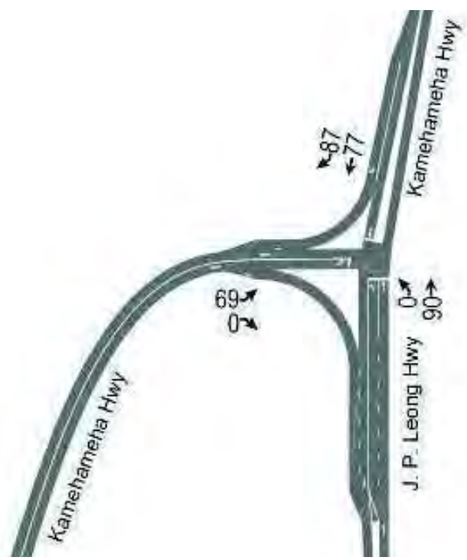
Figure 26. PM Peak Hour Site Traffic Assignment – Conservation Partner Alternative



Project Vicinity

Legend

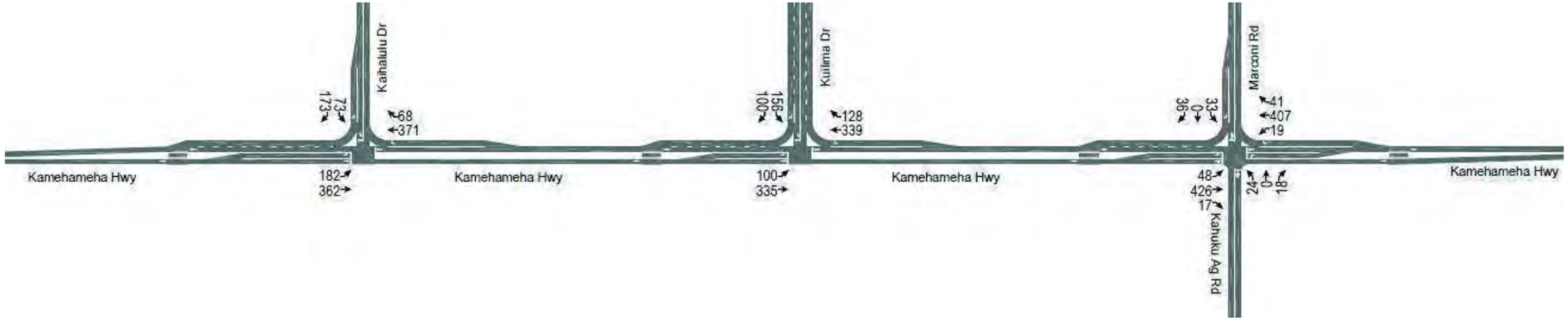
Lane Controls
137 **Traffic Movement Volume (vph)**



Haleiwa

Kahaluu

Figure 27. Weekend Peak Hour Site Traffic Assignment – Conservation Partner Alternative

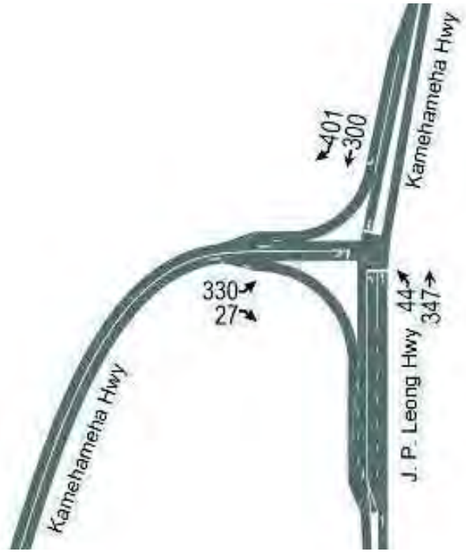


Legend

Lane Controls

137→ **Traffic Movement Volume (vph)**

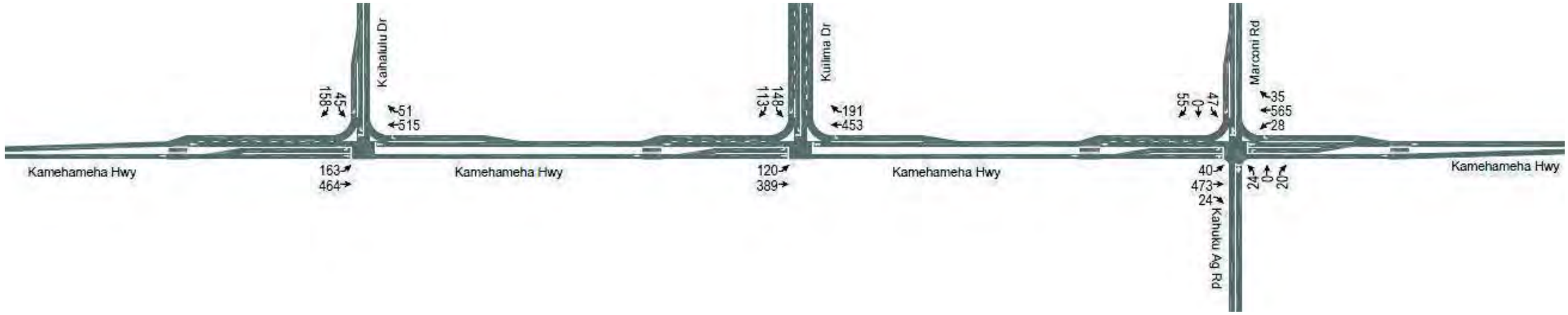
Project Vicinity



Haleiwa

Kahaluu

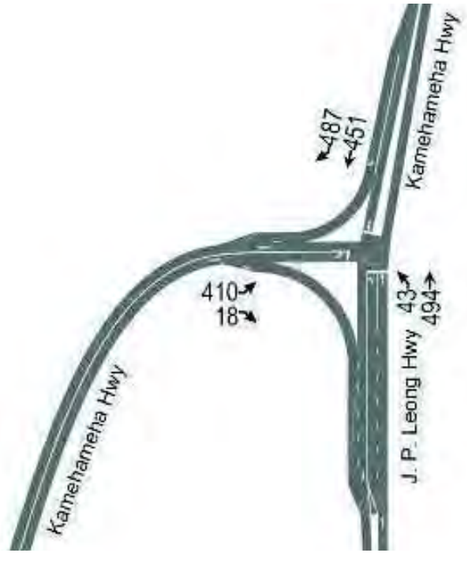
Figure 28. Cumulative AM Peak Hour Traffic – Conservation Partner Alternative



Legend

Lane Controls
137→ **Traffic Movement Volume (vph)**

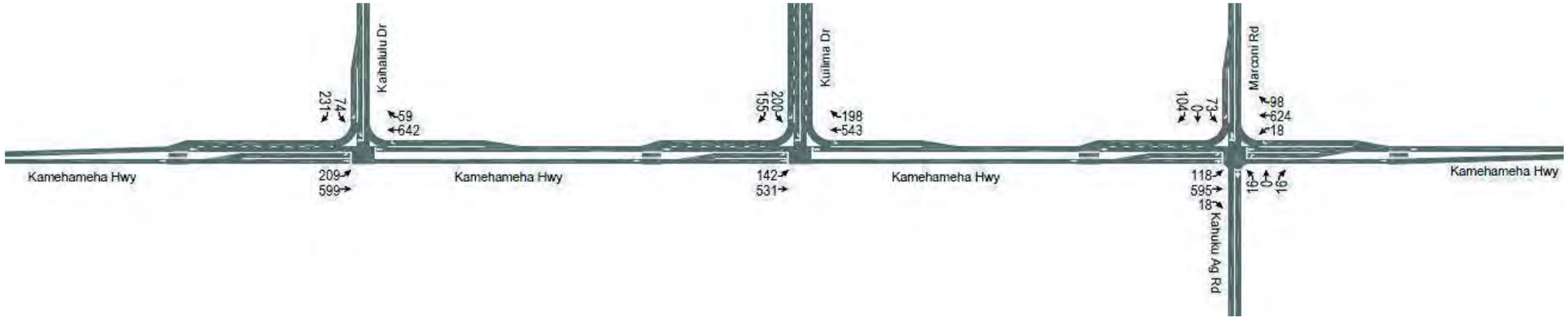
Project Vicinity



Haleiwa

Kahaluu

Figure 29. Cumulative PM Peak Hour Traffic – Conservation Partner Alternative

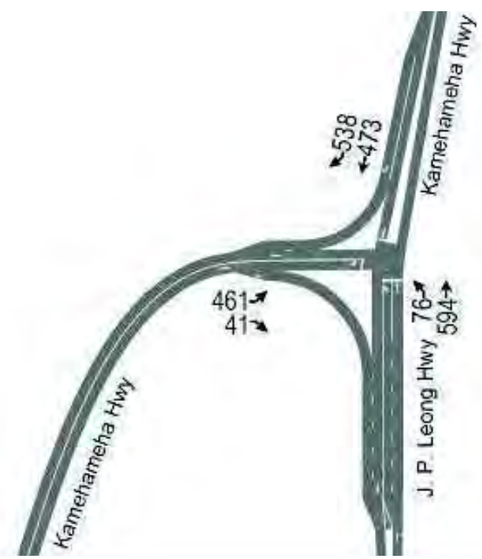


Legend

Lane Controls

137→ **Traffic Movement Volume (vph)**

Project Vicinity



Haleiwa

Kahaluu

Figure 30. Cumulative Weekend Peak Hour Traffic – Conservation Partner Alternative

C. Traffic Impact Analysis of the Proposed Action

1. Proposed Action Phasing

The purpose of analyzing the phasing of a long term development is to coordinate the proposed traffic improvements with the development schedule of the project. The development of the Proposed Action is expected to span eleven (11) years, from the Year 2015 through the Year 2025, which was based upon a market analysis prepared by HVS International Consulting and Evaluation.

In the first year of development, units on Parcels RR-1, RR-2a, RR-2b, H-1a, RR-5, RR-6, RES-1, and RES-2 are expected to begin occupancy. The first occupancy of Parcels RR-1, RR-2a, and RR-2b will require access on Kamehameha Highway at Kaihalulu Drive and the channelization improvements at the intersection. The initial development of Parcel H-1a will require the channelization improvements at the intersection of Kuilima Drive and Kamehameha Highway. Traffic signalization also will be necessary during the initial phase of development, since the intersection meets the MUTCD Warrant under existing conditions. When the first units are developed and become occupied, Parcels RR-5, RR-6, RES-1, and RES-2 will require the channelization improvements at the intersection of Marconi Road and Kamehameha Highway.

Because the Proposed Action is expected to start development on various Parcels across the entire Resort during the first year of occupancy, the previously discussed Kamehameha Highway channelization improvements at Kaihalulu Drive, Kuilima Drive, and Marconi Road are expected to be constructed in the first year of occupancy. Furthermore, Kaihalulu Drive also is expected to be constructed between Kamehameha Highway and Marconi Road during the first year of occupancy. This internal roadway would provide traffic circulation within the Resort, and minimize the Resort traffic demands on Kamehameha Highway.

The signalization of Kaihalulu Drive at Kamehameha Highway is <u>not</u> expected to be warranted until the final year of development. The traffic signals at Marconi Road and Kamehameha Highway are expected to become warranted when access to the Kahuku Mauka Agricultural Lots is constructed (by others) from Kamehameha Highway, opposite Marconi Road. As previously discussed, the Kahuku Mauka Agricultural Lots project is currently on hold. Since the traffic improvements for the Proposed Action are expected to be required only during the first year and the final year of development, the traffic impacts of the Proposed Action were analyzed at its completion.

The actual phasing of the development of the Proposed Action will be subject to future market and economic conditions. This traffic impact analysis report will be updated, as necessary, to coordinate the traffic improvements with any changes to the project schedule to the satisfaction of DOT and the City and County of Honolulu.

2. Year 2025 AM Peak Hour Traffic Analysis With the Proposed Action

The Kaihalulu Drive, Kuilima Drive, and Marconi Road intersections at Kamehameha Highway are expected to operate at LOS "B", during the Year 2025 AM peak hour of traffic with the Proposed Action. The individual traffic movements at all three intersections are expected to operate at LOS "C" or better. The AM peak hour site-generated traffic assignment for the Proposed Action is depicted on Figure 31. Figure 32 depicts the cumulative AM peak hour traffic with the Proposed Action.

3. Year 2025 PM Peak Hour Traffic Analysis With the Proposed Action

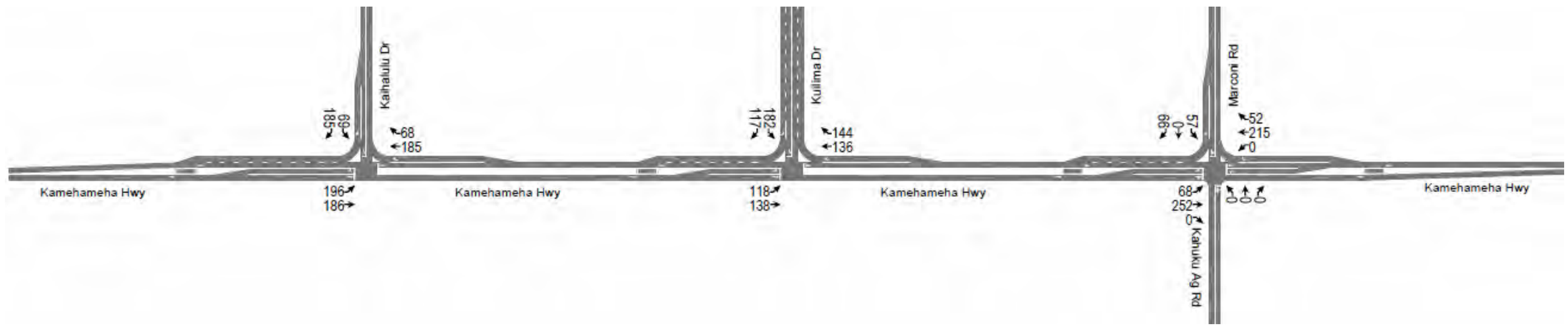
During the Year 2025 PM peak hour of traffic with the Proposed Action, the intersection of Kamehameha Highway and Kaihalulu Drive is expected to operate at LOS "C". The left-turn movement from eastbound Kamehameha Highway is expected to operate at LOS "D". The other traffic movements at the Kaihalulu Drive intersection are expected to operate at satisfactory Levels of Service.

The Kuilima Drive and Marconi Road intersections are expected to operate at overall LOS "B" at Kamehameha Highway, during the Year 2025 PM peak hour of traffic with the Proposed Action. The individual traffic movements at both intersections are expected to operate at satisfactory Levels of Service. Figure 33 depicts the PM peak hour site-generated traffic assignment for the Proposed Action. The cumulative PM peak hour traffic with the Proposed Action is depicted on Figure 34.

4. Year 2025 Weekend Peak Hour Traffic Analysis With the Proposed Action

The intersection of Kaihalulu Drive and Kamehameha Highway is expected to operate at an intersection LOS "C". The eastbound left-turn movement, westbound through movement, and the southbound left-turn movement are expected to operate at LOS "D".

During the Year 2025 Weekend peak hour of traffic with the Proposed Action, the Kuilima Drive and Marconi Road intersections are expected to operate at an overall LOS "C" at Kamehameha Highway. The left-turn movements from Kamehameha Highway are expected to operate LOS "D". The other traffic movements at the intersections are expected to operate at satisfactory Levels of Service. Figure 35 depicts the Weekend peak hour site-generated traffic assignment for the Proposed Action. The cumulative Weekend peak hour traffic with the Proposed Action is depicted on Figure 36. Table 18 summarizes the intersection analysis for the peak hours of traffic with the Proposed Action.



Project Vicinity

Legend

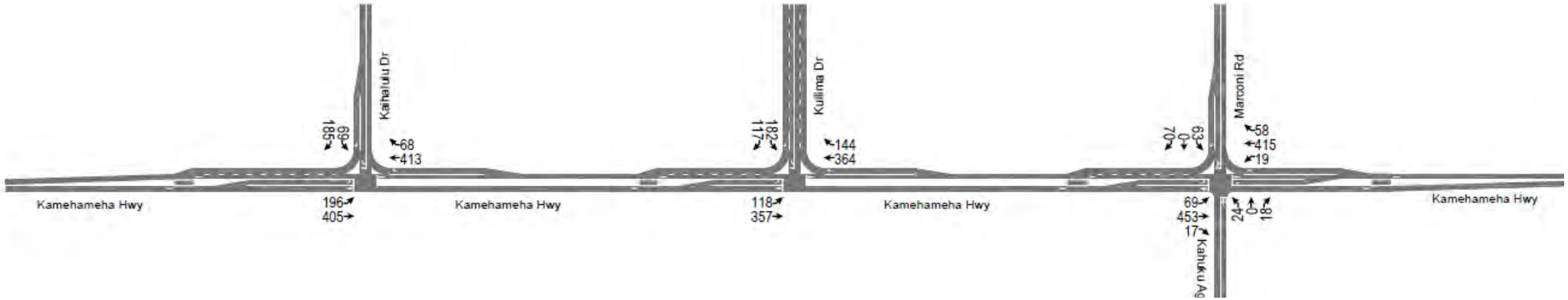
Lane Controls

137→ **Traffic Movement Volume (vph)**

Haleiwa

Kahaluu

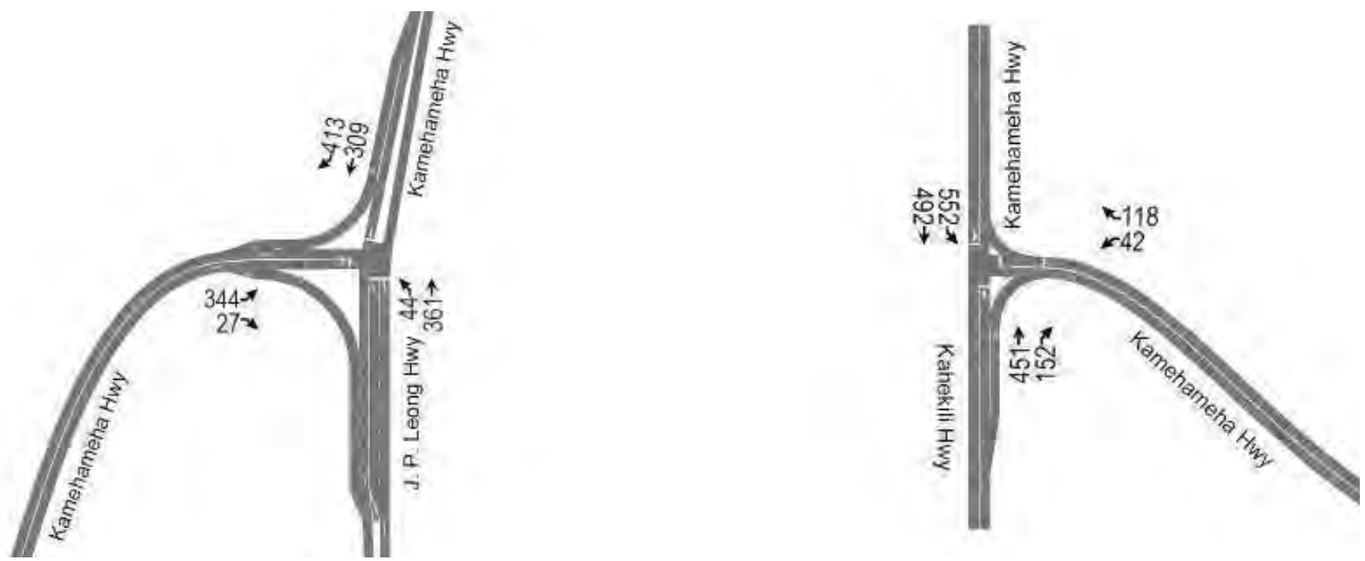
Figure 31. AM Peak Hour Site Traffic Assignment – Proposed Action



Legend

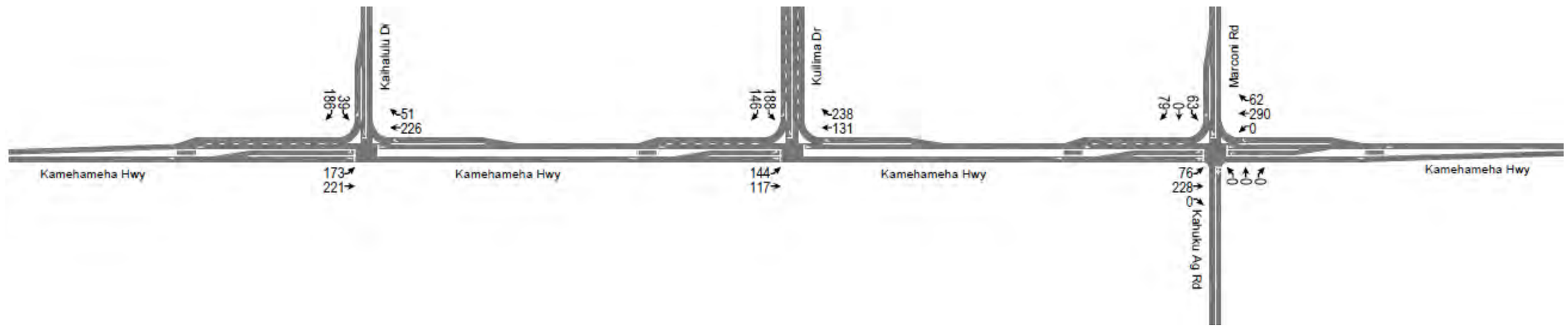
Lane Controls
137→ **Traffic Movement Volume (vph)**

Project Vicinity



Haleiwa **Kahaluu**

Figure 32. Cumulative AM Peak Hour Traffic – Proposed Action



Legend

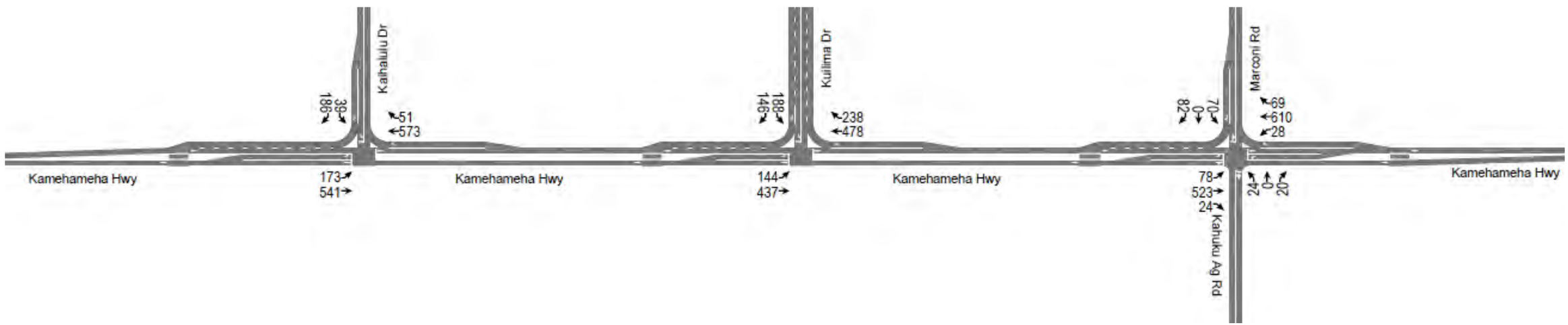
Lane Controls
137→ **Traffic Movement Volume (vph)**

Project Vicinity

Haleiwa

Kahaluu

Figure 33. PM Peak Hour Site Traffic Assignment – Proposed Action



Project Vicinity

Legend

Lane Controls

137→ **Traffic Movement Volume (vph)**

Haleiwa

Kahaluu

Figure 34. Cumulative PM Peak Hour Traffic – Proposed Action

Project Vicinity

Legend

Lane Controls

137→ **Traffic Movement Volume (vph)**

Haleiwa

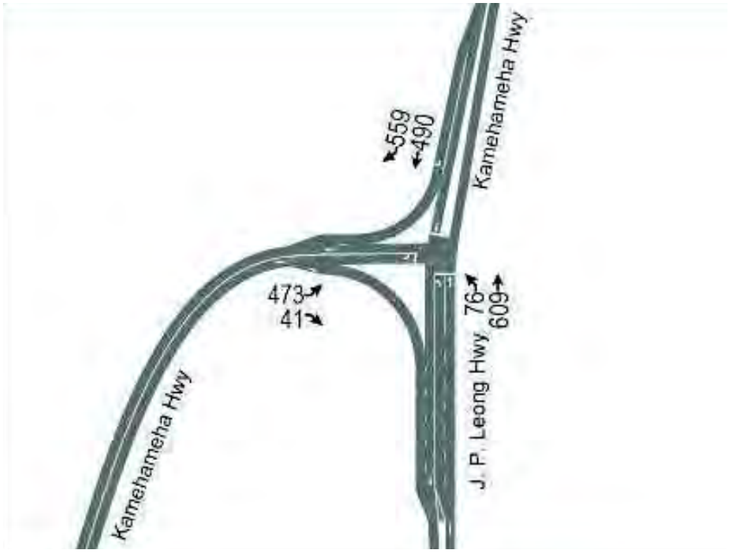
Kahaluu

Figure 35. Weekend Peak Hour Site Traffic Assignment – Proposed Action

Legend

Lane Controls
137→ **Traffic Movement Volume (vph)**

Project Vicinity



Haleiwa

Kahaluu

Figure 36. Cumulative Weekend Peak Hour Traffic – Proposed Action

Table 18. Intersection Traffic Analysis Summary - 2025 Peak Hour Conditions With Proposed Action

Scenario	Kamehameha Hwy Intersection	MOE	EBLT	EBTH	EBRT	WBLT	WBTH	WBRT	NBLT	NBTH	NBRT	SBLT	SBTH	SBRT	Intersection
2025 AM Peak Hour of Weekday Traffic With Proposed Action	Kaihalulu Drive	LOS	C	A	N/A	N/A	C	A	N/A	N/A	N/A	C	N/A	A	B
		Delay	34.2	8.7	N/A	N/A	32.4	3.4	N/A	N/A	N/A	24.6	N/A	6.7	20.1
		v/c	0.62	0.44	N/A	N/A	0.79	0.14	N/A	N/A	N/A	0.17	N/A	0.37	N/A
	Kuilima Drive	LOS	C	A	N/A	N/A	C	A	N/A	N/A	N/A	C	N/A	A	B
		Delay	27.7	8.6	N/A	N/A	22.2	4.4	N/A	N/A	N/A	21.9	N/A	5.9	15.4
		v/c	0.44	0.44	N/A	N/A	0.68	0.27	N/A	N/A	N/A	0.48	N/A	0.28	N/A
	Marconi Rd	LOS	C	B		C	B	A	A			B		A	B
		Delay	24.3	11.9		25.2	15.2	0.7	1.2			19.4		2.7	12.9
		v/c	0.30	0.62		0.16	0.63	0.09	0.16			0.25		0.18	N/A
	Joseph P. Leong Hwy	LOS	C	N/A	A	N/A	N/A	N/A	D	B	N/A	N/A	B	A	B
		Delay	25.0	N/A	0.1	N/A	N/A	N/A	42.7	11.2	N/A	N/A	16.4	4.2	14.8
		v/c	0.72	N/A	0.05	N/A	N/A	N/A	0.51	0.42	N/A	N/A	0.43	0.50	N/A
	Kahekili Hwy	LOS	N/A	N/A	N/A	F			N/A	N/A	N/A	C	N/A	N/A	F
		Delay	N/A	N/A	N/A	>300			N/A	N/A	N/A	20.3	N/A	N/A	57.9
		v/c	N/A	N/A	N/A	>1.2			N/A	N/A	N/A	0.77	N/A	N/A	N/A
2025 PM Peak Hour of Weekday Traffic With Proposed Action	Kaihalulu Drive	LOS	D	A	N/A	N/A	C	A	N/A	N/A	N/A	C	N/A	A	C
		Delay	44.8	9.0	N/A	N/A	32.9	1.7	N/A	N/A	N/A	28.4	N/A	7.4	21.8
		v/c	0.66	0.51	N/A	N/A	0.85	0.08	N/A	N/A	N/A	0.10	N/A	0.39	N/A
	Kuilima Drive	LOS	C	A	N/A	N/A	C	A	N/A	N/A	N/A	C	N/A	A	B
		Delay	34.0	7.9	N/A	N/A	24.1	3.7	N/A	N/A	N/A	28.0	N/A	6.9	16.6
		v/c	0.53	0.45	N/A	N/A	0.74	0.36	N/A	N/A	N/A	0.54	N/A	0.35	N/A
	Marconi Rd	LOS	C	B		C	C	A	A			C		A	B
		Delay	31.7	11.9		32.5	21.3	1.9	3.3			29.7		8.4	16.9
		v/c	0.33	0.59		0.20	0.79	0.10	0.20			0.33		0.26	N/A
	Joseph P. Leong Hwy	LOS	C	N/A	A	N/A	N/A	N/A	C	B	N/A	N/A	B	A	B
		Delay	31.2	N/A	0.1	N/A	N/A	N/A	32.0	11.8	N/A	N/A	19.6	3.7	16.3
		v/c	0.80	N/A	0.03	N/A	N/A	N/A	0.31	0.54	N/A	N/A	0.67	0.52	N/A
	Kahekili Hwy	LOS	N/A	N/A	N/A	F			N/A	N/A	N/A	B	N/A	N/A	E
		Delay	N/A	N/A	N/A	284.0			N/A	N/A	N/A	11.0	N/A	N/A	49.3
		v/c	N/A	N/A	N/A	>1.2			N/A	N/A	N/A	0.15	N/A	N/A	N/A
2025 Weekend Peak Hour of Traffic With Proposed Action	Kaihalulu Drive	LOS	D	A	N/A	N/A	D	A	N/A	N/A	N/A	D	N/A	A	C
		Delay	53.7	7.9	N/A	N/A	38.2	3.9	N/A	N/A	N/A	41.4	N/A	9.4	25.3
		v/c	0.76	0.55	N/A	N/A	0.90	0.09	N/A	N/A	N/A	0.28	N/A	0.53	N/A
	Kuilima Drive	LOS	D	A	N/A	N/A	C	A	N/A	N/A	N/A	C	N/A	A	C
		Delay	48.9	9.4	N/A	N/A	33.3	3.4	N/A	N/A	N/A	33.1	N/A	6.7	21.7
		v/c	0.73	0.55	N/A	N/A	0.87	0.32	N/A	N/A	N/A	0.67	N/A	0.39	N/A
	Marconi Rd	LOS	D	B		D	C	A	A			C		A	C
		Delay	44.4	10.6		41.6	29.0	2.9	1.2			33.1		8.3	20.4
		v/c	0.66	0.60		0.26	0.87	0.17	0.14			0.48		0.38	N/A
	Joseph P. Leong Hwy	LOS	C	N/A	A	N/A	N/A	N/A	D	B	N/A	N/A	C	A	C
		Delay	33.5	N/A	1.2	N/A	N/A	N/A	47.0	19.9	N/A	N/A	32.0	5.7	22.2
		v/c	0.86	N/A	0.09	N/A	N/A	N/A	0.53	0.71	N/A	N/A	0.78	0.66	N/A
	Kahekili Hwy	LOS	N/A	N/A	N/A	F			N/A	N/A	N/A	B	N/A	N/A	F
		Delay	N/A	N/A	N/A	>300			N/A	N/A	N/A	11.9	N/A	N/A	95.3
		v/c	N/A	N/A	N/A	>1.2			N/A	N/A	N/A	0.19	N/A	N/A	N/A

5. Year 2025 Regional Traffic Analysis With the Proposed Action

Table 19 summarizes the regional traffic analysis of Kamehameha Highway with the Proposed Action.

Table 19. 2025 Peak Hour Two-Lane Operations on Kamehameha Highway With the Proposed Action

Peak Hour	Location	LOS	v/c
Weekday AM	Haleiwa	D	0.48
	Kahuku	D	0.41
	Kahaluu	D	0.57
Weekday PM	Haleiwa	E	0.63
	Kahuku	D	0.50
	Kahaluu	E	0.66
Weekend	Haleiwa	E	0.72
	Kahuku	E	0.63
	Kahaluu	E	0.71

VIII. Recommendations and Conclusions

A. Recommendations for the Proposed Action

1. Intersection Improvements

The following roadway improvements are recommended at each of the Kamehameha Highway intersections at Kaihalulu Drive, Kuilima Drive, and Marconi Road to accommodate the estimated increases in peak hour traffic with the development of the Proposed Action. The following access improvements are expected to mitigate the anticipated traffic impacts resulting from the implementation of the Proposed Action.

a. Westbound Kamehameha Highway should be widened to provide exclusive right-turn lanes at Kaihalulu Drive, Kuilima Drive, and Marconi Road.

b. Eastbound Kamehameha Highway should be widened to provide exclusive left-turn lanes at Kaihalulu Drive, Kuilima Drive, and Marconi Road.

c. Westbound Kamehameha Highway should be widened to provide right-turn acceleration lanes at Kaihalulu Drive, Kuilima Drive, and Marconi Road.

d. Each Resort access road should be widened/constructed to provide separate left-turn and right-turn lanes at Kamehameha Highway.

e. The Kamehameha Highway intersection at Kuilima Drive should be signalized, when improved to a channelized intersection.

f. The Kamehameha Highway intersection at Kaihalulu Drive should be signalized, when warranted.

g. The Kamehameha Highway intersection at Marconi Road should be signalized, when warranted.

2. Turning Lane Lengths

The left-turn storage lengths were based upon a protected left-turn signal phase at each of the Resort access intersections on Kamehameha Highway. The left-turn storage requirements were based upon the average of the 95th percentile queue lengths of ten (10) simulations, using SimTraffic. The acceleration and deceleration lengths are based upon AASHTO's A Policy on Geometric Design of Highways and Streets, (Exhibits 10-70 and 10-73) for the Kamehameha Highway design speed of 50 mph, as designated by DOT. The right-turn acceleration lane lengths are based upon an entrance curve design speed of 15 mph. The deceleration lane lengths are based upon a stop condition. Table 20 summarizes the turning lane requirements.

Table 20. Kamehameha Highway – Turning Lane Lengths (Feet)

Intersection	Lane Type	Lane No.	Storage Lane Length	Decel/ Accel Lane Length	Total	Design Lane Length
Kaihalulu Drive	EB LT	1	227	435	662	665
	WB RT Decel.	1	0	435	435	435
	WB RT Accel.	1	0	660	660	660
Kuilima Drive	EB LT	1	138	435	573	575
	WB RT Decel.	1	0	435	435	435
	WB RT Accel.	1	0	660	660	660
Marconi Road	EB LT	1	152	435	587	590
	WB RT Decel.	1	0	435	435	440
	WB RT Accel.	1	0	660	660	660
	WB LT	1	58	435	493	500

EB = eastbound WB = westbound LT = left-turn RT = right-turn
Decel = Deceleration Accel = Acceleration

3. Resort Roadways

As previously discussed, the development of the Proposed Action is expected to commence at various locations throughout the Resort area. Traffic improvements at each of the three access points on Kamehameha Highway should be constructed in the initial phase of development. Kaihalulu Drive also should be constructed in the first phase of development between Kamehameha Highway and Marconi Road. The two-lane internal road will facilitate traffic circulation within the Resort and reduce the traffic demand on Kamehameha Highway.

4. Traffic Demand Management

Turtle Bay Resort currently requires the implementation of an informal traffic demand management (TDM) plan by the promoters of special events held at the Resort. A TDM plan consists of a variety of mitigation measures, which are intended to reduce traffic generation. TDM measures are discussed in a memorandum titled "Turtle Bay Resort Transportation Demand Management (TDM) – Overview and Potential Strategies.", which was prepared by Fehr & Peers. TDM is a working document that will provide the Resort operator(s) a "toolbox", which will contain a variety of transportation strategies that can be implemented during special events as well as on a day-to-day basis. The effectiveness of each strategy will be measured during the implementation, which can be expected to reduce peak hour traffic from 5 percent to 15 percent. Since TDM measures cannot be accurately quantified at this writing, they were not taken into account in this traffic impact analysis.

5. Regional Traffic Improvements

The regional traffic improvements in the study area include the construction of turn lanes, guardrails, signage, and crosswalks to improve safety, as recommended in the ORTP. Where feasible, paved shoulders on Kamehameha would accommodate bicycles, and provide safe and more efficient overall traffic operations on Kamehameha Highway. Full-width shoulders would permit slow-moving vehicles to pull over and allow faster traffic to pass. Kamehameha Highway is expected to remain a two-lane highway in response to community preference.

The intersection of Kamehameha Highway and Kahekili Highway in Kahaluu is an existing problem where the left-turn movement from westbound Kamehameha Highway to southbound Kahekili Highway is expected to continue to operate at LOS "F". The left-turn volumes on westbound Kamehameha Highway are below the minimum threshold volumes that are required to meet the warrants for the installation of traffic signals. The heavy left-turn demands on southbound Kamehameha Highway only occur during the existing 2-hour AM peak period, which would not meet traffic signal warrants. A modern roundabout intersection also has been considered by DOT. However, a multi-lane roundabout would be required to meet the traffic demands at the intersection. Currently, DOT restricts roundabout intersections on its highways to a single lane on the circular roadway. Finally, a left-turn refuge lane on Kahekili Highway would facilitate the left-turn movement from westbound Kamehameha

Highway. However LOS "F" conditions would still persist during the existing AM peak hour of traffic.

B. Conclusions

The Proposed Action of the Turtle Bay Resort Master Plan is the first effort since the 1985 EIS to reduce the overall density of the Resort expansion. The owner/developer Turtle Bay Resort, LLC has reached out to the community and decision makers to craft a viable plan for the Turtle Bay Resort that addresses the concerns of the community. The Proposed Action represents a reduction of over 60 percent in the number of units that was originally proposed in the 1985 EIS through the 2009 Revised TIAR Update. Up to 40 percent of the weekend traffic is expected to be generated by resources that will be dedicated to the public, such as the beach parks, the farmers market, and the bird sanctuary and wildlife refuge.

This traffic study has consistently taken a conservative approach when establishing the assumptions upon which the traffic impact analysis is based. The ORTP travel forecast included an additional 300 resort units, which have not been credited in this study's forecast with the Proposed Action. The trip generation analysis has not taken into account the "critical mass" effect of a 2,243-unit resort, where trips are contained within the site by activities and opportunities of a destination resort.

The two-lane capacity of Kamehameha Highway is expected to accommodate the increase in traffic generated by the Proposed Action of the Turtle Bay Resort Master Plan. Kamehameha Highway currently operates at LOS "C" conditions during the existing peak hours of traffic. LOS "D" persists in Haleiwa and Kahaluu under existing conditions.

Without the Proposed Action, LOS "E" conditions are expected on Kamehameha Highway in Kahaluu, during the PM and weekend peak hours of traffic, due to the regional growth in traffic. In Kahuku, Kamehameha Highway is expected to operate at LOS "D" conditions during the PM peak hour and weekend peak hour without the Proposed Action.

Kamehameha Highway is expected to operate at LOS "E" conditions, with the Proposed Action, in Kahuku during the weekend peak hour of traffic. LOS "E" conditions are also expected in Haleiwa during the PM and weekend peak hours of traffic with the Proposed Action. The LOS "E" conditions are results of traffic flowing in platoons with few opportunities to pass slow-moving vehicles, resulting in restricted speeds, during the day and early evenings. The v/c ratios are less than 1.00 on Kamehameha Highway for all scenarios, which indicate available capacity on the two-lane highway.

Traffic congestion on the North Shore is a result of the uniqueness of the region, which attracts both visitors and residents alike. The "bottleneck" conditions on Kamehameha Highway at popular beach parks along the North Shore are results of motorists turning on and off Kamehameha Highway or parking on the Highway shoulders, and pedestrians walking across the Highway, thereby creating stop-and-go

traffic flows. The land area for additional parking is limited on the makai side of Kamehameha Highway. The construction of parking lots on the mauka side of Kamehameha Highway will increase the pedestrian traffic across the Highway. A mauka bypass highway can increase the shoreline area to provide for more parking. However, a bypass highway would require the acquisition of additional rights-of-way. Additional parking will ultimately attract more traffic to the area. The current situation is further exacerbated by the world famous big wave surfing competitions during the winter months and the popular sightings of turtles sunning at Laniakea Beach, all of which contribute to the attractions on the North Shore of Oahu.

In Windward Oahu, traffic congestion occurs in the small towns along the coastline. The slow-moving traffic is typical of scenic routes as local traffic mixes with visitors touring the windward coast of Oahu. Left-turn storage lanes and refuge lanes will reduce delays at intersections. Bus bays also can reduce delays to through traffic. The existing congestion at the intersection of Kamehameha Highway and Kahekili Highway occur on the relatively low-volume left-turn movement from westbound Kamehameha Highway to Honolulu-bound Kahekili Highway. The existing conditions are somewhat mitigated by courteous drivers, who permit the left-turn movement onto Kahekili Highway, and the overall slow-moving traffic at the intersection. Several traffic mitigation measures have been considered. The construction of a left-turn storage lane and refuge lane can reduce delays, but not enough the improve the Level of Service. A single-lane roundabout intersection limits the capacity of the intersection. A multi-lane roundabout is currently not permitted on State highways. The existing traffic demands do not meet the volume warrants for the installation of traffic signals.

Up to 40 percent of the weekend traffic from the Proposed Action will be generated by benefits, which will be provided to the community by Turtle Bay Resort, such as, the beach parks, wildlife preserve, and the farmers market. While the farmers market traffic is not expected to extend beyond the study area, the beach parks and wildlife preserve could become regional attractions.

As the Turtle Bay Resort expands, Transportation Demand Management (TDM) measures are expected to be formalized into a plan which will be implemented by the Resort management. The remote location of the Resort, with only two routes to and from the Resort, present several opportunities for TDM measures, which can be implemented to promote alternative modes of transportation and reduce the Resort's contribution to traffic in the region.

Turtle Bay Resort LLC, and its consultants have worked extensively with the transportation agencies of the State of Hawaii and the City and County of Honolulu in the preparation of this traffic impact analysis. The traffic improvements, recommended herein, are expected to improve the capacity of Kamehameha Highway at the Turtle Bay Resort's access intersections, and mitigate the traffic impacts resulting from the development of the Proposed Action for the Turtle Bay Resort Master Plan.

TRAFFIC IMPACT ANALYSIS REPORT

FOR THE PROPOSED

TURTLE BAY RESORT MASTER PLAN

KAHUKU, OAHU, HAWAII

APPENDIX A

TRAFFIC COUNT DATA

Weekday Turning Movement Count Data
Study Name: Kam Hwy Kuilima Drive Wkday
Start Date: 11/03/2011

Vehicular Traffic

		Eastbound Kamehameha Hwy		Westbound Kamehameha Hwy		Southbound Kuilima Drive			
Start Time	End Time	Left-Turn	Through	Through	Right-Turn	Left-Turn	Right-Turn	Total	Hrly Total
6:00 AM	6:15 AM	7	20	21	10	12	5	75	
6:15 AM	6:30 AM	7	22	25	6	3	8	71	
6:30 AM	6:45 AM	10	40	26	7	4	5	92	
6:45 AM	7:00 AM	12	31	32	13	8	14	110	348
7:00 AM	7:15 AM	6	34	36	7	11	11	105	378
7:15 AM	7:30 AM	13	65	28	7	15	14	142	449
7:30 AM	7:45 AM	21	84	40	20	12	15	192	549
7:45 AM	8:00 AM	20	45	38	14	11	9	137	576
8:00 AM	8:15 AM	10	37	48	11	13	8	127	**598**
8:15 AM	8:30 AM	14	26	33	3	9	13	98	554
8:30 AM	8:45 AM	15	28	32	13	10	8	106	468
8:45 AM	9:00 AM	16	34	23	10	9	17	109	440
9:00 AM	9:15 AM	11	31	18	7	15	18	100	413
9:15 AM	9:30 AM	13	32	22	13	7	15	102	417
9:30 AM	9:45 AM	18	31	29	9	16	21	124	435
9:45 AM	10:00 AM	21	32	34	13	11	21	132	458
10:00 AM	10:15 AM	25	42	28	21	14	19	149	507
10:15 AM	10:30 AM	20	42	32	12	7	20	133	538
10:30 AM	10:45 AM	26	25	40	15	20	24	150	564
10:45 AM	11:00 AM	17	48	40	9	11	17	142	574
11:00 AM	11:15 AM	17	29	41	16	19	20	142	567
11:15 AM	11:30 AM	17	55	34	17	18	27	168	602
11:30 AM	11:45 AM	22	41	59	14	18	16	170	622
11:45 AM	12:00 PM	26	44	48	15	15	21	169	649
12:00 PM	12:15 PM	12	46	50	24	17	19	168	675
12:15 PM	12:30 PM	21	46	40	12	26	22	167	674
12:30 PM	12:45 PM	31	62	42	12	14	14	175	679
12:45 PM	1:00 PM	30	55	54	17	18	13	187	697
1:00 PM	1:15 PM	23	60	69	17	19	17	205	734
1:15 PM	1:30 PM	21	66	58	25	15	22	207	774
1:30 PM	1:45 PM	18	43	83	15	18	22	199	798
1:45 PM	2:00 PM	17	55	70	17	10	19	188	799
2:00 PM	2:15 PM	22	59	64	24	17	28	214	808
2:15 PM	2:30 PM	19	52	61	17	23	16	188	789
2:30 PM	2:45 PM	24	79	81	20	14	25	**243**	833
2:45 PM	3:00 PM	39	50	71	15	16	22	213	**858**
3:00 PM	3:15 PM	22	71	62	15	14	20	204	848
3:15 PM	3:30 PM	26	51	64	16	18	21	196	856
3:30 PM	3:45 PM	23	46	70	22	33	18	212	825
3:45 PM	4:00 PM	19	52	59	22	23	32	207	819
4:00 PM	4:15 PM	21	72	69	19	15	31	227	842
4:15 PM	4:30 PM	25	71	56	12	14	27	205	851
4:30 PM	4:45 PM	22	58	53	23	12	20	188	827
4:45 PM	5:00 PM	23	77	45	19	13	16	193	813
5:00 PM	5:15 PM	18	54	57	9	20	15	173	759
5:15 PM	5:30 PM	17	40	53	9	16	19	154	708
5:30 PM	5:45 PM	30	35	46	14	21	17	163	683
5:45 PM	6:00 PM	26	38	53	13	12	13	155	645

AM Peak Hour								
11:00 AM	12:00 PM	82	169	182	62	70	84	649
Peak Hour Factor		0.93	1.03	0.77	1.11	0.97	1.31	0.95
Heavy Vehicles (%)		3.7%	13.0%	5.5%	6.5%	5.7%	6.0%	7.4%
PM Peak Hour								
2:00 PM	3:00 PM	104	240	277	76	70	91	858
Peak Hour Factor		1.08	0.76	0.85	0.95	1.25	0.91	0.88
Heavy Vehicles (%)		1.9%	2.5%	5.4%	7.9%	4.3%	6.6%	4.4%

Saturday Turning Movement Count Data
Study Name Kam Hwy Kuilima Dr
Survey Date 11/5/2011 Saturday

Vehicular Traffic

		Eastbound Kamehameha Hwy		Westbound Kamehameha Hwy		Southbound Kuilima Drive			
Start Time	End Time	Left-Turn	Through	Through	Right-Turn	Left-Turn	Right-Turn	Total	Hrly Total
9:15 AM	9:30 AM	20	34	50	4	8	14	130	
9:30 AM	9:45 AM	18	35	40	11	16	27	147	
9:45 AM	10:00 AM	14	33	41	10	3	28	129	
10:00 AM	10:15 AM	23	32	42	9	9	17	132	538
10:15 AM	10:30 AM	26	36	72	18	16	31	199	607
10:30 AM	10:45 AM	18	32	52	12	17	35	166	626
10:45 AM	11:00 AM	19	43	64	23	13	21	183	680
11:00 AM	11:15 AM	23	49	75	12	15	36	210	758
11:15 AM	11:30 AM	22	60	68	18	22	26	216	775
11:30 AM	11:45 AM	18	51	60	13	14	24	180	789
11:45 AM	12:00 PM	19	63	88	19	18	21	228	834
12:00 PM	12:15 PM	27	81	68	18	10	21	225	849
12:15 PM	12:30 PM	28	62	81	18	21	27	237	870
12:30 PM	12:45 PM	32	78	78	14	18	31	251	941
12:45 PM	1:00 PM	33	49	77	23	27	26	235	948
1:00 PM	1:15 PM	35	69	72	21	22	31	250	973
1:15 PM	1:30 PM	21	81	89	16	16	30	253	989
1:30 PM	1:45 PM	24	70	77	20	16	22	229	967
1:45 PM	2:00 PM	25	79	68	22	17	26	237	969
2:00 PM	2:15 PM	24	95	76	27	14	26	262	981
2:15 PM	2:30 PM	26	78	87	21	28	32	272	1000
2:30 PM	2:45 PM	30	78	61	21	16	27	233	1004
2:45 PM	3:00 PM	37	77	98	26	16	19	**273**	**1040**
3:00 PM	3:15 PM	24	73	91	25	20	29	262	1040
3:15 PM	3:30 PM	32	67	70	15	26	18	228	996
3:30 PM	3:45 PM	30	83	58	16	17	30	234	997
3:45 PM	4:00 PM	25	71	63	16	17	36	228	952
4:00 PM	4:15 PM	20	65	59	18	23	43	228	918
4:15 PM	4:30 PM	24	77	51	13	25	35	225	915
4:30 PM	4:45 PM	30	62	56	22	13	26	209	890
4:45 PM	5:00 PM	28	75	78	16	16	15	228	890
5:00 PM	5:15 PM	20	75	48	11	15	27	196	858
5:15 PM	5:30 PM	28	60	52	16	14	28	198	831
5:30 PM	5:45 PM	24	66	46	8	17	17	178	800
5:45 PM	6:00 PM	23	49	49	18	16	28	183	755

Saturday Peak Hour Traffic								
2:00 PM	3:00 PM	117	328	322	95	74	104	1040
Peak Hour Factor		0.79	1.06	0.82	0.91	1.16	1.37	0.95
Heavy Vehicles (%)		2.6%	1.5%	4.7%	4.2%	2.7%	1.9%	3.0%

Sunday Turning Movement Count Data
Study Name Kamehameha Hwy Kuilima Dr Sunday
Start Date 2/26/2012

Vehicular Traffic

		Eastbound Kamehameha Hwy		Westbound Kamehameha Hwy		Southbound Kuilima Drive			
Start Time	End Time	Left-Turn	Through	Through	Right-Turn	Left-Turn	Right-Turn	Total	Hrly Total
10:00 AM	10:15 AM	18	31	34	5	11	26	125	
10:15 AM	10:30 AM	15	44	37	3	7	31	137	
10:30 AM	10:45 AM	26	36	61	13	14	19	169	
10:45 AM	11:00 AM	39	57	62	21	12	40	231	662
11:00 AM	11:15 AM	31	58	49	12	8	22	180	717
11:15 AM	11:30 AM	16	47	58	14	20	34	189	769
11:30 AM	11:45 AM	27	55	82	11	11	29	215	815
11:45 AM	12:00 PM	20	35	57	15	22	25	174	758
12:00 PM	12:15 PM	23	76	73	16	12	30	230	808
12:15 PM	12:30 PM	25	69	61	22	12	30	219	838
12:30 PM	12:45 PM	16	64	64	18	10	22	194	817
12:45 PM	1:00 PM	20	69	88	6	9	21	213	856
1:00 PM	1:15 PM	21	56	98	13	14	31	233	859
1:15 PM	1:30 PM	22	73	80	29	11	27	242	882
1:30 PM	1:45 PM	35	79	103	18	19	20	**274**	962
1:45 PM	2:00 PM	29	88	81	20	13	27	258	1007
2:00 PM	2:15 PM	29	70	92	16	18	36	261	1035
2:15 PM	2:30 PM	20	73	91	19	17	23	243	**1036**
2:30 PM	2:45 PM	32	60	83	21	25	28	249	1011
2:45 PM	3:00 PM	33	77	83	16	15	36	260	1013
3:00 PM	3:15 PM	26	63	71	10	29	42	241	993
3:15 PM	3:30 PM	22	77	58	18	14	33	222	972
3:30 PM	3:45 PM	26	85	61	14	22	32	240	963
3:45 PM	4:00 PM	25	54	72	14	12	19	196	899
4:00 PM	4:15 PM	24	67	74	16	24	24	229	887
4:15 PM	4:30 PM	38	73	62	17	13	24	227	892
4:30 PM	4:45 PM	31	86	43	13	11	28	212	864
4:45 PM	5:00 PM	24	59	63	16	13	19	194	862
5:00 PM	5:15 PM	32	67	57	17	13	32	218	851
5:15 PM	5:30 PM	15	56	50	19	15	27	182	806
5:30 PM	5:45 PM	29	60	32	12	15	28	176	770
5:45 PM	6:00 PM	27	45	42	17	14	27	172	748

Sunday Peak Hour								
1:30 PM	2:30 PM	113	310	367	73	67	106	1036
Peak Hour Factor		0.81	0.98	0.89	1.01	0.88	1.33	0.95
Heavy Vehicles (%)		1.8%	0.0%	0.0%	8.2%	3.0%	2.8%	0.2%

Weekday Turning Movement Count Data
Study Name Kam Hwy Marconi Rd Wkdy 0700-0830 1030-1630
Start Date 11/3/2011

Vehicular Traffic

		Eastbound Kamehameha Hwy		Westbound Kamehameha Hwy		Southbound Kuilima Drive			
Start Time	End Time	Left-Turn	Through	Through	Right-Turn	Left-Turn	Right-Turn	Total	Hrly Total
7:00 AM	7:15 AM	1	45	38	0	3	1	88	
7:15 AM	7:30 AM	1	74	37	1	1	0	114	
7:30 AM	7:45 AM	0	100	61	1	1	0	163	
7:45 AM	8:00 AM	2	56	57	2	2	0	119	484
8:00 AM	8:15 AM	1	52	55	1	0	0	109	505
8:15 AM	8:30 AM	0	34	33	2	1	0	70	461
10:30 AM	10:45 AM	1	48	51	1	0	2	103	
10:45 AM	11:00 AM	0	64	52	1	0	0	117	
11:00 AM	11:15 AM	0	40	51	3	1	1	96	
11:15 AM	11:30 AM	0	66	58	1	2	0	127	443
11:30 AM	11:45 AM	0	71	71	1	1	1	145	485
11:45 AM	12:00 PM	1	56	68	1	2	2	130	498
12:00 PM	12:15 PM	0	63	67	2	1	0	133	535
12:15 PM	12:30 PM	0	62	49	1	1	0	113	521
12:30 PM	12:45 PM	3	75	55	0	1	0	134	510
12:45 PM	1:00 PM	0	76	75	4	0	1	156	536
1:00 PM	1:15 PM	1	74	87	2	1	0	165	568
1:15 PM	1:30 PM	1	81	79	0	2	1	164	619
1:30 PM	1:45 PM	3	61	92	0	0	1	157	642
1:45 PM	2:00 PM	1	64	81	0	0	1	147	633
2:00 PM	2:15 PM	0	78	94	2	1	0	175	643
2:15 PM	2:30 PM	0	70	77	1	3	1	152	631
2:30 PM	2:45 PM	2	88	96	0	0	1	187	661
2:45 PM	3:00 PM	0	68	78	4	3	1	154	668
3:00 PM	3:15 PM	0	88	83	1	1	1	174	667
3:15 PM	3:30 PM	1	69	78	4	2	2	156	671
3:30 PM	3:45 PM	1	76	90	0	0	2	169	653
3:45 PM	4:00 PM	0	78	76	0	0	0	154	653
4:00 PM	4:15 PM	1	83	88	3	0	0	175	654
4:15 PM	4:30 PM	4	77	66	3	1	0	151	649

AM Peak Hour								
11:00 AM	12:00 PM	1	233	248	6	6	4	498
	PHF	N/A	0.82	0.87	1.50	1.50	1.00	0.86
PM Peak Hour								
2:00 PM	3:00 PM	2	304	345	7	7	3	668
	PHF	0.25	0.86	0.90	N/A	N/A	0.75	0.89

Saturday Turning Movement Count Data

Study Name Kam Hwy Marconi Rd Sat 1230-1530

Survey Date 11/5/2011

Vehicular Traffic

		Eastbound		Westbound		Southbound			
		Kamehameha Hwy		Kamehameha Hwy		Kuilima Drive			
Start Time	End Time	Left-Turn	Through	Through	Right-Turn	Left-Turn	Right-Turn	Total	Hrly Total
12:30 PM	12:45 PM	0	86	100	4	2	1	193	
12:45 PM	1:00 PM	0	75	90	3	2	1	171	
1:00 PM	1:15 PM	1	94	101	1	1	1	199	
1:15 PM	1:30 PM	0	91	103	2	1	1	198	761
1:30 PM	1:45 PM	0	83	82	0	0	0	165	733
1:45 PM	2:00 PM	1	97	98	6	0	2	204	766
2:00 PM	2:15 PM	1	103	105	1	1	3	**214**	781
2:15 PM	2:30 PM	2	109	94	1	2	1	209	792
2:30 PM	2:45 PM	0	94	87	1	0	0	182	809
2:45 PM	3:00 PM	0	85	124	2	0	1	212	**817**
3:00 PM	3:15 PM	0	96	87	1	0	0	184	787
3:15 PM	3:30 PM	1	89	80	1	0	1	172	750

Saturday Peak Hour Traffic

2:00 PM	3:00 PM	3	391	410	5	3	5	817
Peak Hour Factor		0.75	0.95	0.98	1.25	0.75	0.42	0.95
Heavy Vehicles (%)		0.0%	2.0%	4.4%	0.0%	0.0%	0.0%	3.2%

Study Name Kamehameha Hwy Marconi Rd Sun 1300-1500

Survey Date 2/26/2012

Vehicular Traffic

		Eastbound		Westbound		Southbound			
		Kamehameha Hwy		Kamehameha Hwy		Marconi Road			
Start Time	End Time	Left-Turn	Through	Through	Right-Turn	Left-Turn	Right-Turn	Total	Hrly Total
1:00 PM	1:15 PM	1	80	109	1	1	0	192	
1:15 PM	1:30 PM	0	79	98	2	1	0	180	
1:30 PM	1:45 PM	1	99	122	5	1	1	229	
1:45 PM	2:00 PM	2	95	112	1	2	1	213	814
2:00 PM	2:15 PM	0	82	91	2	0	0	175	797
2:15 PM	2:30 PM	0	94	113	2	1	1	211	828
2:30 PM	2:45 PM	0	86	107	1	1	0	195	794
2:45 PM	3:00 PM	1	86	89	2	0	0	178	759

Sunday Peak Hour

1:30 PM	2:30 PM	3	370	438	10	4	3	828
Peak Hour Factor		0.75	0.93	0.90	0.50	1.00	0.75	0.90

24-Hour Traffic Count Data on Kuilima Drive at Kamehameha Highway-Inbound

Site: [Kuilima Drive North] Kuilima Drive Hotel Entrance

* Sunday, October 30, 2011=928 (Incomplete) , 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
Hrly	-	-	-	-	-	-	-	-	-	-	-	-	-	149	177	159	147	122	100	65	52	38	36	19
:00	-	-	-	-	-	-	-	-	-	-	-	-	-	39	43	41	35	33	34	21	17	11	11	6
:15	-	-	-	-	-	-	-	-	-	-	-	-	-	32	43	32	36	37	24	20	11	9	8	3
:30	-	-	-	-	-	-	-	-	-	-	-	-	-	38	47	42	42	27	20	11	11	10	10	5
:45	-	-	-	-	-	-	-	-	-	-	-	-	-	41	45	44	34	25	22	13	13	8	7	5

PM Peak Gen 14:45 to 15:45 Vol= 160 PHF= 0.89

* Monday, October 31, 2011=1665, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24-Hr
Hrly	9	3	3	6	29	42	54	114	93	108	103	129	151	116	159	142	144	117	110	75	76	82	40	16	1921
:00	3	0	1	0	2	7	9	18	24	30	26	34	41	25	35	52	31	29	24	21	23	15	9	4	
:15	1	2	2	1	5	11	13	28	22	19	19	44	28	18	41	27	37	31	21	20	11	35	12	5	
:30	1	0	0	2	5	10	14	36	25	30	27	26	50	33	43	30	43	23	39	20	27	10	11	5	
:45	4	2	0	3	17	15	18	33	23	30	32	26	33	40	40	34	34	34	26	15	15	23	8	2	

AM Peak Gen 10:45 to 11:45 Vol= 136 PHF= 0.77

PM Peak Gen 14:15 to 15:15 Vol= 176 PHF= 0.85

* Tuesday, November 01, 2011=1637, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24-Hr
Hrly	4	3	6	8	23	44	60	121	109	90	97	137	148	139	151	142	168	134	109	79	47	50	44	22	1935
:00	3	0	1	2	0	6	15	23	27	20	25	37	35	33	33	37	31	27	23	25	20	13	12	9	
:15	0	3	3	1	5	10	11	17	27	24	30	32	33	38	33	34	44	31	30	17	9	15	6	3	
:30	1	0	2	1	7	11	7	40	31	19	23	32	41	37	44	30	43	43	28	14	8	15	18	6	
:45	0	0	0	4	11	17	28	41	24	27	20	36	39	31	41	41	50	33	28	24	11	8	8	4	

AM Peak Gen 11:00 to 12:00 Vol= 137 PHF= 0.93

PM Peak Gen 16:00 to 17:00 Vol= 168 PHF= 0.84

* Wednesday, November 02, 2011=1661, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24-Hr
Hrly	8	3	2	5	27	45	65	104	112	94	113	108	131	162	160	133	160	116	96	78	63	70	39	14	1908
:00	2	2	0	0	4	8	14	14	26	23	27	23	24	45	35	29	49	24	26	24	11	10	10	0	
:15	4	1	1	1	1	9	15	21	34	20	26	27	32	44	41	33	18	40	30	19	23	20	11	4	
:30	2	0	1	1	8	9	9	34	22	22	31	33	33	31	38	34	40	20	19	14	18	28	13	6	
:45	0	0	0	3	14	19	27	35	31	29	29	26	42	43	46	38	53	32	22	21	11	12	5	4	

AM Peak Gen 10:00 to 11:00 Vol= 113 PHF= 0.91

PM Peak Gen 14:00 to 15:00 Vol= 160 PHF= 0.87

* Thursday, November 03, 2011=1952, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24-Hr
Hrly	3	5	5	6	25	46	74	107	98	117	150	158	166	157	186	169	163	137	135	100	88	73	46	22	2236
:00	1	2	1	1	1	7	18	13	21	20	45	40	33	43	48	37	38	23	34	25	30	13	8	13	
:15	0	1	1	2	3	12	12	19	19	32	37	34	41	42	37	42	38	31	45	32	22	32	11	4	
:30	1	0	2	1	4	12	15	39	30	30	39	39	45	39	45	46	42	44	23	24	22	19	18	2	
:45	1	2	1	2	17	15	29	36	28	35	29	45	47	34	57	44	46	40	34	19	14	9	10	3	

AM Peak Gen 11:00 to 12:00 Vol= 158 PHF= 0.88

PM Peak Gen 14:00 to 15:00 Vol= 186 PHF= 0.82

* Friday, November 04, 2011=2234, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24-Hr
Hrly	7	8	7	6	28	48	97	124	168	127	203	158	159	150	190	190	199	170	119	118	77	48	67	26	2494
:00	3	3	1	1	2	8	17	16	47	25	46	49	46	34	46	36	57	42	38	33	25	12	14	8	
:15	3	4	3	2	6	15	27	29	44	43	52	48	38	41	31	43	45	45	30	27	17	15	22	7	
:30	1	1	3	2	3	7	24	33	44	26	54	27	41	43	62	58	52	42	26	40	20	10	17	5	
:45	0	0	0	1	17	19	30	47	33	33	52	35	35	33	51	53	45	41	26	19	15	11	14	6	

AM Peak Gen 10:15 to 11:15 Vol= 207 PHF= 0.96

PM Peak Gen 15:30 to 16:30 Vol= 213 PHF= 0.92

* Saturday, November 05, 2011=2214, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24-Hr
Hrly	23	9	5	7	20	23	61	145	114	116	148	146	195	187	222	193	173	153	133	103	84	56	55	29	2400
:00	5	3	4	1	1	2	10	25	20	34	31	34	48	52	54	54	37	34	43	30	18	10	11	11	
:15	8	1	0	3	5	5	14	31	26	25	43	43	46	42	48	49	37	42	36	31	33	19	7	5	
:30	8	4	0	2	7	6	15	43	23	31	32	32	43	40	57	49	56	37	34	26	14	18	21	9	
:45	2	1	1	1	7	10	22	46	46	27	43	37	58	53	64	42	43	42	21	16	19	9	16	4	

AM Peak Gen 11:00 to 12:00 Vol= 146 PHF= 0.85

PM Peak Gen 14:15 to 15:15 Vol= 223 PHF= 0.87

* Sunday, November 06, 2011=1386, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
Hrly	3	9	6	7	22	32	53	110	132	142	121	169	187	215	222	-	-	-	-	-	-	-	-	-
:00	0	5	1	1	1	2	4	18	41	29	24	30	50	53	57	-	-	-	-	-	-	-	-	-
:15	1	1	3	2	3	8	11	27	33	31	28	51	44	48	46	-	-	-	-	-	-	-	-	-
:30	1	1	0	2	12	9	19	30	30	39	37	48	49	59	62	-	-	-	-	-	-	-	-	-
:45	1	2	2	2	6	13	19	36	28	44	33	40	44	55	57	-	-	-	-	-	-	-	-	-

AM Peak Gen 11:00 to 12:00 Vol= 169 PHF= 0.83

24-Hour Traffic Count Data on Kuilima Drive at Kamehameha Highway-Outbound
Site: Kuilima Drive at Kamehameha Hwy Entrance

* Sunday, October 30, 2011=928 (Incomplete) , 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
Hrly	-	-	-	-	-	-	-	-	-	-	-	-	-	150	142	166	155	129	122	71	47	38	51	30
:00	-	-	-	-	-	-	-	-	-	-	-	-	-	33	41	51	48	36	32	23	15	15	21	18
:15	-	-	-	-	-	-	-	-	-	-	-	-	-	39	29	42	47	33	34	14	11	6	14	4
:30	-	-	-	-	-	-	-	-	-	-	-	-	-	40	35	46	34	40	31	20	10	7	11	4
:45	-	-	-	-	-	-	-	-	-	-	-	-	-	38	38	27	27	20	25	14	11	10	5	4

PM Peak Gen 14:45 to 15:45 Vol= 177 PHF= 0.87

* Monday, October 31, 2011=1665, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24-Hr
Hrly	10	4	1	3	14	23	59	105	94	130	137	119	149	125	149	144	155	134	107	58	39	55	35	26	1875
:00	7	2	0	0	1	7	11	27	27	28	31	37	43	27	45	37	48	45	41	22	9	10	8	6	
:15	0	1	1	0	4	2	18	30	24	30	28	32	47	28	37	35	40	29	22	18	15	18	12	8	
:30	1	0	0	1	5	3	14	26	17	34	32	28	30	41	33	37	32	26	29	10	10	17	9	6	
:45	2	1	0	2	4	11	17	23	26	38	47	23	30	29	35	35	35	34	15	8	5	10	6	6	

AM Peak Gen 10:45 to 11:45 Vol= 144 PHF= 0.77
PM Peak Gen 14:15 to 15:15 Vol= 142 PHF= 0.96

* Tuesday, November 01, 2011=1637, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24-Hr
Hrly	8	2	1	4	15	27	52	90	101	117	108	124	131	153	155	148	155	138	128	66	37	44	40	31	1875
:00	4	2	0	2	5	7	8	14	30	24	25	33	23	40	41	44	44	38	36	23	14	13	17	16	
:15	1	0	0	2	4	3	16	27	28	31	22	29	32	32	34	26	50	43	40	20	5	10	7	7	
:30	2	0	0	0	2	4	10	28	22	31	29	33	36	44	52	44	28	33	30	15	6	9	9	3	
:45	1	0	1	0	4	13	18	21	23	32	32	30	40	37	28	34	33	24	22	8	12	12	7	5	

AM Peak Gen 11:00 to 12:00 Vol= 124 PHF= 0.94
PM Peak Gen 16:00 to 17:00 Vol= 155 PHF= 0.78

* Wednesday, November 02, 2011=1661, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24-Hr
Hrly	11	2	1	1	14	34	54	110	80	89	136	134	122	145	151	145	161	123	114	62	59	57	31	30	1866
:00	4	1	0	0	4	11	13	17	18	23	35	34	33	27	33	37	58	25	34	14	19	13	14	17	
:15	3	1	1	0	2	7	14	29	18	17	26	36	37	35	35	31	36	37	37	21	11	16	6	4	
:30	2	0	0	0	3	5	10	38	24	25	35	35	25	41	42	39	35	33	23	12	21	15	10	6	
:45	2	0	0	1	5	11	17	26	20	24	41	29	29	42	41	38	32	28	20	15	8	13	1	3	

AM Peak Gen 10:00 to 11:00 Vol= 136 PHF= 0.83
PM Peak Gen 14:00 to 15:00 Vol= 151 PHF= 0.90

* Thursday, November 03, 2011=1952, 15 minute drops 1652

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24-Hr
Hrly	12	1	2	4	13	31	58	98	91	131	135	170	141	143	161	176	148	133	113	95	81	82	56	47	2122
:00	7	0	0	1	1	8	16	22	22	33	33	39	36	36	45	33	47	35	35	31	17	33	16	19	
:15	3	1	0	2	3	4	11	29	23	27	27	53	44	38	40	40	40	35	32	24	21	25	12	12	
:30	0	0	1	0	3	10	9	27	20	40	45	41	29	42	38	49	32	38	22	20	20	13	18	9	
:45	2	0	1	1	6	9	22	20	27	32	30	37	32	28	38	54	29	25	24	20	23	11	10	7	

AM Peak Gen 11:00 to 12:00 Vol= 170 PHF= 0.80
PM Peak Gen 14:00 to 15:00 Vol= 161 PHF= 0.89

* Friday, November 04, 2011=2234, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24-Hr
Hrly	19	6	5	3	14	21	56	93	108	125	143	149	162	153	153	168	171	166	165	95	92	96	95	115	2373
:00	10	1	1	0	0	7	16	26	36	30	33	33	32	26	45	38	47	49	54	33	24	30	10	57	
:15	4	4	3	1	3	3	11	19	21	30	42	44	36	40	33	37	58	43	48	23	20	26	24	24	
:30	2	1	1	0	6	5	14	24	26	35	32	34	52	51	35	48	35	41	30	21	25	21	22	23	
:45	3	0	0	2	5	6	15	24	25	30	36	38	42	36	40	45	31	33	33	18	23	19	39	11	

AM Peak Gen 10:15 to 11:15 Vol= 143 PHF= 0.85
PM Peak Gen 15:30 to 16:30 Vol= 198 PHF= 0.85

* Saturday, November 05, 2011=2214, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24-Hr
Hrly	25	10	2	5	13	14	40	76	118	139	161	179	182	182	179	196	196	162	160	67	64	62	107	49	2388
:00	11	5	1	2	2	4	6	19	34	40	28	53	31	53	40	49	66	42	46	16	26	22	22	23	
:15	7	2	0	0	4	1	7	16	28	24	47	48	47	47	61	46	59	41	29	17	19	18	30	12	
:30	1	1	0	2	5	3	13	25	27	45	53	40	50	38	43	48	39	35	44	16	9	11	34	9	
:45	6	2	1	1	2	6	15	16	29	31	33	39	54	44	35	53	32	44	41	18	10	11	21	5	

AM Peak Gen 11:00 to 12:00 Vol= 179 PHF= 0.84
PM Peak Gen 14:15 to 15:15 Vol= 188 PHF= 0.77

* Sunday, November 06, 2011=1386, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
Hrly	15	12	5	2	5	17	38	83	119	139	153	152	121	176	159	-	-	-	-	-	-	-	-	-
:00	8	6	1	0	3	1	5	15	23	35	28	46	31	36	31	-	-	-	-	-	-	-	-	-
:15	4	3	2	1	0	3	7	19	28	36	39	24	31	41	37	-	-	-	-	-	-	-	-	-
:30	1	0	1	1	2	5	10	24	34	31	49	36	27	57	46	-	-	-	-	-	-	-	-	-
:45	2	3	1	0	0	8	16	25	34	37	37	46	32	42	45	-	-	-	-	-	-	-	-	-

AM Peak Gen 11:00 to 12:00 Vol= 152 PHF= 0.83

24-Hour Traffic Count Data on Kuilima Drive at Kamehameha Highway
Site: Kuilima Drive at Kamehameha Hwy (Total for Both Directions)

* Sunday, October 30, 2011, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
Hrly	-	-	-	-	-	-	-	-	-	-	-	-	-	300	321	325	303	251	222	136	99	76	87	49
:00	-	-	-	-	-	-	-	-	-	-	-	-	-	72	84	**92**	83	69	66	44	32	26	32	24
:15	-	-	-	-	-	-	-	-	-	-	-	-	-	71	72	**74**	83	70	58	34	22	15	22	7
:30	-	-	-	-	-	-	-	-	-	-	-	-	-	78	82	**88**	76	67	51	31	21	17	21	9
:45	-	-	-	-	-	-	-	-	-	-	-	-	-	79	**83**	71	61	45	47	27	24	18	12	9

PM Peak Gen 14:45 to 15:45 Vol= 337

* Monday, October 31, 2011, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24-Hr
Hrly	19	8	4	9	43	66	114	221	188	239	242	250	302	241	309	287	300	251	217	134	115	138	75	42	3814
:00	10	2	1	0	3	14	20	45	51	58	57	**71**	84	52	80	**89**	79	74	65	43	32	25	17	10	
:15	1	3	3	1	9	13	31	58	46	49	47	**76**	75	46	**78**	62	77	60	43	38	26	53	24	13	
:30	2	0	0	3	10	13	28	62	42	64	59	**54**	80	74	**76**	67	75	49	68	30	37	27	20	11	
:45	6	3	0	5	21	26	35	56	49	68	**79**	49	63	69	**75**	69	69	68	41	23	20	33	14	8	

AM Peak Gen 10:45 to 11:45 Vol= 280
PM Peak Gen 14:15 to 15:15 Vol= 318

* Tuesday, November 01, 2011, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24-Hr
Hrly	12	5	7	12	38	71	113	211	210	208	206	262	279	292	306	290	323	272	237	146	85	95	84	53	3817
:00	7	2	1	4	5	13	23	37	57	44	50	**70**	58	73	74	81	**75**	65	59	48	34	26	29	25	
:15	1	3	3	3	9	13	27	44	53	55	52	**61**	65	70	67	60	**94**	74	70	37	14	25	13	10	
:30	3	0	2	1	9	15	17	68	53	50	52	**65**	77	81	96	74	**71**	76	58	29	14	24	27	9	
:45	1	0	1	4	15	30	46	62	47	59	52	**66**	79	68	69	75	**83**	57	50	32	23	20	15	9	

AM Peak Gen 11:00 to 12:00 Vol= 262
PM Peak Gen 16:00 to 17:00 Vol= 323

* Wednesday, November 02, 2011, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24-Hr
Hrly	19	5	3	6	41	79	119	214	193	183	250	243	255	308	311	279	321	239	211	140	122	127	70	44	3782
:00	6	3	0	0	8	19	27	31	44	46	**62**	57	57	72	**68**	66	107	49	60	38	30	23	24	17	
:15	7	2	2	1	3	16	29	50	52	37	**52**	63	69	79	**76**	64	54	77	67	40	34	36	17	8	
:30	4	0	1	1	11	14	19	72	46	47	**66**	68	58	72	**80**	73	75	53	42	26	39	43	23	12	
:45	2	0	0	4	19	30	44	61	51	53	**70**	55	71	85	**87**	76	85	60	42	36	19	25	6	7	

AM Peak Gen 10:00 to 11:00 Vol= 250
PM Peak Gen 14:00 to 15:00 Vol= 311

* Thursday, November 03, 2011, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24-Hr
Hrly	15	6	7	10	38	77	132	205	190	249	285	328	307	302	348	345	312	271	249	195	169	155	103	69	4367
:00	8	2	1	2	2	15	34	35	43	53	78	**79**	69	79	**93**	70	85	58	69	56	47	46	24	32	
:15	3	2	1	4	6	16	23	48	42	59	64	**87**	85	80	**77**	82	78	66	77	56	43	57	23	16	
:30	1	0	3	1	7	22	24	66	50	70	84	**80**	74	81	**83**	95	74	82	45	44	42	32	36	11	
:45	3	2	2	3	23	24	51	56	55	67	59	**82**	79	62	**95**	98	75	65	58	39	37	20	20	10	

AM Peak Gen 11:00 to 12:00 Vol= 328
PM Peak Gen 14:00 to 15:00 Vol= 348

* Friday, November 04, 2011, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24-Hr
Hrly	26	14	12	9	42	70	154	218	276	252	347	308	322	304	343	358	370	336	285	214	169	144	162	141	4876
:00	13	4	2	1	2	15	33	42	83	55	**79**	82	78	60	91	74	104	91	92	66	49	42	24	65	
:15	7	8	6	3	9	18	38	48	65	73	**94**	92	74	81	64	80	103	88	78	50	37	41	46	31	
:30	3	2	4	2	9	12	38	57	70	61	**86**	61	93	94	97	106	87	83	56	61	45	31	39	28	
:45	3	0	0	3	22	25	45	71	58	63	**88**	73	77	69	91	98	76	74	59	37	38	30	53	17	

AM Peak Gen 10:15 to 11:15 Vol= 350
PM Peak Gen 15:30 to 16:30 Vol= 411

* Saturday, November 05, 2011, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24-Hr
Hrly	48	19	7	12	33	37	102	221	233	257	310	326	377	369	402	390	369	317	294	170	148	118	162	78	4799
:00	16	8	5	3	3	6	16	44	54	74	59	**87**	79	105	94	103	103	76	89	46	44	32	33	34	
:15	15	3	0	3	9	6	21	47	54	49	90	**91**	93	89	109	95	96	83	65	48	52	37	37	17	
:30	9	5	0	4	12	9	28	68	50	76	85	**72**	93	78	100	97	95	72	78	42	23	29	55	18	
:45	8	3	2	2	9	16	37	62	75	58	76	**76**	112	97	99	95	75	86	62	34	29	20	37	9	

AM Peak Gen 11:00 to 12:00 Vol= 326
PM Peak Gen 14:15 to 15:15 Vol= 411

* Sunday, November 06, 2011, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
Hrly	18	21	11	9	27	49	91	194	251	282	275	321	308	391	381	-	-	-	-	-	-	-	-	-
:00	8	11	2	1	4	3	9	33	64	64	52	76	81	89	88	-	-	-	-	-	-	-	-	-
:15	5	4	5	3	3	11	18	46	61	67	67	75	75	89	83	-	-	-	-	-	-	-	-	-
:30	2	1	1	3	14	14	29	54	64	70	86	84	76	116	108	-	-	-	-	-	-	-	-	-
:45	3	5	3	2	6	21	35	61	62	81	70	86	76	97	102	-	-	-	-	-	-	-	-	-

AM Peak Gen 11:00 to 12:00 Vol= 321

24-Hour Traffic Count Data on Kuilima Drive at Kamehameha Highway-Inbound
Site: Kuilima Drive Hotel Entrance

* Sunday, October 30, 2011=928 (Incomplete) , 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
Hrly	-	-	-	-	-	-	-	-	-	-	-	-	96	133	155	132	124	89	66	44	41	20	26	6
:00	-	-	-	-	-	-	-	-	-	-	-	-	2	29	38	35	27	25	25	16	16	9	12	1
:15	-	-	-	-	-	-	-	-	-	-	-	-	26	34	33	27	30	26	16	13	7	2	3	0
:30	-	-	-	-	-	-	-	-	-	-	-	-	37	36	42	33	40	19	16	10	9	6	6	2
:45	-	-	-	-	-	-	-	-	-	-	-	-	31	35	42	37	28	19	10	5	9	4	5	3

PM Peak 1400 - 1500 (155), PM PHF=0.92

* Monday, October 31, 2011=1665, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24-Hr
Hrly	4	2	2	6	32	40	52	112	102	114	108	136	140	119	130	127	100	83	57	51	51	66	26	11	1671
:00	0	0	1	0	1	8	9	17	26	35	30	31	35	30	27	46	20	19	11	15	15	4	7	4	
:15	1	0	1	0	4	11	14	25	20	19	24	44	28	17	35	27	29	16	15	15	8	35	7	4	
:30	0	0	0	3	6	8	12	38	26	35	24	36	38	34	35	24	27	20	18	10	16	9	7	1	
:45	3	2	0	3	21	14	18	33	31	26	30	25	40	38	34	30	25	29	13	12	12	18	6	2	

AM Peak 1045 - 1145 (140), AM PHF=0.80 PM Peak 1415 - 1515 (149), PM PHF=0.81

* Tuesday, November 01, 2011=1637, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24-Hr
Hrly	2	0	2	8	22	42	58	127	105	79	91	118	139	126	120	124	133	111	66	50	31	42	32	14	1642
:00	2	0	1	2	0	8	12	19	25	21	20	31	35	27	33	31	24	24	17	9	17	7	10	4	
:15	0	0	1	1	5	11	11	21	25	20	33	30	35	38	22	29	28	28	20	11	6	13	3	2	
:30	0	0	0	2	5	10	8	44	30	16	23	26	29	33	33	30	32	34	15	11	4	12	12	4	
:45	0	0	0	3	12	13	28	44	26	23	16	32	40	29	33	35	50	27	15	19	5	10	8	4	

AM Peak 0730 - 0830 (137), AM PHF=0.78 PM Peak 1200 - 1300 (139), PM PHF=0.87

* Wednesday, November 02, 2011=1661, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24-Hr
Hrly	9	1	1	5	29	44	61	101	105	91	118	101	115	144	149	125	124	95	69	53	37	46	34	9	1666
:00	0	1	0	0	4	9	9	10	24	22	29	19	24	40	27	22	41	25	13	16	8	4	9	0	
:15	3	0	1	1	2	8	16	26	32	21	32	20	27	38	41	35	15	31	26	14	12	18	10	3	
:30	6	0	0	2	9	10	10	30	24	20	30	38	27	27	38	32	28	13	13	10	10	16	8	4	
:45	0	0	0	3	15	17	28	36	26	28	28	24	38	39	44	36	41	26	18	14	8	8	8	2	

AM Peak 0730 - 0830 (121), AM PHF=0.85 PM Peak 1400 - 1500 (149), PM PHF=0.86

* Thursday, November 03, 2011=1952, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24-Hr
Hrly	3	2	5	5	27	48	71	114	93	112	138	147	144	134	167	155	135	107	103	80	68	53	33	13	1957
:00	2	2	0	0	1	6	13	14	21	21	44	46	26	40	36	32	34	18	24	21	22	12	9	6	
:15	0	0	1	2	4	12	11	21	21	28	36	31	38	37	31	40	29	26	36	21	19	21	4	3	
:30	1	0	0	1	4	12	16	41	22	27	31	34	43	27	41	41	39	37	21	22	19	16	13	1	
:45	0	0	4	2	19	18	32	38	29	36	27	37	38	30	59	42	34	27	22	17	9	5	8	3	

AM Peak 1100 - 1200 (147), AM PHF=0.80 PM Peak 1430 - 1530 (172), PM PHF=0.73

* Friday, November 04, 2011=2234, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24-Hr
Hrly	3	5	9	8	30	50	98	129	168	136	210	145	150	132	152	165	161	140	97	98	53	39	46	15	2239
:00	2	1	0	1	3	9	15	18	45	27	54	48	46	25	31	35	41	32	35	26	18	15	15	5	
:15	0	2	5	2	5	16	28	28	42	44	55	42	36	35	24	41	40	44	22	26	9	10	11	5	
:30	1	2	4	4	3	7	22	39	39	24	51	26	34	34	47	48	34	31	24	31	17	6	7	3	
:45	0	0	0	1	19	19	34	45	42	41	50	30	34	39	51	42	47	34	17	15	9	8	13	2	

AM Peak 1000 - 1100 (210), AM PHF=0.95 PM Peak 1445 - 1545 (174), PM PHF=0.86

* Saturday, November 05, 2011=2214, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24-Hr
Hrly	20	3	3	5	21	25	66	160	115	119	138	130	173	193	207	177	165	134	117	90	57	47	40	15	2220
:00	5	0	3	2	2	1	11	26	22	34	32	34	38	51	48	42	36	28	37	25	17	7	8	3	
:15	7	0	0	2	4	7	16	33	25	28	44	33	40	49	38	46	39	37	30	27	21	13	6	3	
:30	4	3	0	0	7	6	17	48	26	30	27	32	38	44	57	44	48	33	26	26	9	20	17	6	
:45	5	0	0	1	8	11	23	53	43	27	36	32	58	49	64	46	43	37	25	12	11	7	9	3	

AM Peak 0700 - 0800 (160), AM PHF=0.76 PM Peak 1430 - 1530 (208), PM PHF=0.81

* Sunday, November 06, 2011=1386, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
Hrly	4	4	4	5	21	29	56	119	131	133	111	152	175	209	223	-	-	-	-	-	-	-	-	-
:00	0	2	1	0	2	3	6	23	39	29	21	34	48	55	57	-	-	-	-	-	-	-	-	-
:15	1	1	0	1	3	8	11	26	31	26	22	46	42	44	49	-	-	-	-	-	-	-	-	-
:30	2	0	0	2	10	6	20	34	33	30	36	42	40	57	58	-	-	-	-	-	-	-	-	-
:45	1	1	3	2	7	12	19	38	29	49	33	31	45	53	60	-	-	-	-	-	-	-	-	-

AM Peak 1115 - 1215 (167), AM PHF=0.87 PM Peak 1400 - 1500 (223), PM PHF=0.93

24-Hour Traffic Count Data on Kuilima Drive at Kamehameha Highway-Outbound
Site: Kuilima Drive Hotel Entrance

* Sunday, October 30, 2011=1148 (Incomplete) , 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
Hrly	-	-	-	-	-	-	-	-	-	-	-	-	-	141	133	157	144	123	114	67	43	37	49	26
:00	-	-	-	-	-	-	-	-	-	-	-	-	-	33	39	52	47	42	29	22	14	14	21	15
:15	-	-	-	-	-	-	-	-	-	-	-	-	-	32	27	47	40	33	33	12	8	7	13	4
:30	-	-	-	-	-	-	-	-	-	-	-	-	-	40	32	36	30	31	31	19	13	6	9	3
:45	-	-	-	-	-	-	-	-	-	-	-	-	-	36	36	22	28	18	21	14	9	11	6	4

PM Peak 1445 - 1545 (171), PM PHF=0.82

* Monday, October 31, 2011=1710, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24-Hr
Hrly	10	6	0	4	9	17	31	67	74	131	125	124	151	120	126	146	153	121	94	51	34	62	34	25	1715
:00	8	2	0	0	0	6	5	20	26	31	30	33	43	30	44	33	48	42	36	17	5	12	8	8	
:15	1	2	0	0	2	1	11	18	10	30	28	34	43	25	30	39	36	25	21	15	14	20	11	9	
:30	0	0	0	2	4	1	8	11	12	37	25	29	36	40	26	38	31	26	28	14	11	20	10	4	
:45	1	2	0	2	3	9	8	19	26	33	43	29	30	26	27	37	39	28	10	6	5	10	6	5	

AM Peak 1145 - 1245 (149), AM PHF=0.88 PM Peak 1515 - 1615 (161), PM PHF=0.85

* Tuesday, November 01, 2011=1715, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24-Hr
Hrly	9	1	2	3	15	16	27	58	90	105	94	126	121	140	151	144	142	134	125	73	34	46	37	28	1721
:00	4	1	0	2	5	5	3	14	26	26	21	29	20	26	43	43	49	42	38	28	11	10	18	15	
:15	2	0	0	1	5	2	6	13	23	23	23	31	30	29	36	27	44	38	41	17	5	13	4	7	
:30	2	0	0	0	3	0	5	16	22	29	27	36	43	45	44	40	27	27	30	20	4	9	5	4	
:45	1	0	2	0	2	9	13	16	21	28	24	30	29	41	29	35	23	27	16	9	15	15	10	2	

AM Peak 1100 - 1200 (126), AM PHF=0.87 PM Peak 1530 - 1630 (167), PM PHF=0.86

* Wednesday, November 02, 2011=2196, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24-Hr
Hrly	12	1	0	0	12	23	34	69	70	77	131	124	108	156	155	145	170	204	231	118	111	118	62	70	2201
:00	5	0	0	0	4	10	7	13	16	21	34	37	26	27	39	34	62	46	83	25	38	19	28	43	
:15	3	1	0	0	3	5	8	22	16	14	28	33	28	35	38	31	35	70	67	39	20	30	13	13	
:30	4	0	0	0	4	2	8	18	20	23	37	28	28	48	34	41	30	49	42	20	44	40	17	11	
:45	1	0	0	0	2	7	11	16	18	20	32	27	27	47	45	40	44	40	39	35	10	29	4	4	

AM Peak 1030 - 1130 (139), AM PHF=0.94 PM Peak 1715 - 1815 (241), PM PHF=0.73

* Thursday, November 03, 2011=1828, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24-Hr
Hrly	25	3	7	6	20	47	46	65	75	90	97	127	118	121	134	151	136	119	97	92	75	84	54	45	1834
:00	17	0	0	4	0	16	16	16	21	23	27	31	29	31	43	26	46	37	30	30	15	35	16	19	
:15	5	3	0	2	4	13	6	18	18	15	21	42	38	28	29	31	41	30	29	25	20	24	11	9	
:30	0	0	5	0	7	4	8	15	16	27	28	28	26	39	31	47	25	31	21	17	18	15	18	9	
:45	4	0	2	0	10	14	16	16	20	26	21	27	25	24	32	47	25	22	18	21	23	11	9	8	

AM Peak 1100 - 1200 (127), AM PHF=0.77 PM Peak 1530 - 1630 (181), PM PHF=0.96

* Friday, November 04, 2011=2026, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24-Hr
Hrly	20	3	9	1	12	13	32	59	71	108	103	117	135	133	125	144	149	149	155	88	95	93	103	113	2030
:00	10	0	1	0	0	5	7	16	25	26	21	26	29	22	39	31	41	47	48	29	21	30	13	59	
:15	4	2	5	1	2	3	10	13	18	29	28	31	31	31	30	35	49	37	48	20	22	25	24	19	
:30	2	1	3	0	6	1	7	13	13	29	24	26	45	48	28	41	26	34	30	20	26	19	19	25	
:45	4	0	0	0	4	4	9	18	15	26	31	35	31	32	29	37	34	32	29	19	26	19	47	10	

AM Peak 1145 - 1245 (139), AM PHF=0.78 PM Peak 1530 - 1630 (167), PM PHF=0.86

* Saturday, November 05, 2011=2026, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24-Hr
Hrly	24	6	3	4	12	9	26	53	73	105	121	155	156	161	158	164	183	125	142	68	66	70	102	45	2031
:00	10	2	1	2	4	3	2	14	23	31	18	46	29	47	40	40	61	33	44	18	28	22	20	22	
:15	5	1	0	0	2	0	6	10	15	18	42	39	41	42	54	39	56	30	29	17	19	18	30	11	
:30	1	1	0	2	4	2	6	22	17	33	39	31	37	28	31	36	37	25	40	13	9	14	35	8	
:45	8	2	2	0	2	4	12	7	19	23	23	39	49	44	34	50	30	37	31	20	11	16	17	5	

AM Peak 1100 - 1200 (155), AM PHF=0.85 PM Peak 1545 - 1645 (203), PM PHF=0.84

* Sunday, November 06, 2011=981, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
Hrly	15	10	5	3	3	10	21	57	89	97	121	134	106	160	132	-	-	-	-	-	-	-	-	-
:00	7	5	0	0	2	2	2	15	21	24	22	40	26	34	27	-	-	-	-	-	-	-	-	-
:15	4	2	1	0	0	1	2	13	24	28	35	21	30	39	33	-	-	-	-	-	-	-	-	-
:30	1	0	1	1	1	1	6	15	24	18	41	32	26	50	41	-	-	-	-	-	-	-	-	-
:45	3	3	3	2	0	6	11	14	21	28	24	42	25	37	32	-	-	-	-	-	-	-	-	-

AM Peak 1015 - 1115 (139), AM PHF=0.85 PM Peak 1300 - 1400 (160), PM PHF=0.81

24-Hour Traffic Count Data on Kuilima Drive at Kamehameha Highway-Total for Both Directions
Site: Kuilima [Kuilima Drive North] Kuilima Drive Hotel Entrance

* Sunday, October 30, 2011=928 (Incomplete) , 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
Hrly	-	-	-	-	-	-	-	-	-	-	-	-	-	275	289	289	270	213	181	111	85	59	75	32
:00	-	-	-	-	-	-	-	-	-	-	-	-	-	62	77	87	74	67	54	38	30	23	33	16
:15	-	-	-	-	-	-	-	-	-	-	-	-	-	66	60	74	70	59	49	25	15	9	16	4
:30	-	-	-	-	-	-	-	-	-	-	-	-	-	76	74	69	70	50	47	29	22	12	15	5
:45	-	-	-	-	-	-	-	-	-	-	-	-	-	71	78	59	56	37	31	19	18	15	11	7

PM Peak Gen 14:30 to 15:30 Vol= 313

* Monday, October 31, 2011=1665, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24-Hr
Hrly	14	8	2	10	41	58	85	181	177	246	234	261	293	240	258	274	255	205	152	104	86	128	62	37	3411
:00	8	2	1	0	1	14	14	37	52	66	60	64	78	60	71	79	68	61	47	32	20	16	15	12	
:15	2	2	1	0	6	12	25	43	30	49	52	78	71	42	65	66	65	41	36	30	22	55	18	13	
:30	0	0	0	5	10	9	20	49	38	72	49	65	74	74	61	62	58	46	46	24	27	29	17	5	
:45	4	4	0	5	24	23	26	52	57	59	73	54	70	64	61	67	64	57	23	18	17	28	12	7	

AM Peak Gen 10:45 to 11:45 Vol= 280
PM Peak Gen 15:00 to 16:00 Vol= 274

* Tuesday, November 01, 2011=1637, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24-Hr
Hrly	11	1	4	11	37	58	86	187	198	186	187	245	261	268	273	270	277	247	192	124	67	89	70	42	3391
:00	6	1	1	4	5	13	15	33	51	47	41	60	55	53	76	74	73	66	55	37	28	17	28	19	
:15	2	0	1	2	10	13	17	34	48	43	56	61	65	67	58	56	72	66	61	28	11	26	7	9	
:30	2	0	0	2	8	10	13	60	52	45	50	62	72	78	77	70	59	61	45	31	8	21	17	8	
:45	1	0	2	3	14	22	41	60	47	51	40	62	69	70	62	70	73	54	31	28	20	25	18	6	

AM Peak Gen 10:45 to 11:45 Vol= 223
PM Peak Gen 15:00 to 16:00 Vol= 270

* Wednesday, November 02, 2011=1661, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24-Hr
Hrly	22	2	1	6	43	68	97	171	176	169	250	226	225	301	306	271	296	300	301	173	150	164	97	80	3895
:00	5	1	0	0	8	19	16	23	40	43	63	56	50	67	66	56	103	71	96	41	46	23	37	43	
:15	6	1	1	1	5	13	24	48	48	35	60	53	55	73	79	66	50	101	93	53	32	48	23	16	
:30	10	0	0	2	13	12	18	48	44	43	67	66	55	75	72	73	58	62	55	30	54	56	25	15	
:45	1	0	0	3	17	24	39	52	44	48	60	51	65	86	89	76	85	66	57	49	18	37	12	6	

AM Peak Gen 10:00 to 11:00 Vol= 250
PM Peak Gen 15:15 to 16:15 Vol= 318

* Thursday, November 03, 2011=1952, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24-Hr
Hrly	29	5	12	11	49	95	118	179	168	203	235	276	263	256	302	306	273	228	201	174	145	139	88	58	3813
:00	19	2	0	4	1	22	29	30	42	44	71	77	55	71	79	58	80	55	54	51	37	47	25	25	
:15	5	3	1	4	8	25	17	39	39	43	57	73	76	65	60	71	70	56	65	46	39	45	15	12	
:30	1	0	5	1	11	16	24	56	38	54	59	62	69	66	72	88	64	68	42	39	37	31	31	10	
:45	4	0	6	2	29	32	48	54	49	62	48	64	63	54	91	89	59	49	40	38	32	16	17	11	

AM Peak Gen 11:00 to 12:00 Vol= 276
PM Peak Gen 14:45 to 15:45 Vol= 308

* Friday, November 04, 2011=2234, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24-Hr
Hrly	23	8	18	9	42	64	132	190	239	246	314	264	286	266	279	310	312	291	253	186	148	132	149	128	4289
:00	12	1	1	1	3	14	22	34	70	53	75	74	75	47	70	66	82	79	83	55	39	45	28	64	
:15	4	4	10	3	7	19	38	41	60	73	83	73	67	66	54	76	89	81	70	46	31	35	35	24	
:30	3	3	7	4	9	8	29	52	52	53	75	52	79	82	75	89	60	65	54	51	43	25	26	28	
:45	4	0	0	1	23	23	43	63	57	67	81	65	65	71	80	79	81	66	46	34	35	27	60	12	

AM Peak Gen 10:00 to 11:00 Vol= 314
PM Peak Gen 16:00 to 17:00 Vol= 312

* Saturday, November 05, 2011=2214, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24-Hr
Hrly	45	9	6	9	33	34	93	213	190	224	261	286	330	354	366	343	350	260	262	158	125	117	142	61	4271
:00	15	2	4	4	6	4	13	40	45	65	50	80	67	98	88	82	97	61	81	43	45	29	28	25	
:15	12	1	0	2	6	7	22	43	40	46	86	72	81	91	92	85	95	67	59	44	40	31	36	14	
:30	5	4	0	2	11	8	23	70	43	63	66	63	75	72	88	80	85	58	66	39	18	34	52	14	
:45	13	2	2	1	10	15	35	60	62	50	59	71	107	93	98	96	73	74	56	32	22	23	26	8	

AM Peak Gen 11:00 to 12:00 Vol= 286
PM Peak Gen 12:30 to 13:30 Vol= 371

* Sunday, November 06, 2011=1386, 15 minute drops

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
Hrly	19	14	9	8	25	39	77	178	222	232	234	288	282	369	357	-	-	-	-	-	-	-	-	-
:00	7	7	1	0	4	5	8	38	60	53	43	74	74	89	84	-	-	-	-	-	-	-	-	-
:15	5	3	1	1	3	9	13	39	55	54	57	67	72	83	82	-	-	-	-	-	-	-	-	-
:30	3	0	1	3	11	7	26	49	57	48	77	74	66	107	99	-	-	-	-	-	-	-	-	-
:45	4	4	6	4	7	18	30	52	50	77	57	73	70	90	92	-	-	-	-	-	-	-	-	-

AM Peak Gen 11:00 to 12:00 Vol= 288

Weekday Turning Movement Count Data
Study Name: Kamehameha Hwy Joseph P Leong Hwy Wkdy
Start Date: 11/01/2011

Vehicular Traffic

		Eastbound Kamehameha Hwy		Northbound Joseph P Leong Hwy		Southbound Kamehameha Hwy			
Start Time	End Time	Left-Turn	Right-Turn	Left-Turn	Through	Through	Right-Turn	Total	Hrly Total
6:30 AM	6:45 AM	18	2	1	45	56	14	136	
6:45 AM	7:00 AM	30	1	1	64	84	16	196	
7:00 AM	7:15 AM	27	0	2	53	75	29	186	
7:15 AM	7:30 AM	27	2	3	63	96	36	227	745
7:30 AM	7:45 AM	34	3	3	60	97	30	227	836
7:45 AM	8:00 AM	21	0	4	62	84	55	226	866
8:00 AM	8:15 AM	41	4	2	70	78	53	248	928
8:15 AM	8:30 AM	36	4	2	52	65	47	206	907
8:30 AM	8:45 AM	35	4	4	47	68	50	208	888
8:45 AM	9:00 AM	45	2	4	50	70	48	219	881
9:00 AM	9:15 AM	36	4	4	59	67	59	229	862
9:15 AM	9:30 AM	42	1	6	57	79	46	231	887
9:30 AM	9:45 AM	42	3	5	49	62	58	219	898
9:45 AM	10:00 AM	48	4	3	74	54	57	240	919
10:00 AM	10:15 AM	61	2	7	66	61	68	265	955
10:15 AM	10:30 AM	55	7	6	64	68	66	266	990
10:30 AM	10:45 AM	63	2	8	57	66	60	256	1027
10:45 AM	11:00 AM	72	4	17	68	57	84	**302**	1089
11:00 AM	11:15 AM	56	10	11	53	55	81	266	1090
11:15 AM	11:30 AM	71	11	7	71	66	75	301	1125
11:30 AM	11:45 AM	53	2	8	72	54	71	260	**1129**
11:45 AM	12:00 PM	66	4	11	63	49	58	251	1078
12:00 PM	12:15 PM	82	3	9	65	55	72	286	1098
12:15 PM	12:30 PM	71	6	17	72	65	84	315	1112
12:30 PM	12:45 PM	86	10	11	71	70	81	329	1181
12:45 PM	1:00 PM	93	7	7	72	47	93	319	1249
1:00 PM	1:15 PM	76	4	15	94	68	82	339	1302
1:15 PM	1:30 PM	96	5	12	82	65	83	343	1330
1:30 PM	1:45 PM	83	13	5	72	64	76	313	1314
1:45 PM	2:00 PM	67	7	9	97	73	75	328	1323
2:00 PM	2:15 PM	83	16	12	76	74	78	339	1323
2:15 PM	2:30 PM	94	7	11	90	44	93	339	1319
2:30 PM	2:45 PM	75	6	10	62	73	76	302	1308
2:45 PM	3:00 PM	81	6	6	92	81	98	364	1344
3:00 PM	3:15 PM	76	2	13	105	87	85	368	1373
3:15 PM	3:30 PM	82	7	17	93	81	101	381	1415
3:30 PM	3:45 PM	82	3	5	96	104	99	**389**	**1502**
3:45 PM	4:00 PM	91	4	11	83	62	68	319	1457
4:00 PM	4:15 PM	84	4	5	97	68	75	333	1422
4:15 PM	4:30 PM	71	9	5	107	70	76	338	1379
AM Peak Hour									
10:45 AM	11:45 AM	252	27	43	264	232	311	1129	
Peak Hour Factor		0.88	1.69	0.63	0.97	1.02	0.93	0.93	
Heavy Vehicles %		5.2%	0.0%	0.0%	5.7%	3.4%	3.2%	4.1%	
PM Peak Hour									
2:45 PM	3:45 PM	321	18	41	386	353	383	1502	
Peak Hour Factor		0.98	1.50	2.05	1.01	0.85	0.97	0.97	
Heavy Vehicles %		0.6%	0.0%	0.0%	0.3%	4.8%	1.6%	1.7%	

Saturday Turning Movement Count Data
Study Name: Kamehameha Hwy Haleiwa Bypass Sat 1130-1530
Start Date: 10/29/2011 Saturday

Vehicular Traffic

		Eastbound Kamehameha Hwy		Northbound Joseph P Leong Hwy		Southbound Kamehameha Hwy			
Start Time	End Time	Left-Turn	Right-Turn	Left-Turn	Through	Through	Right-Turn	Total	Hrly Total
10:30 AM	10:45 AM	76	17	15	100	76	79	363	
10:45 AM	11:00 AM	85	10	15	92	59	81	342	
11:00 AM	11:15 AM	98	9	15	100	59	79	360	
11:15 AM	11:30 AM	98	12	13	90	70	73	356	1421
11:30 AM	11:45 AM	85	9	14	96	77	89	370	1428
11:45 AM	12:00 PM	89	3	24	128	80	86	410	1496
12:00 PM	12:15 PM	83	9	14	106	84	113	409	1545
12:15 PM	12:30 PM	105	14	15	109	95	118	**456**	1645
12:30 PM	12:45 PM	72	13	19	107	102	94	407	**1682**
12:45 PM	1:00 PM	79	5	17	98	70	80	349	1621
1:00 PM	1:15 PM	102	7	14	89	72	99	383	1595
1:15 PM	1:30 PM	94	14	12	91	80	96	387	1526
1:30 PM	1:45 PM	84	9	19	96	86	80	374	1493
1:45 PM	2:00 PM	90	14	11	92	79	99	385	1529
2:00 PM	2:15 PM	73	6	10	99	88	102	378	1524
2:15 PM	2:30 PM	97	11	13	87	84	77	369	1506
2:30 PM	2:45 PM	62	17	8	105	92	88	372	1504
2:45 PM	3:00 PM	85	12	12	85	90	74	358	1477
3:00 PM	3:15 PM	79	22	11	114	117	103	446	1545
3:15 PM	3:30 PM	67	8	12	83	112	72	354	1530
3:30 PM	3:45 PM	83	15	12	93	102	111	416	1574
3:45 PM	4:00 PM	57	10	11	97	85	97	357	1573
4:00 PM	4:15 PM	68	11	8	76	89	77	329	1456
4:15 PM	4:30 PM	77	8	11	97	96	75	364	1466

Saturday Peak Hour

11:45 AM	12:45 PM	349	39	72	450	361	411	1682
Peak Hour Factor		0.83	0.70	1.20	1.03	0.95	0.87	0.92
Heavy Vehicles		1.1%	0.0%	0.0%	2.9%	0.6%	1.7%	1.5%

Sunday Turning Movement Count Data
Study Name Kamehameha Hwy Haleiwa Bypass Sun 1100-1400
Start Date 3/4/2012

Vehicular Traffic

		Eastbound Kamehameha Hwy		Northbound Joseph P Leong Hwy		Southbound Kamehameha Hwy			
Start Time	End Time	Left-Turn	Right-Turn	Left-Turn	Through	Through	Right-Turn	Total	Hrly Total
11:00 AM	11:15 AM	94	9	20	55	68	118	364	
11:15 AM	11:30 AM	94	10	29	82	65	115	395	
11:30 AM	11:45 AM	93	21	30	80	65	94	383	
11:45 AM	12:00 PM	116	21	30	59	68	97	391	1533
12:00 PM	12:15 PM	95	10	21	71	66	102	365	1534
12:15 PM	12:30 PM	88	23	24	70	51	106	362	1501
12:30 PM	12:45 PM	91	16	34	63	82	120	406	1524
12:45 PM	1:00 PM	94	16	28	72	68	110	388	1521
1:00 PM	1:15 PM	93	18	16	67	66	113	373	1529
1:15 PM	1:30 PM	116	21	29	84	77	111	**438**	**1605**
1:30 PM	1:45 PM	112	20	11	78	85	89	395	1594
1:45 PM	2:00 PM	105	28	18	69	71	71	362	1568

Sunday Peak Hour

12:30 PM	1:30 PM	394	71	107	286	293	454	1605
Peak Hour Factor		0.85	0.85	0.92	0.85	0.95	1.02	0.92

Weekday Turning Movement Count Data
Study Name: Kamehameha Hwy Kahekili Hwy Weekday
Start Date: 11/01/2011

Vehicular Traffic

		Westbound Kamehameha Hwy		Northbound Kahekili Hwy		Southbound Kamehameha Hwy			
Start Time	End Time	Left-Turn	Right-Turn	Through	Right-Turn	Left-Turn	Through	Total	Hrly Total
5:15 AM	5:30 AM	15	5	29	5	5	106	165	
5:30 AM	5:45 AM	13	6	34	11	9	153	226	
5:45 AM	6:00 AM	12	4	34	5	22	140	217	
6:00 AM	6:15 AM	11	3	45	16	72	129	276	884
6:15 AM	6:30 AM	5	7	38	24	102	72	248	967
6:30 AM	6:45 AM	4	11	51	28	104	76	274	1015
6:45 AM	7:00 AM	4	16	58	36	126	93	333	1131
7:00 AM	7:15 AM	12	24	79	38	136	92	**381**	1236
7:15 AM	7:30 AM	9	11	59	33	84	109	305	1293
7:30 AM	7:45 AM	10	30	112	19	71	78	320	**1339**
7:45 AM	8:00 AM	9	38	92	21	53	96	309	1315
8:00 AM	8:15 AM	12	24	83	17	22	120	278	1212
8:15 AM	8:30 AM	10	29	94	12	15	120	280	1187
8:30 AM	8:45 AM	5	19	72	19	27	144	286	1153
8:45 AM	9:00 AM	13	11	77	14	15	136	266	1110
9:00 AM	9:15 AM	16	19	86	14	9	143	287	1119
9:15 AM	9:30 AM	13	14	77	15	11	108	238	1077
9:30 AM	9:45 AM	9	16	74	10	16	107	232	1023
9:45 AM	10:00 AM	13	23	87	13	9	96	241	998
10:00 AM	10:15 AM	14	16	88	9	12	112	251	962
10:15 AM	10:30 AM	10	28	88	9	16	122	273	997
10:30 AM	10:45 AM	14	21	74	10	17	95	231	996
10:45 AM	11:00 AM	7	37	105	12	16	122	299	1054
11:00 AM	11:15 AM	11	31	119	8	12	101	282	1085
11:15 AM	11:30 AM	7	37	102	15	11	114	286	1098
11:30 AM	11:45 AM	6	27	131	9	17	96	286	**1153**
11:45 AM	12:00 PM	13	21	93	11	8	108	254	1108
12:00 PM	12:15 PM	12	28	108	10	12	101	271	1097
12:15 PM	12:30 PM	6	37	107	10	10	101	271	1082
12:30 PM	12:45 PM	10	36	115	15	10	97	283	1079
12:45 PM	1:00 PM	8	37	120	13	20	109	307	1132
1:00 PM	1:15 PM	12	43	117	19	15	107	313	1174
1:15 PM	1:30 PM	12	24	114	18	19	104	291	1194
1:30 PM	1:45 PM	14	49	129	10	24	106	332	1243
1:45 PM	2:00 PM	16	40	115	14	12	114	311	1247
2:00 PM	2:15 PM	10	31	122	18	14	134	329	1263
2:15 PM	2:30 PM	12	23	111	13	29	171	359	1331
2:30 PM	2:45 PM	10	29	110	11	23	124	307	1306
2:45 PM	3:00 PM	8	40	134	13	13	108	316	1311
3:00 PM	3:15 PM	13	37	141	17	19	140	367	1349
3:15 PM	3:30 PM	9	61	164	17	13	122	386	1376
3:30 PM	3:45 PM	13	61	166	19	16	142	**417**	1486
3:45 PM	4:00 PM	13	52	159	10	23	154	411	1581
4:00 PM	4:15 PM	10	73	157	13	13	132	398	1612
4:15 PM	4:30 PM	14	53	151	22	23	144	407	**1633**
4:30 PM	4:45 PM	9	71	143	13	15	129	380	1596
4:45 PM	5:00 PM	11	80	131	20	14	124	380	1565
5:00 PM	5:15 PM	15	72	115	19	19	135	375	1542
5:15 PM	5:30 PM	14	67	151	20	15	111	378	1513
5:30 PM	5:45 PM	10	81	114	21	17	120	363	1496
5:45 PM	6:00 PM	12	52	128	12	18	114	336	1452
6:00 PM	6:15 PM	9	53	144	16	15	114	351	1428
6:15 PM	6:30 PM	10	49	133	9	13	104	318	1368

AM Peak Hour								
6:45 AM	7:45 AM	35	81	308	126	417	372	1339
Peak Hour Factor		0.73	0.84	0.97	0.83	0.77	1.01	0.88
Heavy Vehicles		5.7%	7.4%	4.5%	4.0%	2.2%	2.7%	3.4%

PM Peak Hour								
3:30 PM	4:30 PM	50	239	633	64	75	572	1633
Peak Hour Factor		0.96	0.98	0.95	0.84	1.17	1.01	0.98
Heavy Vehicles		6.0%	5.4%	3.0%	4.7%	2.7%	1.6%	3.0%

Saturday Turning Movement Count Data
Study Name: Kamehameha Hwy Kahekili Hwy Sat 1130-1530
Start Date: 10/29/2011 Saturday

Vehicular Traffic

		Westbound Kamehameha Hwy		Northbound Kahekili Hwy		Southbound Kamehameha Hwy			
Start Time	End Time	Left-Turn	Right-Turn	Through	Right-Turn	Left-Turn	Through	Total	Hrly Total
11:00 AM	11:15 AM	6	54	152	17	18	146	393	
11:15 AM	11:30 AM	13	43	144	18	17	118	353	
11:30 AM	11:45 AM	10	43	124	15	16	172	380	
11:45 AM	12:00 PM	13	47	157	13	16	124	370	1496
12:00 PM	12:15 PM	18	46	149	27	22	133	395	1498
12:15 PM	12:30 PM	11	59	128	16	20	136	370	1515
12:30 PM	12:45 PM	10	61	140	15	23	135	384	1519
12:45 PM	1:00 PM	8	49	167	16	24	171	435	1584
1:00 PM	1:15 PM	9	77	152	22	18	101	379	1568
1:15 PM	1:30 PM	9	60	141	17	17	149	393	1591
1:30 PM	1:45 PM	7	53	133	17	18	146	374	1581
1:45 PM	2:00 PM	14	55	142	15	21	154	401	1547
2:00 PM	2:15 PM	17	60	142	21	18	123	381	1549
2:15 PM	2:30 PM	11	62	137	17	16	156	399	1555
2:30 PM	2:45 PM	9	43	163	24	22	168	**429**	1610
2:45 PM	3:00 PM	13	47	154	16	16	146	392	1601
3:00 PM	3:15 PM	13	55	141	20	14	149	392	**1612**
3:15 PM	3:30 PM	14	48	133	16	16	140	367	1580
3:30 PM	3:45 PM	11	37	142	19	10	158	377	1528
3:45 PM	4:00 PM	10	38	144	19	17	159	387	1523

Saturday Peak Hour								
2:15 PM	3:15 PM	46	207	595	77	68	619	1612
Peak Hour Factor		1.28	1.20	0.91	0.80	0.77	0.92	0.94
Heavy Vehicles		6.5%	1.9%	2.4%	2.6%	4.4%	3.1%	2.8%

Sunday Turning Movement Count Data

Study Name Kam Hwy Kahekili Hwy Sunday

Start Date 3/11/2012

Vehicular Traffic

		Westbound Kamehameha Hwy		Northbound Kahekili Hwy		Southbound Kamehameha Hwy			
Start Time	End Time	Left-Turn	Right-Turn	Through	Right-Turn	Left-Turn	Through	Total	Hrly Total
12:30 PM	12:45 PM	16	40	116	9	19	129	329	
12:45 PM	1:00 PM	8	41	133	9	16	136	343	
1:00 PM	1:15 PM	11	38	120	15	19	127	330	
1:15 PM	1:30 PM	14	71	104	27	18	128	362	1364
1:30 PM	1:45 PM	20	58	119	9	19	105	330	1365
1:45 PM	2:00 PM	18	45	148	22	16	110	359	1381
2:00 PM	2:15 PM	6	56	131	20	15	140	368	1419
2:15 PM	2:30 PM	19	41	142	19	15	140	**376**	**1433**
2:30 PM	2:45 PM	8	46	106	15	22	132	329	1432
2:45 PM	3:00 PM	11	44	124	16	11	142	348	1421
3:00 PM	3:15 PM	7	29	106	9	16	119	286	1339
3:15 PM	3:30 PM	16	32	116	20	9	154	347	1310
3:30 PM	3:45 PM	8	37	109	16	12	114	296	1277
3:45 PM	4:00 PM	15	34	101	14	20	157	341	1270
4:00 PM	4:15 PM	10	35	98	17	14	154	328	1312
4:15 PM	4:30 PM	16	33	86	20	13	160	328	1293

Sunday Peak Hour

1:30 PM	2:30 PM	63	200	540	70	65	495	1433
Peak Hour Factor		0.83	1.22	0.95	0.92	1.08	0.88	0.95
Heavy Vehicles		1.6%	1.5%	0.9%	2.9%	1.5%	2.2%	1.6%

Sunday Turning Movement Count Data

Study Name Haleiwa Farmers Market Trip Generation

Start Date 6/10/2012

Vehicular Traffic

		Eastbound Kamehameha Hwy		Westbound Kamehameha Hwy		Farmers Market Southbound Street		Intersection		Farmers Market		
Start Time	End Time	Left-Turn	Through	Through	Right-Turn	Left-Turn	Right-Turn	Total	Hrly Total	Site Enter	Site Exit	Site Total	Hrly Total
9:00 AM	9:15 AM	10	47	56	20	2	13	148		30	15	45	
9:15 AM	9:30 AM	9	68	60	24	6	16	183		33	22	55	
9:30 AM	9:45 AM	10	66	49	21	4	16	166		31	20	51	
9:45 AM	10:00 AM	7	76	90	30	2	14	219	716	37	16	53	204
10:00 AM	10:15 AM	15	96	73	32	8	18	242	810	47	26	73	232
10:15 AM	10:30 AM	10	72	78	28	6	20	214	841	38	26	64	241
10:30 AM	10:45 AM	13	83	75	24	6	26	227	902	37	32	69	259
10:45 AM	11:00 AM	11	88	114	26	4	23	266	949	37	27	64	270
11:00 AM	11:15 AM	11	113	102	31	5	28	290	997	42	33	75	272
11:15 AM	11:30 AM	3	100	104	34	9	18	268	1051	37	27	64	272
11:30 AM	11:45 AM	10	121	107	31	8	21	298	1122	41	29	70	273
11:45 AM	12:00 PM	6	117	114	23	13	24	297	1153	29	37	66	**275**
12:00 PM	12:15 PM	9	94	112	18	5	26	264	1127	27	31	58	258
12:15 PM	12:30 PM	2	124	118	28	5	24	301	1160	30	29	59	253
12:30 PM	12:45 PM	6	114	99	20	5	21	265	1127	26	26	52	235
12:45 PM	1:00 PM	14	120	112	19	4	33	302	1132	33	37	70	239
1:00 PM	1:15 PM	1	121	125	18	12	19	296	1164	19	31	50	231
1:15 PM	1:30 PM	4	123	122	13	4	33	299	1162	17	37	54	226
1:30 PM	1:45 PM	3	128	133	2	14	25	305	**1202**	5	39	44	218
1:45 PM	2:00 PM	3	102	100	0	9	8	222	1122	3	17	20	168
2:00 PM	2:15 PM	1	106	93	0	2	6	208	1034	1	8	9	127
2:15 PM	2:30 PM	2	115	130	1	2	6	256	991	3	8	11	84
2:30 PM	2:45 PM	1	123	138	0	0	4	266	952	1	4	5	45
2:45 PM	3:00 PM	0	113	122	0	1	0	236	966	0	1	1	26

Peak Hour

11:00 AM	12:00 PM	30	451	427	119	35	91	1153	149	126	275
2:00 PM	3:00 PM	4	457	483	1	5	16	966	5	21	26

TRAFFIC IMPACT ANALYSIS REPORT

FOR THE PROPOSED

TURTLE BAY RESORT MASTER PLAN

KAHUKU, OAHU, HAWAII

APPENDIX B

CAPACITY ANALYSIS WORKSHEETS

EXISTING TRAFFIC CONDITIONS

Intersection						
Intersection Delay (sec/veh):	3.8					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Volume (vph)	82	169	182	62	70	84
Conflicting Peds.(#/hr)	1	0	0	1	7	0
Sign Control	Free	Free	Free	Free	Stop	Stop
Right Turn Channelized	None	None	Yield	Yield	Free	Free
Storage Length	0			0	0	0
Median Width		0	0		12	
Grade (%)		0%	0%		0%	
Peak Hour Factor	0.93	1.00	0.77	1.00	0.97	1.00
Heavy Vehicles(%)	4	13	6	7	6	7
Movement Flow Rate	88	169	236	62	72	84
Number of Lanes	0	1	1	0	1	1

Major/Minor	Major 1		Major 2			
Conflicting Flow Rate - All	305	0	0	0	619	275
Stage 1	-	-	-	-	274	-
Stage 2	-	-	-	-	345	-
Follow-up Headway	2.236	-	-	-	3.554	3.363
Pot Capacity-1 Maneuver	1244	-	-	-	446	752
Stage 1	-	-	-	-	763	-
Stage 2	-	-	-	-	708	-
Time blocked-Platoon(%)	0	-	-	-	0	0
Mov Capacity-1 Maneuver	1243	-	-	-	406	747
Mov Capacity-2 Maneuver	-	-	-	-	406	-
Stage 1	-	-	-	-	759	-
Stage 2	-	-	-	-	649	-

Approach	EB	WB	SB
HCM Control Delay (s)	2.8	0	12.9
HCM LOS	A	A	B

Lane	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (vph)					406	747
HCM Control Delay (s)	8.117	-	-	-	15.8	10.4
HCM Lane VC Ratio	0.071	-	-	-	0.178	0.112
HCM Lane LOS	A	-	-	-	C	B
HCM 95th Percentile Queue (veh)	0.229	-	-	-	0.639	0.378

Intersection	
Intersection Delay (sec/veh):	0.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Volume (vph)	1	233	248	6	6	4
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None
Storage Length	0			0	0	0
Median Width		0	0		12	
Grade (%)		0%	0%		0%	
Peak Hour Factor	1.00	0.82	0.87	1.00	1.00	1.00
Heavy Vehicles(%)	0	13	6	0	0	0
Movement Flow Rate	1	284	285	6	6	4
Number of Lanes	0	1	1	0	1	0

Major/Minor	Major 1		Major 2			
Conflicting Flow Rate - All	291	0	0	0	574	288
Stage 1	-	-	-	-	288	-
Stage 2	-	-	-	-	286	-
Follow-up Headway	2.2	-	-	-	3.5	3.3
Pot Capacity-1 Maneuver	1282	-	-	-	484	756
Stage 1	-	-	-	-	766	-
Stage 2	-	-	-	-	767	-
Time blocked-Platoon(%)	0	-	-	-	0	0
Mov Capacity-1 Maneuver	1282	-	-	-	484	756
Mov Capacity-2 Maneuver	-	-	-	-	484	-
Stage 1	-	-	-	-	766	-
Stage 2	-	-	-	-	766	-

Approach	EB	WB	SB
HCM Control Delay (s)	0	0	11.5
HCM LOS	A	A	B

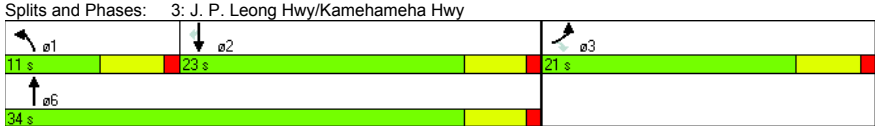
Lane	EBL	EBT	WBT	WBR	SBLn1
Capacity (vph)					565
HCM Control Delay (s)	7.81	-	-	-	11.5
HCM Lane VC Ratio	0.001	-	-	-	0.018
HCM Lane LOS	A	-	-	-	B
HCM 95th Percentile Queue (veh)	0.002	-	-	-	0.054

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	252	27	43	264	232	311
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	0			450
Storage Lanes	1	1	1			1
Taper Length (ft)	100		100			
Satd. Flow (prot)	1719	1615	1805	1792	1845	1568
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1719	1615	1805	1792	1845	1568
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		139				334
Link Speed (mph)	30			30	30	
Link Distance (ft)	220			382	754	
Travel Time (s)	5.0			8.7	17.1	
Peak Hour Factor	0.88	1.00	0.63	0.97	1.00	0.93
Heavy Vehicles (%)	5%	0%	0%	6%	3%	3%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	286	27	68	272	232	334
Turn Type	NA	Perm	Prot	NA	NA	Perm
Protected Phases	3		1	6	2	
Permitted Phases		3				2
Detector Phase	3	3	1	6	2	2
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.0	21.0	9.0	9.0	21.0	21.0
Total Split (s)	21.0	21.0	11.0	34.0	23.0	23.0
Total Split (%)	38.2%	38.2%	20.0%	61.8%	41.8%	41.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Max	Max
Act Effct Green (s)	12.7	12.7	6.0	24.5	20.8	20.8
Actuated g/C Ratio	0.26	0.26	0.12	0.49	0.42	0.42
v/c Ratio	0.65	0.05	0.31	0.31	0.30	0.39
Control Delay	24.4	0.2	26.1	8.3	13.9	3.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.4	0.2	26.1	8.3	13.9	3.7
LOS	C	A	C	A	B	A
Approach Delay	22.3			11.9	7.9	
Approach LOS	C			B	A	
Queue Length 50th (ft)	79	0	20	39	53	0
Queue Length 95th (ft)	140	0	36	82	107	45
Internal Link Dist (ft)	140			302	674	
Turn Bay Length (ft)						450
Base Capacity (vph)	564	623	221	1065	771	849
Starvation Cap Reductn	0	0	0	0	0	0

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.51	0.04	0.31	0.26	0.30	0.39

Intersection Summary	
Area Type:	Other
Cycle Length: 55	
Actuated Cycle Length: 49.7	
Natural Cycle: 55	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.65	
Intersection Signal Delay: 12.7	Intersection LOS: B
Intersection Capacity Utilization 42.0%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 3: J. P. Leong Hwy/Kamehameha Hwy



Intersection	
Intersection Delay (sec/veh):	78

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Volume (vph)	36	81	308	126	417	372
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
Right Turn Channelized	Yield	Yield	Yield	Yield	None	None
Storage Length	0	0		200	0	
Median Width	12		0			0
Grade (%)	0%		0%			0%
Peak Hour Factor	0.73	0.84	0.97	0.83	0.70	1.00
Heavy Vehicles(%)	6	7	5	4	2	3
Movement Flow Rate	49	96	318	152	596	372
Number of Lanes	1	0	1	1	0	1

Major/Minor			Major 1			Major 2
Conflicting Flow Rate - All	1958	235	0	0	470	0
Stage 1	394	-	-	-	-	-
Stage 2	1564	-	-	-	-	-
Follow-up Headway	3.554	3.363	-	-	2.218	-
Pot Capacity-1 Maneuver	68	792	-	-	1092	-
Stage 1	673	-	-	-	-	-
Stage 2	186	-	-	-	-	-
Time blocked-Platoon(%)	0	0	-	-	0	-
Mov Capacity-1 Maneuver	# 21	792	-	-	1092	-
Mov Capacity-2 Maneuver	# 21	-	-	-	-	-
Stage 1	673	-	-	-	-	-
Stage 2	58	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay (s)	$ 797.6	0	7.5
HCM LOS	F	A	A

Lane	NBT	NBR	WBLn1	SBL	SBT
Capacity (vph)			60		
HCM Control Delay (s)	-	-	$ 797.6	12.18	-
HCM Lane VC Ratio	-	-	2.429	0.546	-
HCM Lane LOS	-	-	F	B	-
HCM 95th Percentile Queue (veh)	-	-	14.49	3.413	-

Intersection	
Intersection Delay (sec/veh):	3.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Volume (vph)	104	240	277	76	70	91
Conflicting Peds.(#/hr)	0	0	0	0	3	1
Sign Control	Free	Free	Free	Free	Stop	Stop
Right Turn Channelized	None	None	Yield	Yield	Free	Free
Storage Length	0			0	0	0
Median Width		0	0		12	
Grade (%)		0%	0%		0%	
Peak Hour Factor	1.00	0.76	0.85	0.95	1.00	0.91
Heavy Vehicles(%)	2	3	5	8	4	7
Movement Flow Rate	104	316	326	80	70	100
Number of Lanes	0	1	1	0	1	1

Major/Minor	Major 1		Major 2			
Conflicting Flow Rate - All	409	0	0	0	893	369
Stage 1	-	-	-	-	369	-
Stage 2	-	-	-	-	524	-
Follow-up Headway	2.218	-	-	-	3.536	3.363
Pot Capacity-1 Maneuver	1150	-	-	-	309	666
Stage 1	-	-	-	-	695	-
Stage 2	-	-	-	-	590	-
Time blocked-Platoon(%)	0	-	-	-	0	0
Mov Capacity-1 Maneuver	1150	-	-	-	274	664
Mov Capacity-2 Maneuver	-	-	-	-	274	-
Stage 1	-	-	-	-	693	-
Stage 2	-	-	-	-	524	-

Approach	EB	WB	SB
HCM Control Delay (s)	2.1	0	16
HCM LOS	A	A	C

Lane	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (vph)					274	664
HCM Control Delay (s)	8.441	-	-	-	22.6	11.4
HCM Lane VC Ratio	0.09	-	-	-	0.255	0.151
HCM Lane LOS	A	-	-	-	C	B
HCM 95th Percentile Queue (veh)	0.298	-	-	-	0.991	0.528

Intersection	
Intersection Delay (sec/veh):	0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Volume (vph)	2	304	345	7	7	3
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None
Storage Length	0			0	0	0
Median Width		0	0		12	
Grade (%)		0%	0%		0%	
Peak Hour Factor	0.25	0.86	0.90	1.00	1.00	0.75
Heavy Vehicles(%)	0	3	5	0	0	0
Movement Flow Rate	8	353	383	7	7	4
Number of Lanes	0	1	1	0	1	0

Major/Minor	Major 1		Major 2			
Conflicting Flow Rate - All	390	0	0	0	756	387
Stage 1	-	-	-	-	387	-
Stage 2	-	-	-	-	369	-
Follow-up Headway	2.2	-	-	-	3.5	3.3
Pot Capacity-1 Maneuver	1180	-	-	-	379	665
Stage 1	-	-	-	-	691	-
Stage 2	-	-	-	-	704	-
Time blocked-Platoon(%)	0	-	-	-	0	0
Mov Capacity-1 Maneuver	1180	-	-	-	376	665
Mov Capacity-2 Maneuver	-	-	-	-	376	-
Stage 1	-	-	-	-	691	-
Stage 2	-	-	-	-	698	-

Approach	EB	WB	SB
HCM Control Delay (s)	0.2	0	13.3
HCM LOS	A	A	B

Lane	EBL	EBT	WBT	WBR	SBLn1
Capacity (vph)					447
HCM Control Delay (s)	8.072	-	-	-	13.3
HCM Lane VC Ratio	0.007	-	-	-	0.025
HCM Lane LOS	A	-	-	-	B
HCM 95th Percentile Queue (veh)	0.02	-	-	-	0.076

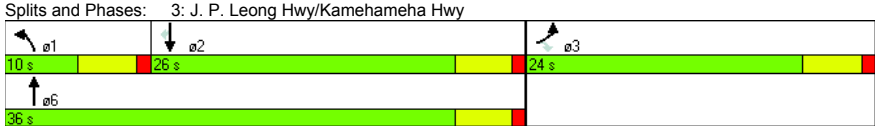
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	321	18	41	386	353	383
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	0			450
Storage Lanes	1	1	1			1
Taper Length (ft)	100		100			
Satd. Flow (prot)	1787	1615	1805	1900	1810	1583
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1787	1615	1805	1900	1810	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		127				407
Link Speed (mph)	30			30	30	
Link Distance (ft)	220			382	754	
Travel Time (s)	5.0			8.7	17.1	
Peak Hour Factor	0.95	0.64	0.60	1.00	1.00	0.94
Heavy Vehicles (%)	1%	0%	0%	0%	5%	2%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	338	28	68	386	353	407
Turn Type	NA	Perm	Prot	NA	NA	Perm
Protected Phases	3		1	6	2	
Permitted Phases		3				2
Detector Phase	3	3	1	6	2	2
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.0	21.0	9.0	9.0	21.0	21.0
Total Split (s)	24.0	24.0	10.0	36.0	26.0	26.0
Total Split (%)	40.0%	40.0%	16.7%	60.0%	43.3%	43.3%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Max	Max
Act Effct Green (s)	14.5	14.5	5.1	28.1	22.7	22.7
Actuated g/C Ratio	0.27	0.27	0.10	0.53	0.43	0.43
v/c Ratio	0.69	0.05	0.39	0.38	0.45	0.45
Control Delay	25.6	0.2	32.2	9.3	15.8	3.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.6	0.2	32.2	9.3	15.8	3.7
LOS	C	A	C	A	B	A
Approach Delay	23.7			12.7	9.3	
Approach LOS	C			B	A	
Queue Length 50th (ft)	101	0	22	66	90	0
Queue Length 95th (ft)	176	0	38	131	173	50
Internal Link Dist (ft)	140			302	674	
Turn Bay Length (ft)						450
Base Capacity (vph)	656	673	174	1139	778	913
Starvation Cap Reductn	0	0	0	0	0	0

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.52	0.04	0.39	0.34	0.45	0.45

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 52.8
Natural Cycle: 55
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.69
Intersection Signal Delay: 13.6 — Intersection LOS: B
Intersection Capacity Utilization 52.2% — ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 3: J. P. Leong Hwy/Kamehameha Hwy



Intersection						
Intersection Delay (sec/veh): 2.8						

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Volume (vph)	50	239	633	64	75	572
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
Right Turn Channelized	Yield	Yield	Yield	Yield	None	None
Storage Length	0	0		200	0	
Median Width	12		0			0
Grade (%)	0%		0%			0%
Peak Hour Factor	0.96	0.98	0.95	0.84	1.00	1.00
Heavy Vehicles(%)	6	5	3	5	3	2
Movement Flow Rate	52	244	666	76	75	572
Number of Lanes	1	0	1	1	0	1

Major/Minor			Major 1			Major 2
Conflicting Flow Rate - All	1426	371	0	0	742	0
Stage 1	704	-	-	-	-	-
Stage 2	722	-	-	-	-	-
Follow-up Headway	3.554	3.345	-	-	2.227	-
Pot Capacity-1 Maneuver	146	668	-	-	861	-
Stage 1	483	-	-	-	-	-
Stage 2	474	-	-	-	-	-
Time blocked-Platoon(%)	0	0	-	-	0	-
Mov Capacity-1 Maneuver	127	668	-	-	861	-
Mov Capacity-2 Maneuver	127	-	-	-	-	-
Stage 1	483	-	-	-	-	-
Stage 2	413	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay (s)	13.4	0	1.1
HCM LOS	B	A	A

Lane	NBT	NBR	WBLn1	SBL	SBT
Capacity (vph)			722		
HCM Control Delay (s)	-	-	13.4	9.58	-
HCM Lane VC Ratio	-	-	0.41	0.087	-
HCM Lane LOS	-	-	B	A	-
HCM 95th Percentile Queue (veh)	-	-	2.008	0.285	-

Intersection						
Intersection Delay (sec/veh): 4.3						

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Volume (vph)	117	328	322	95	74	104
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
Right Turn Channelized	None	None	Yield	Yield	Free	Free
Storage Length	0			0	0	0
Median Width		0	0		12	
Grade (%)		0%	0%		0%	
Peak Hour Factor	0.79	1.00	0.82	0.91	1.00	1.00
Heavy Vehicles(%)	3	2	5	4	3	2
Movement Flow Rate	148	328	393	104	74	104
Number of Lanes	0	1	1	0	1	1

Major/Minor		Major 1		Major 2		
Conflicting Flow Rate - All	497	0	0	0	1069	445
Stage 1	-	-	-	-	445	-
Stage 2	-	-	-	-	624	-
Follow-up Headway	2.227	-	-	-	3.527	3.318
Pot Capacity-1 Maneuver	1062	-	-	-	244	613
Stage 1	-	-	-	-	644	-
Stage 2	-	-	-	-	532	-
Time blocked-Platoon(%)	0	-	-	-	0	0
Mov Capacity-1 Maneuver	1062	-	-	-	203	613
Mov Capacity-2 Maneuver	-	-	-	-	203	-
Stage 1	-	-	-	-	644	-
Stage 2	-	-	-	-	442	-

Approach	EB	WB	SB
HCM Control Delay (s)	2.8	0	20.6
HCM LOS	A	A	C

Lane	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (vph)					203	613
HCM Control Delay (s)	8.938	-	-	-	32.6	12.1
HCM Lane VC Ratio	0.139	-	-	-	0.365	0.17
HCM Lane LOS	A	-	-	-	D	B
HCM 95th Percentile Queue (veh)	0.484	-	-	-	1.568	0.607

Intersection	
Intersection Delay (sec/veh):	0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Volume (vph)	3	391	410	5	3	5
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None
Storage Length	0			0	0	0
Median Width		0	0		12	
Grade (%)		0%	0%		0%	
Peak Hour Factor	0.75	0.95	0.98	1.00	0.75	0.42
Heavy Vehicles(%)	0	2	4	0	0	0
Movement Flow Rate	4	412	418	5	4	12
Number of Lanes	0	1	1	0	1	0

Major/Minor	Major 1		Major 2			
Conflicting Flow Rate - All	423	0	0	0	841	421
Stage 1	-	-	-	-	421	-
Stage 2	-	-	-	-	420	-
Follow-up Headway	2.2	-	-	-	3.5	3.3
Pot Capacity-1 Maneuver	1147	-	-	-	338	637
Stage 1	-	-	-	-	667	-
Stage 2	-	-	-	-	667	-
Time blocked-Platoon(%)	0	-	-	-	0	0
Mov Capacity-1 Maneuver	1147	-	-	-	336	637
Mov Capacity-2 Maneuver	-	-	-	-	336	-
Stage 1	-	-	-	-	667	-
Stage 2	-	-	-	-	664	-

Approach	EB	WB	SB
HCM Control Delay (s)	0.1	0	12.1
HCM LOS	A	A	B

Lane	EBL	EBT	WBT	WBR	SBLn1
Capacity (vph)					520
HCM Control Delay (s)	8.15	-	-	-	12.1
HCM Lane VC Ratio	0.003	-	-	-	0.031
HCM Lane LOS	A	-	-	-	B
HCM 95th Percentile Queue (veh)	0.01	-	-	-	0.095

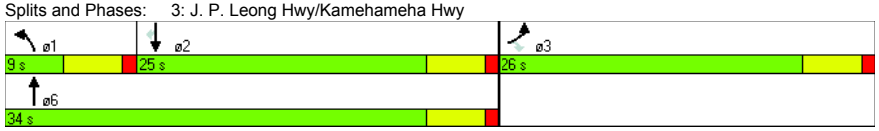
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	349	39	72	450	361	411
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	0			450
Storage Lanes	1	1	1			1
Taper Length (ft)	100		100			
Satd. Flow (prot)	1787	1615	1805	1845	1881	1583
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1787	1615	1805	1845	1881	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		127				472
Link Speed (mph)	30			30	30	
Link Distance (ft)	220			382	754	
Travel Time (s)	5.0			8.7	17.1	
Peak Hour Factor	0.83	0.70	1.00	1.00	0.95	0.87
Heavy Vehicles (%)	1%	0%	0%	3%	1%	2%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	420	56	72	450	380	472
Turn Type	NA	Perm	Prot	NA	NA	Perm
Protected Phases	3		1	6	2	
Permitted Phases		3				2
Detector Phase	3	3	1	6	2	2
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.0	21.0	9.0	9.0	21.0	21.0
Total Split (s)	26.0	26.0	9.0	34.0	25.0	25.0
Total Split (%)	43.3%	43.3%	15.0%	56.7%	41.7%	41.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Max	Max
Act Effct Green (s)	16.9	16.9	4.1	25.6	20.8	20.8
Actuated g/C Ratio	0.32	0.32	0.08	0.49	0.39	0.39
v/c Ratio	0.74	0.09	0.51	0.50	0.51	0.52
Control Delay	25.1	0.4	42.6	12.3	17.7	4.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.1	0.4	42.6	12.3	17.7	4.2
LOS	C	A	D	B	B	A
Approach Delay	22.2			16.5	10.2	
Approach LOS	C			B	B	
Queue Length 50th (ft)	126	0	25	92	103	0
Queue Length 95th (ft)	190	0	#79	174	191	48
Internal Link Dist (ft)	140			302	674	
Turn Bay Length (ft)						450
Base Capacity (vph)	730	735	140	1041	741	909
Starvation Cap Reductn	0	0	0	0	0	0

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.58	0.08	0.51	0.43	0.51	0.52

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 52.7
Natural Cycle: 55
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.74
Intersection Signal Delay: 15.1 — Intersection LOS: B
Intersection Capacity Utilization 54.8% — ICU Level of Service A
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: J. P. Leong Hwy/Kamehameha Hwy



Intersection

Intersection Delay (sec/veh): 2.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Volume (vph)	46	207	595	77	68	619
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
Right Turn Channelized	Yield	Yield	Yield	Yield	None	None
Storage Length	0	0		200	0	
Median Width	12		0			0
Grade (%)	0%		0%			0%
Peak Hour Factor	1.00	1.00	0.91	0.80	0.77	0.92
Heavy Vehicles(%)	7	2	2	6	4	3
Movement Flow Rate	46	207	654	96	88	673
Number of Lanes	1	0	1	1	0	1

Major/Minor			Major 1		Major 2	
Conflicting Flow Rate - All	1551	375	0	0	750	0
Stage 1	702	-	-	-	-	-
Stage 2	849	-	-	-	-	-
Follow-up Headway	3.563	3.318	-	-	2.236	-
Pot Capacity-1 Maneuver	122	671	-	-	850	-
Stage 1	482	-	-	-	-	-
Stage 2	411	-	-	-	-	-
Time blocked-Platoon(%)	0	0	-	-	0	-
Mov Capacity-1 Maneuver	102	671	-	-	850	-
Mov Capacity-2 Maneuver	102	-	-	-	-	-
Stage 1	482	-	-	-	-	-
Stage 2	343	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay (s)	16.6	0	1.1
HCM LOS	C	A	A

Lane	NBT	NBR	WBLn1	SBL	SBT
Capacity (vph)			561		
HCM Control Delay (s)	-	-	16.6	9.726	-
HCM Lane VC Ratio	-	-	0.451	0.104	-
HCM Lane LOS	-	-	C	A	-
HCM 95th Percentile Queue (veh)	-	-	2.324	0.347	-

HCS+: Two-Lane Highways Release 5.4

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/3/11
Analysis Time Period	AM Peak Hour of Traffic
Highway	Kamehameha Highway
From/To	West of Kuilima Drive
Jurisdiction	
Analysis Year	Existing
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.94	
Lane width	12.0	ft	% Trucks and buses	8	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	50	%
Grade: Length		mi	Access points/mi	2	/mi
Up/down		%			

Two-way hourly volume, V 517 veh/h
Directional split 51 / 49 %

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.7	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.947	
Two-way flow rate,(note-1) vp	581	pc/h
Highest directional split proportion (note-2)	296	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	0.5	mi/h
Free-flow speed, FFS	44.5	mi/h

Adjustment for no-passing zones, fnp	2.7	mi/h
Average travel speed, ATS	37.3	mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	0.992	
Two-way flow rate,(note-1) vp	554	pc/h
Highest directional split proportion (note-2)	283	
Base percent time-spent-following, BPTSF	38.6	%
Adj.for directional distribution and no-passing zones, fd/np	18.1	
Percent time-spent-following, PTSF	56.6	%

Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.18	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS+: Two-Lane Highways Release 5.4

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/1/2011
Analysis Time Period	AM Peak Hour of Traffic
Highway	Kamehameha Highway
From/To	Haleiwa to Kawailoa
Jurisdiction	
Analysis Year	Existing
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.94	
Lane width	12.0	ft	% Trucks and buses	4	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	80	%
Grade: Length		mi	Access points/mi	2	/mi
Up/down		%			

Two-way hourly volume, V	1059	veh/h
Directional split	51 / 49	%

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.2	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.992	
Two-way flow rate,(note-1) vp	1136	pc/h
Highest directional split proportion (note-2)	579	pc/h
Free-Flow Speed from Field Measurement:		
Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	0.5	mi/h
Free-flow speed, FFS	44.5	mi/h
Adjustment for no-passing zones, fnp	2.0	mi/h

Average travel speed, ATS	33.7	mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	0.996	
Two-way flow rate,(note-1) vp	1131	pc/h
Highest directional split proportion (note-2)	577	
Base percent time-spent-following, BPTSF	63.0	%
Adj.for directional distribution and no-passing zones, fd/np	10.5	
Percent time-spent-following, PTSF	73.5	%

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.35	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS+: Two-Lane Highways Release 5.4

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/1/2011
Analysis Time Period	AM Peak Hour of Traffic
Highway	Kamehameha Highway
From/To	Hygienic Store
Jurisdiction	
Analysis Year	Existing
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.89	
Lane width	12.0	ft	% Trucks and buses	3	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	80	%
Grade: Length		mi	Access points/mi	10	/mi
Up/down		%			

Two-way hourly volume, V 1178 veh/h
Directional split 67 / 33 %

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.997	
Two-way flow rate,(note-1) vp	1328	pc/h
Highest directional split proportion (note-2)	890	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	2.5	mi/h
Free-flow speed, FFS	42.5	mi/h
Adjustment for no-passing zones, fnp	1.6	mi/h

Average travel speed, ATS 30.6 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	1324	pc/h
Highest directional split proportion (note-2)	887	
Base percent time-spent-following, BPTSF	68.8	%
Adj.for directional distribution and no-passing zones, fd/np	8.6	
Percent time-spent-following, PTSF	77.4	%

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.41	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS+: Two-Lane Highways Release 5.4

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/3/11
Analysis Time Period	PM Peak Hour of Traffic
Highway	Kamehameha Highway
From/To	West of Kuilima Drive
Jurisdiction	
Analysis Year	Existing
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.85	
Lane width	12.0	ft	% Trucks and buses	4	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	50	%
Grade: Length		mi	Access points/mi	2	/mi
Up/down		%			

Two-way hourly volume, V 712 veh/h
Directional split 52 / 48 %

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.2	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.992	
Two-way flow rate,(note-1) vp	844	pc/h
Highest directional split proportion (note-2)	439	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	0.5	mi/h
Free-flow speed, FFS	44.5	mi/h
Adjustment for no-passing zones, fnp	2.1	mi/h

Average travel speed, ATS 35.9 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	0.996	
Two-way flow rate,(note-1) vp	841	pc/h
Highest directional split proportion (note-2)	437	
Base percent time-spent-following, BPTSF	52.3	%
Adj.for directional distribution and no-passing zones, fd/np	12.4	
Percent time-spent-following, PTSF	64.7	%

Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.26	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/1/2011
Analysis Time Period	PM Peak Hour of Traffic
Highway	Kamehameha Highway
From/To	Haleiwa to Kawailoa
Jurisdiction	
Analysis Year	Existing
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.95	
Lane width	12.0	ft	% Trucks and buses	2	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	80	%
Grade: Length		mi	Access points/mi	2	/mi
Up/down		%			

Two-way hourly volume, V 1443 veh/h
Directional split 51 / 49 %

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.998	
Two-way flow rate,(note-1) vp	1522	pc/h
Highest directional split proportion (note-2)	776	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	0.5	mi/h
Free-flow speed, FFS	44.5	mi/h
Adjustment for no-passing zones, fnp	1.3	mi/h

Average travel speed, ATS 31.4 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	1519	pc/h
Highest directional split proportion (note-2)	775	
Base percent time-spent-following, BPTSF	73.7	%
Adj.for directional distribution and no-passing zones, fd/np	6.7	
Percent time-spent-following, PTSF	80.4	%

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.48	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/1/2011
Analysis Time Period	PM Peak Hour of Traffic
Highway	Kamehameha Highway
From/To	Hygienic Store
Jurisdiction	
Analysis Year	Existing
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.99	
Lane width	12.0	ft	% Trucks and buses	5	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	80	%
Grade: Length		mi	Access points/mi	10	/mi
Up/down		%			

Two-way hourly volume, V 1519 veh/h
Directional split 57 / 43 %

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.995	
Two-way flow rate,(note-1) vp	1542	pc/h
Highest directional split proportion (note-2)	879	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	2.5	mi/h
Free-flow speed, FFS	42.5	mi/h
Adjustment for no-passing zones, fnp	1.3	mi/h

Average travel speed, ATS 29.2 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	1534	pc/h
Highest directional split proportion (note-2)	874	
Base percent time-spent-following, BPTSF	74.0	%
Adj.for directional distribution and no-passing zones, fd/np	6.7	
Percent time-spent-following, PTSF	80.8	%

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.48	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS+: Two-Lane Highways Release 5.4

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/5/11
Analysis Time Period	Saturday Peak Hour of Traffic
Highway	Kamehameha Highway
From/To	West of Kuilima Drive
Jurisdiction	
Analysis Year	Existing
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.94	
Lane width	12.0	ft	% Trucks and buses	3	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	50	%
Grade: Length		mi	Access points/mi	2	/mi
Up/down		%			

Two-way hourly volume, V	867	veh/h
Directional split	51 / 49	%

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.2	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.994	
Two-way flow rate,(note-1) vp	928	pc/h
Highest directional split proportion (note-2)	473	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	0.5	mi/h
Free-flow speed, FFS	44.5	mi/h
Adjustment for no-passing zones, fnp	1.9	mi/h

Average travel speed, ATS	35.4	mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	0.997	
Two-way flow rate,(note-1) vp	925	pc/h
Highest directional split proportion (note-2)	472	
Base percent time-spent-following, BPTSF	55.7	%
Adj.for directional distribution and no-passing zones, fd/np	11.6	
Percent time-spent-following, PTSF	67.3	%

Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.29	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS+: Two-Lane Highways Release 5.4

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	10/29/2011
Analysis Time Period	Saturday Peak Hour of Traffic
Highway	Kamehameha Highway
From/To	Haleiwa to Kawailoa
Jurisdiction	
Analysis Year	Existing
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.92	
Lane width	12.0	ft	% Trucks and buses	2	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	80	%
Grade: Length		mi	Access points/mi	2	/mi
Up/down		%			

Two-way hourly volume, V	1571	veh/h
Directional split	51 / 49	%

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.998	
Two-way flow rate,(note-1) vp	1711	pc/h
Highest directional split proportion (note-2)	873	pc/h
Free-Flow Speed from Field Measurement:		
Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	0.5	mi/h
Free-flow speed, FFS	44.5	mi/h
Adjustment for no-passing zones, fnp	1.2	mi/h

Average travel speed, ATS	30.0	mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	1708	pc/h
Highest directional split proportion (note-2)	871	
Base percent time-spent-following, BPTSF	77.7	%
Adj.for directional distribution and no-passing zones, fd/np	5.7	
Percent time-spent-following, PTSF	83.4	%

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.53	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS+: Two-Lane Highways Release 5.4

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	10/29/2011
Analysis Time Period	Saturday Peak Hour of Traffic
Highway	Kamehameha Highway
From/To	Hygienic Store
Jurisdiction	
Analysis Year	Existing
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.94	
Lane width	12.0	ft	% Trucks and buses	3	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	80	%
Grade: Length		mi	Access points/mi	10	/mi
Up/down		%			

Two-way hourly volume, V 1489 veh/h
Directional split 54 / 46 %

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.997	
Two-way flow rate,(note-1) vp	1589	pc/h
Highest directional split proportion (note-2)	858	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	2.5	mi/h
Free-flow speed, FFS	42.5	mi/h
Adjustment for no-passing zones, fnp	1.3	mi/h

Average travel speed, ATS 28.9 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	1584	pc/h
Highest directional split proportion (note-2)	855	
Base percent time-spent-following, BPTSF	75.2	%
Adj.for directional distribution and no-passing zones, fd/np	6.4	
Percent time-spent-following, PTSF	81.5	%

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.50	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

TRAFFIC IMPACT ANALYSIS REPORT

FOR THE PROPOSED

TURTLE BAY RESORT MASTER PLAN

KAHUKU, OAHU, HAWAII

APPENDIX C

CAPACITY ANALYSIS WORKSHEETS

2025 TRAFFIC CONDITIONS WITHOUT PROJECT

Intersection	
Intersection Delay (sec/veh):	4.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Volume (vph)	95	219	228	68	81	98
Conflicting Peds.(#/hr)	1	0	0	1	7	0
Sign Control	Free	Free	Free	Free	Stop	Stop
Right Turn Channelized	None	None	Yield	Yield	Free	Free
Storage Length	0			0	0	0
Median Width		0	0		12	
Grade (%)		0%	0%		0%	
Peak Hour Factor	0.88	0.79	1.00	0.94	0.92	0.98
Heavy Vehicles(%)	4	13	6	7	6	7
Movement Flow Rate	108	277	228	72	88	100
Number of Lanes	0	1	1	0	1	1

Major/Minor	Major 1		Major 2			
Conflicting Flow Rate - All	307	0	0	0	764	272
Stage 1	-	-	-	-	271	-
Stage 2	-	-	-	-	493	-
Follow-up Headway	2.236	-	-	-	3.554	3.363
Pot Capacity-1 Maneuver	1242	-	-	-	366	755
Stage 1	-	-	-	-	765	-
Stage 2	-	-	-	-	606	-
Time blocked-Platoon(%)	0	-	-	-	0	0
Mov Capacity-1 Maneuver	1241	-	-	-	324	750
Mov Capacity-2 Maneuver	-	-	-	-	324	-
Stage 1	-	-	-	-	761	-
Stage 2	-	-	-	-	540	-

Approach	EB	WB	SB
HCM Control Delay (s)	2.3	0	15
HCM LOS	A	A	C

Lane	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (vph)					324	750
HCM Control Delay (s)	8.177	-	-	-	20.2	10.5
HCM Lane VC Ratio	0.087	-	-	-	0.272	0.133
HCM Lane LOS	A	-	-	-	C	B
HCM 95th Percentile Queue (veh)	0.285	-	-	-	1.08	0.459

Intersection	
Intersection Delay (sec/veh):	1.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Volume (vph)	1	282	17	19	268	6	24	0	18	6	0	4
Conflicting Peds.(#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None	None	None	None	None	None	None
Storage Length	0		0	330		0	0		0	0		0
Median Width		12			12			0			0	
Grade (%)		0%			0%			0%			0%	
Peak Hour Factor	1.00	0.82	0.92	0.92	0.87	1.00	0.92	0.92	0.92	1.00	0.92	1.00
Heavy Vehicles(%)	0	13	50	50	6	0	50	5	50	0	5	0
Movement Flow Rate	1	344	18	21	308	6	26	0	20	6	0	4
Number of Lanes	0	1	0	1	1	0	0	1	0	0	1	0

Major/Minor	Major 1			Major 2			Minor 1			Minor 2		
Conflicting Flow Rate - All	314	0	0	362	0	0	710	711	353	718	717	157
Stage 1	-	-	-	-	-	-	355	355	-	353	353	-
Stage 2	-	-	-	-	-	-	355	356	-	365	364	-
Follow-up Headway	2.2	-	-	2.65	-	-	3.95	4.045	3.75	3.5	4.045	3.3
Pot Capacity-1 Maneuver	1258	-	-	974	-	-	293	354	595	347	352	894
Stage 1	-	-	-	-	-	-	574	624	-	668	626	-
Stage 2	-	-	-	-	-	-	574	624	-	658	619	-
Time blocked-Platoon(%)	0	-	-	0	-	-	0	0	0	0	0	0
Mov Capacity-1 Maneuver	1258	-	-	974	-	-	287	346	595	330	344	894
Mov Capacity-2 Maneuver	-	-	-	-	-	-	287	346	-	330	344	-
Stage 1	-	-	-	-	-	-	573	623	-	667	613	-
Stage 2	-	-	-	-	-	-	559	611	-	636	618	-

Approach	EB	WB	NB	SB
HCM Control Delay (s)	0	0.5	16.1	13.4
HCM LOS	A	A	C	B

Lane	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (vph)	369							441
HCM Control Delay (s)	16.1	7.864	0	-	8.776	0	-	13.4
HCM Lane VC Ratio	0.124	0.001	-	-	0.021	-	-	0.023
HCM Lane LOS	C	A	A	-	A	A	-	B
HCM 95th Percentile Queue (veh)	0.419	0.002	-	-	0.065	-	-	0.07

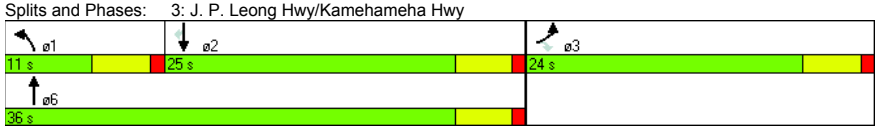
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	270	27	44	284	251	337
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	0			450
Storage Lanes	1	1	1			1
Taper Length (ft)	100		100			
Satd. Flow (prot)	1719	1615	1805	1792	1845	1568
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1719	1615	1805	1792	1845	1568
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		127				362
Link Speed (mph)	30			30	30	
Link Distance (ft)	220			382	754	
Travel Time (s)	5.0			8.7	17.1	
Peak Hour Factor	0.87	1.00	0.61	0.97	1.00	0.93
Heavy Vehicles (%)	5%	0%	0%	6%	3%	3%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	310	27	72	293	251	362
Turn Type	NA	Perm	Prot	NA	NA	Perm
Protected Phases	3		1	6	2	
Permitted Phases		3				2
Detector Phase	3	3	1	6	2	2
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.0	21.0	9.0	9.0	21.0	21.0
Total Split (s)	24.0	24.0	11.0	36.0	25.0	25.0
Total Split (%)	40.0%	40.0%	18.3%	60.0%	41.7%	41.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Max	Max
Act Effct Green (s)	14.1	14.1	6.0	28.2	22.2	22.2
Actuated g/C Ratio	0.27	0.27	0.11	0.54	0.42	0.42
v/c Ratio	0.67	0.05	0.35	0.30	0.32	0.42
Control Delay	25.4	0.2	29.2	8.5	14.6	3.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.4	0.2	29.2	8.5	14.6	3.7
LOS	C	A	C	A	B	A
Approach Delay	23.4			12.6	8.2	
Approach LOS	C			B	A	
Queue Length 50th (ft)	92	0	23	46	61	0
Queue Length 95th (ft)	155	0	39	99	124	49
Internal Link Dist (ft)	140			302	674	
Turn Bay Length (ft)						450
Base Capacity (vph)	636	678	211	1082	781	872
Starvation Cap Reductn	0	0	0	0	0	0

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.49	0.04	0.34	0.27	0.32	0.42

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 52.5
Natural Cycle: 55
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.67
Intersection Signal Delay: 13.3 — Intersection LOS: B
Intersection Capacity Utilization 44.0% — ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 3: J. P. Leong Hwy/Kamehameha Hwy



Intersection

Intersection Delay (sec/veh): $ 473

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Volume (vph)	42	101	386	152	512	456
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
Right Turn Channelized	Yield	Yield	Yield	Yield	None	None
Storage Length	0	0		200	0	
Median Width	12		0			0
Grade (%)	0%		0%			0%
Peak Hour Factor	0.75	0.84	0.98	0.83	0.77	1.00
Heavy Vehicles(%)	6	7	5	4	2	3
Movement Flow Rate	56	120	394	183	665	456
Number of Lanes	1	0	1	1	0	1

Major/Minor			Major 1			Major 2
Conflicting Flow Rate - All	2272	289	0	0	577	0
Stage 1	486	-	-	-	-	-
Stage 2	1786	-	-	-	-	-
Follow-up Headway	3.554	3.363	-	-	2.218	-
Pot Capacity-1 Maneuver	# 43	738	-	-	996	-
Stage 1	610	-	-	-	-	-
Stage 2	144	-	-	-	-	-
Time blocked-Platoon(%)	0	0	-	-	0	-
Mov Capacity-1 Maneuver	# 5	738	-	-	996	-
Mov Capacity-2 Maneuver	# 5	-	-	-	-	-
Stage 1	610	-	-	-	-	-
Stage 2	# 15	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay (s)	$ 4971.9	0	9.2
HCM LOS	F	A	A

Lane	NBT	NBR	WBLn1	SBL	SBT
Capacity (vph)			16		
HCM Control Delay (s)	-	-	$ 4971.9	15.552	-
HCM Lane VC Ratio	-	-	11.015	0.668	-
HCM Lane LOS	-	-	F	C	-
HCM 95th Percentile Queue (veh)	-	-	22.914	5.337	-

Intersection	
Intersection Delay (sec/veh):	4.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Volume (vph)	118	320	347	108	75	111
Conflicting Peds.(#/hr)	0	0	0	0	3	1
Sign Control	Free	Free	Free	Free	Stop	Stop
Right Turn Channelized	None	None	Yield	Yield	Free	Free
Storage Length	0			0	0	0
Median Width		0	0		12	
Grade (%)		0%	0%		0%	
Peak Hour Factor	0.92	0.80	0.85	0.87	0.99	0.90
Heavy Vehicles(%)	2	3	5	8	4	7
Movement Flow Rate	128	400	408	124	76	123
Number of Lanes	0	1	1	0	1	1

Major/Minor	Major 1		Major 2			
Conflicting Flow Rate - All	535	0	0	0	1129	473
Stage 1	-	-	-	-	473	-
Stage 2	-	-	-	-	656	-
Follow-up Headway	2.218	-	-	-	3.536	3.363
Pot Capacity-1 Maneuver	1033	-	-	-	224	581
Stage 1	-	-	-	-	623	-
Stage 2	-	-	-	-	513	-
Time blocked-Platoon(%)	0	-	-	-	0	0
Mov Capacity-1 Maneuver	1033	-	-	-	187	580
Mov Capacity-2 Maneuver	-	-	-	-	187	-
Stage 1	-	-	-	-	621	-
Stage 2	-	-	-	-	430	-

Approach	EB	WB	SB
HCM Control Delay (s)	2.2	0	22
HCM LOS	A	A	C

Lane	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (vph)					187	580
HCM Control Delay (s)	8.978	-	-	-	36.8	12.9
HCM Lane VC Ratio	0.124	-	-	-	0.405	0.213
HCM Lane LOS	A	-	-	-	E	B
HCM 95th Percentile Queue (veh)	0.424	-	-	-	1.808	0.799

Intersection	
Intersection Delay (sec/veh):	1.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Volume (vph)	2	369	24	28	428	7	24	0	20	7	0	3
Conflicting Peds.(#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None	None	None	None	None	None	None
Storage Length	0		0	330		0	0		0	0		0
Median Width		12			12			0			0	
Grade (%)		0%			0%			0%			0%	
Peak Hour Factor	0.25	0.86	0.92	0.92	0.90	1.00	0.92	0.92	0.92	1.00	0.92	0.75
Heavy Vehicles(%)	0	3	50	50	5	0	50	5	50	0	5	0
Movement Flow Rate	8	429	26	30	476	7	26	0	22	7	0	4
Number of Lanes	0	1	0	1	1	0	0	1	0	0	1	0

Major/Minor	Major 1			Major 2			Minor 1			Minor 2		
Conflicting Flow Rate - All	483	0	0	455	0	0	1000	1001	442	1009	1011	242
Stage 1	-	-	-	-	-	-	458	458	-	540	540	-
Stage 2	-	-	-	-	-	-	542	543	-	469	471	-
Follow-up Headway	2.2	-	-	2.65	-	-	3.95	4.045	3.75	3.5	4.045	3.3
Pot Capacity-1 Maneuver	1090	-	-	894	-	-	182	240	526	221	237	802
Stage 1	-	-	-	-	-	-	501	562	-	530	517	-
Stage 2	-	-	-	-	-	-	448	515	-	579	554	-
Time blocked-Platoon(%)	0	-	-	0	-	-	0	0	0	0	0	0
Mov Capacity-1 Maneuver	1090	-	-	894	-	-	175	230	526	205	227	802
Mov Capacity-2 Maneuver	-	-	-	-	-	-	175	230	-	205	227	-
Stage 1	-	-	-	-	-	-	496	556	-	525	500	-
Stage 2	-	-	-	-	-	-	431	498	-	550	548	-

Approach	EB	WB	NB	SB
HCM Control Delay (s)	0.1	0.5	22.7	18.3
HCM LOS	A	A	C	C

Lane	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (vph)	251							281
HCM Control Delay (s)	22.7	8.327	0	-	9.169	0	-	18.3
HCM Lane VC Ratio	0.191	0.007	-	-	0.034	-	-	0.039
HCM Lane LOS	C	A	A	-	A	A	-	C
HCM 95th Percentile Queue (veh)	0.688	0.022	-	-	0.106	-	-	0.122

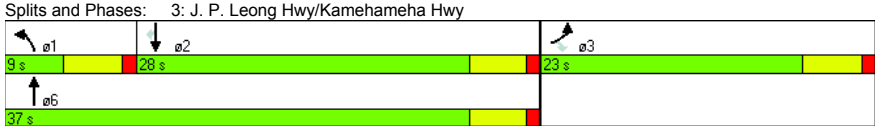
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	344	18	43	415	379	410
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	0			450
Storage Lanes	1	1	1			1
Taper Length (ft)	100		100			
Satd. Flow (prot)	1787	1615	1805	1900	1810	1583
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1787	1615	1805	1900	1810	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		127				423
Link Speed (mph)	30			30	30	
Link Distance (ft)	220			382	754	
Travel Time (s)	5.0			8.7	17.1	
Peak Hour Factor	0.98	1.00	1.00	1.00	0.85	0.97
Heavy Vehicles (%)	1%	0%	0%	0%	5%	2%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	351	18	43	415	446	423
Turn Type	NA	Perm	Prot	NA	NA	Perm
Protected Phases	3		1	6	2	
Permitted Phases		3				2
Detector Phase	3	3	1	6	2	2
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.0	21.0	9.0	9.0	21.0	21.0
Total Split (s)	23.0	23.0	9.0	37.0	28.0	28.0
Total Split (%)	38.3%	38.3%	15.0%	61.7%	46.7%	46.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Max	Max
Act Effct Green (s)	14.2	14.2	4.1	27.5	24.4	24.4
Actuated g/C Ratio	0.27	0.27	0.08	0.53	0.47	0.47
v/c Ratio	0.72	0.03	0.30	0.41	0.52	0.44
Control Delay	26.6	0.1	31.2	9.4	14.7	3.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.6	0.1	31.2	9.4	14.7	3.3
LOS	C	A	C	A	B	A
Approach Delay	25.3			11.4	9.2	
Approach LOS	C			B	A	
Queue Length 50th (ft)	82	0	11	67	74	0
Queue Length 95th (ft)	189	0	42	137	197	48
Internal Link Dist (ft)	140			302	674	
Turn Bay Length (ft)						450
Base Capacity (vph)	631	652	141	1193	851	968
Starvation Cap Reductn	0	0	0	0	0	0

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.56	0.03	0.30	0.35	0.52	0.44

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 51.8
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.72
Intersection Signal Delay: 13.3 — Intersection LOS: B
Intersection Capacity Utilization 54.8% — ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 3: J. P. Leong Hwy/Kamehameha Hwy



Intersection	
Intersection Delay (sec/veh):	13.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Volume (vph)	61	296	782	77	93	706
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
Right Turn Channelized	Yield	Yield	Yield	Yield	None	None
Storage Length	0	0		200	0	
Median Width	12		0			0
Grade (%)	0%		0%			0%
Peak Hour Factor	0.95	0.99	0.95	0.84	1.00	1.00
Heavy Vehicles(%)	6	5	3	5	3	2
Movement Flow Rate	64	299	823	92	93	706
Number of Lanes	1	0	1	1	0	1

Major/Minor			Major 1			Major 2
Conflicting Flow Rate - All	1761	458	0	0	915	0
Stage 1	869	-	-	-	-	-
Stage 2	892	-	-	-	-	-
Follow-up Headway	3.554	3.345	-	-	2.227	-
Pot Capacity-1 Maneuver	91	597	-	-	741	-
Stage 1	404	-	-	-	-	-
Stage 2	394	-	-	-	-	-
Time blocked-Platoon(%)	0	0	-	-	0	-
Mov Capacity-1 Maneuver	72	597	-	-	741	-
Mov Capacity-2 Maneuver	72	-	-	-	-	-
Stage 1	404	-	-	-	-	-
Stage 2	313	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay (s)	75.5	0	1.2
HCM LOS	F	A	A

Lane	NBT	NBR	WBLn1	SBL	SBT
Capacity (vph)			371		
HCM Control Delay (s)	-	-	75.5	10.554	-
HCM Lane VC Ratio	-	-	0.979	0.126	-
HCM Lane LOS	-	-	F	B	-
HCM 95th Percentile Queue (veh)	-	-	11.193	0.428	-

Intersection	
Intersection Delay (sec/veh):	9.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Volume (vph)	149	375	413	105	105	109
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
Right Turn Channelized	None	None	Yield	Yield	Free	Free
Storage Length	0			0	0	0
Median Width		0	0		12	
Grade (%)		0%	0%		0%	
Peak Hour Factor	1.00	0.98	0.97	0.94	0.80	0.74
Heavy Vehicles(%)	3	2	5	4	3	2
Movement Flow Rate	149	383	426	112	131	147
Number of Lanes	0	1	1	0	1	1

Major/Minor		Major 1	Major 2			
Conflicting Flow Rate - All	538	0	0	0	1163	482
Stage 1	-	-	-	-	482	-
Stage 2	-	-	-	-	681	-
Follow-up Headway	2.227	-	-	-	3.527	3.318
Pot Capacity-1 Maneuver	1025	-	-	-	214	584
Stage 1	-	-	-	-	619	-
Stage 2	-	-	-	-	501	-
Time blocked-Platoon(%)	0	-	-	-	0	0
Mov Capacity-1 Maneuver	1025	-	-	-	174	584
Mov Capacity-2 Maneuver	-	-	-	-	174	-
Stage 1	-	-	-	-	619	-
Stage 2	-	-	-	-	408	-

Approach	EB	WB	SB
HCM Control Delay (s)	2.6	0	40.3
HCM LOS	A	A	E

Lane	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (vph)					174	584
HCM Control Delay (s)	9.109	-	-	-	70.8	13.2
HCM Lane VC Ratio	0.145	-	-	-	0.754	0.252
HCM Lane LOS	A	-	-	-	F	B
HCM 95th Percentile Queue (veh)	0.508	-	-	-	4.835	0.994

Intersection												
Intersection Delay (sec/veh):	1.1											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Volume (vph)	3	460	18	18	496	5	16	0	16	3	0	5
Conflicting Peds.(#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None	None	None	None	None	None	None
Storage Length	0		0	330		0	0		0	0		0
Median Width		12			12			0			0	
Grade (%)		0%			0%			0%			0%	
Peak Hour Factor	0.75	0.95	0.92	0.92	0.98	1.00	0.92	0.92	0.92	0.75	0.92	0.42
Heavy Vehicles(%)	0	2	50	50	4	0	50	5	50	0	5	0
Movement Flow Rate	4	484	20	20	506	5	17	0	17	4	0	12
Number of Lanes	0	1	0	1	1	0	0	1	0	0	1	0

Major/Minor	Major 1			Major 2			Minor 1			Minor 2		
Conflicting Flow Rate - All	511	0	0	504	0	0	1057	1053	494	1060	1061	256
Stage 1	-	-	-	-	-	-	502	502	-	549	549	-
Stage 2	-	-	-	-	-	-	555	551	-	511	512	-
Follow-up Headway	2.2	-	-	2.65	-	-	3.95	4.045	3.75	3.5	4.045	3.3
Pot Capacity-1 Maneuver	1065	-	-	854	-	-	165	223	490	204	221	788
Stage 1	-	-	-	-	-	-	472	537	-	524	512	-
Stage 2	-	-	-	-	-	-	440	510	-	549	532	-
Time blocked-Platoon(%)	0	-	-	0	-	-	0	0	0	0	0	0
Mov Capacity-1 Maneuver	1065	-	-	854	-	-	159	217	490	193	215	788
Mov Capacity-2 Maneuver	-	-	-	-	-	-	159	217	-	193	215	-
Stage 1	-	-	-	-	-	-	470	534	-	521	500	-
Stage 2	-	-	-	-	-	-	423	498	-	527	529	-

Approach	EB	WB	NB	SB
HCM Control Delay (s)	0.1	0.3	22.5	13.4
HCM LOS	A	A	C	B

Lane	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (vph)	240							444
HCM Control Delay (s)	22.5	8.393	0	-	9.314	0	-	13.4
HCM Lane VC Ratio	0.145	0.004	-	-	0.023	-	-	0.036
HCM Lane LOS	C	A	A	-	A	A	-	B
HCM 95th Percentile Queue (veh)	0.499	0.011	-	-	0.07	-	-	0.111

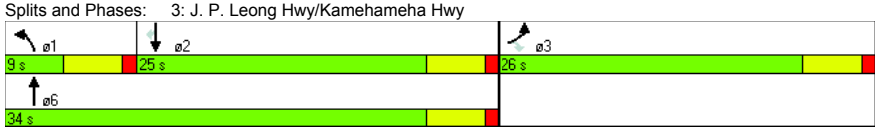
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	371	41	76	477	382	436
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	0			450
Storage Lanes	1	1	1			1
Taper Length (ft)	100		100			
Satd. Flow (prot)	1787	1615	1805	1845	1881	1583
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1787	1615	1805	1845	1881	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		127				501
Link Speed (mph)	30			30	30	
Link Distance (ft)	220			382	754	
Travel Time (s)	5.0			8.7	17.1	
Peak Hour Factor	0.83	0.68	1.00	1.00	0.95	0.87
Heavy Vehicles (%)	1%	0%	0%	3%	1%	2%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	447	60	76	477	402	501
Turn Type	NA	Perm	Prot	NA	NA	Perm
Protected Phases	3		1	6	2	
Permitted Phases		3				2
Detector Phase	3	3	1	6	2	2
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.0	21.0	9.0	9.0	21.0	21.0
Total Split (s)	26.0	26.0	9.0	34.0	25.0	25.0
Total Split (%)	43.3%	43.3%	15.0%	56.7%	41.7%	41.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Max	Max
Act Effct Green (s)	17.5	17.5	4.1	27.2	20.4	20.4
Actuated g/C Ratio	0.32	0.32	0.07	0.50	0.37	0.37
v/c Ratio	0.79	0.10	0.57	0.52	0.57	0.55
Control Delay	28.7	0.7	47.1	12.7	19.8	4.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.7	0.7	47.1	12.7	19.8	4.5
LOS	C	A	D	B	B	A
Approach Delay	25.4			17.4	11.3	
Approach LOS	C			B	B	
Queue Length 50th (ft)	137	0	27	106	116	0
Queue Length 95th (ft)	204	0	#84	187	204	49
Internal Link Dist (ft)	140			302	674	
Turn Bay Length (ft)						450
Base Capacity (vph)	698	708	134	995	700	903
Starvation Cap Reductn	0	0	0	0	0	0

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.64	0.08	0.57	0.48	0.57	0.55

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 54.9
Natural Cycle: 55
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.79
Intersection Signal Delay: 16.7 Intersection LOS: B
Intersection Capacity Utilization 57.4% ICU Level of Service B
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: J. P. Leong Hwy/Kamehameha Hwy



Intersection

Intersection Delay (sec/veh): 22.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Volume (vph)	56	255	729	92	83	759
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
Right Turn Channelized	Yield	Yield	Yield	Yield	None	None
Storage Length	0	0		200	0	
Median Width	12		0			0
Grade (%)	0%		0%			0%
Peak Hour Factor	1.00	1.00	0.91	0.79	0.78	0.92
Heavy Vehicles(%)	7	2	2	6	4	3
Movement Flow Rate	56	255	801	116	106	825
Number of Lanes	1	0	1	1	0	1

Major/Minor			Major 1			Major 2
Conflicting Flow Rate - All	1896	459	0	0	917	0
Stage 1	859	-	-	-	-	-
Stage 2	1037	-	-	-	-	-
Follow-up Headway	3.563	3.318	-	-	2.236	-
Pot Capacity-1 Maneuver	74	602	-	-	736	-
Stage 1	407	-	-	-	-	-
Stage 2	334	-	-	-	-	-
Time blocked-Platoon(%)	0	0	-	-	0	-
Mov Capacity-1 Maneuver	# 54	602	-	-	736	-
Mov Capacity-2 Maneuver	# 54	-	-	-	-	-
Stage 1	407	-	-	-	-	-
Stage 2	245	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay (s)	150.9	0	1.2
HCM LOS	F	A	A

Lane	NBT	NBR	WBLn1	SBL	SBT
Capacity (vph)			265		
HCM Control Delay (s)	-	-	150.9	10.716	-
HCM Lane VC Ratio	-	-	1.174	0.145	-
HCM Lane LOS	-	-	F	B	-
HCM 95th Percentile Queue (veh)	-	-	14.05	0.504	-

HCS+: Two-Lane Highways Release 5.4

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/3/11
Analysis Time Period	AM Peak Hour W/O Project
Highway	Kamehameha Highway
From/To	West of Kuilima Drive
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.93	
Lane width	12.0	ft	% Trucks and buses	8	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	50	%
Grade: Length		mi	Access points/mi	2	/mi
Up/down		%			

Two-way hourly volume, V	640	veh/h	
Directional split	51 / 49	%	

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.2	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.984	
Two-way flow rate,(note-1) vp	699	pc/h
Highest directional split proportion (note-2)	356	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	0.5	mi/h
Free-flow speed, FFS	44.5	mi/h

Adjustment for no-passing zones, fnp	2.4	mi/h
Average travel speed, ATS	36.6	mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	0.992	
Two-way flow rate,(note-1) vp	694	pc/h
Highest directional split proportion (note-2)	354	
Base percent time-spent-following, BPTSF	45.7	%
Adj.for directional distribution and no-passing zones, fd/np	15.3	
Percent time-spent-following, PTSF	61.0	%

Level of Service and Other Performance Measures

Level of service, LOS	C	
Volume to capacity ratio, v/c	0.22	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS+: Two-Lane Highways Release 5.4

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/1/2011
Analysis Time Period	AM Peak Hour W/O Project
Highway	Kamehameha Highway
From/To	Haleiwa to Kawailoa
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.94	
Lane width	12.0	ft	% Trucks and buses	5	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	80	%
Grade: Length		mi	Access points/mi	2	/mi
Up/down		%			

Two-way hourly volume, V	1142	veh/h
Directional split	51 / 49	%

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.995	
Two-way flow rate,(note-1) vp	1221	pc/h
Highest directional split proportion (note-2)	623	pc/h
Free-Flow Speed from Field Measurement:		
Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	0.5	mi/h
Free-flow speed, FFS	44.5	mi/h
Adjustment for no-passing zones, fnp	1.8	mi/h

Average travel speed, ATS	33.2	mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	1215	pc/h
Highest directional split proportion (note-2)	620	
Base percent time-spent-following, BPTSF	65.6	%
Adj.for directional distribution and no-passing zones, fd/np	9.5	
Percent time-spent-following, PTSF	75.1	%

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.38	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS+: Two-Lane Highways Release 5.4

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/1/2011
Analysis Time Period	AM Peak Hour W/O Project
Highway	Kamehameha Highway
From/To	Hygienic Store
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.89	
Lane width	12.0	ft	% Trucks and buses	3	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	80	%
Grade: Length		mi	Access points/mi	10	/mi
Up/down		%			

Two-way hourly volume, V 1455 veh/h
Directional split 67 / 33 %

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.997	
Two-way flow rate,(note-1) vp	1640	pc/h
Highest directional split proportion (note-2)	1099	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	2.5	mi/h
Free-flow speed, FFS	42.5	mi/h
Adjustment for no-passing zones, fnp	1.3	mi/h

Average travel speed, ATS 28.5 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	1635	pc/h
Highest directional split proportion (note-2)	1095	
Base percent time-spent-following, BPTSF	76.2	%
Adj.for directional distribution and no-passing zones, fd/np	6.3	
Percent time-spent-following, PTSF	82.5	%

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.51	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS+: Two-Lane Highways Release 5.4

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/3/11
Analysis Time Period	PM Peak Hour W/O Project
Highway	Kamehameha Highway
From/To	West of Kuilima Drive
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.85	
Lane width	12.0	ft	% Trucks and buses	4	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	50	%
Grade: Length		mi	Access points/mi	2	/mi
Up/down		%			

Two-way hourly volume, V	896	veh/h
Directional split	51 / 49	%

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.2	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.992	
Two-way flow rate,(note-1) vp	1063	pc/h
Highest directional split proportion (note-2)	542	pc/h
Free-Flow Speed from Field Measurement:		
Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	0.5	mi/h
Free-flow speed, FFS	44.5	mi/h
Adjustment for no-passing zones, fnp	1.7	mi/h

Average travel speed, ATS	34.6	mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	0.996	
Two-way flow rate,(note-1) vp	1058	pc/h
Highest directional split proportion (note-2)	540	
Base percent time-spent-following, BPTSF	60.5	%
Adj.for directional distribution and no-passing zones, fd/np	10.1	
Percent time-spent-following, PTSF	70.6	%

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.33	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS+: Two-Lane Highways Release 5.4

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/1/2011
Analysis Time Period	PM Peak Hour W/O Project
Highway	Kamehameha Highway
From/To	Haleiwa to Kawailoa
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.94	
Lane width	12.0	ft	% Trucks and buses	2	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	80	%
Grade: Length		mi	Access points/mi	2	/mi
Up/down		%			

Two-way hourly volume, V	1548	veh/h
Directional split	51 / 49	%

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.998	
Two-way flow rate,(note-1) vp	1650	pc/h
Highest directional split proportion (note-2)	842	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	0.5	mi/h
Free-flow speed, FFS	44.5	mi/h
Adjustment for no-passing zones, fnp	1.3	mi/h

Average travel speed, ATS	30.4	mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	1647	pc/h
Highest directional split proportion (note-2)	840	
Base percent time-spent-following, BPTSF	76.5	%
Adj.for directional distribution and no-passing zones, fd/np	6.0	
Percent time-spent-following, PTSF	82.5	%

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.52	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS+: Two-Lane Highways Release 5.4

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/1/2011
Analysis Time Period	PM Peak Hour W/O Project
Highway	Kamehameha Highway
From/To	Hygienic Store
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.99	
Lane width	12.0	ft	% Trucks and buses	5	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	80	%
Grade: Length		mi	Access points/mi	10	/mi
Up/down		%			

Two-way hourly volume, V 1877 veh/h
Directional split 57 / 43 %

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.995	
Two-way flow rate,(note-1) vp	1905	pc/h
Highest directional split proportion (note-2)	1086	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	2.5	mi/h
Free-flow speed, FFS	42.5	mi/h
Adjustment for no-passing zones, fnp	1.0	mi/h

Average travel speed, ATS 26.7 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	1896	pc/h
Highest directional split proportion (note-2)	1081	
Base percent time-spent-following, BPTSF	81.1	%
Adj.for directional distribution and no-passing zones, fd/np	4.6	
Percent time-spent-following, PTSF	85.7	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.60	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS+: Two-Lane Highways Release 5.4

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/5/11
Analysis Time Period	Saturday Peak Hour W/O Project
Highway	Kamehameha Highway
From/To	West of Kuilima Drive
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.94	
Lane width	12.0	ft	% Trucks and buses	3	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	50	%
Grade: Length		mi	Access points/mi	2	/mi
Up/down		%			

Two-way hourly volume, V 1046 veh/h
Directional split 50 / 50 %

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.2	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.994	
Two-way flow rate,(note-1) vp	1119	pc/h
Highest directional split proportion (note-2)	560	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	0.5	mi/h
Free-flow speed, FFS	44.5	mi/h
Adjustment for no-passing zones, fnp	1.6	mi/h

Average travel speed, ATS 34.3 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	0.997	
Two-way flow rate,(note-1) vp	1116	pc/h
Highest directional split proportion (note-2)	558	
Base percent time-spent-following, BPTSF	62.5	%
Adj.for directional distribution and no-passing zones, fd/np	9.5	
Percent time-spent-following, PTSF	72.0	%

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.35	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS+: Two-Lane Highways Release 5.4

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	10/29/2011
Analysis Time Period	Saturday Peak Hour W/O Project
Highway	Kamehameha Highway
From/To	Haleiwa to Kawailoa
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.92	
Lane width	12.0	ft	% Trucks and buses	2	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	80	%
Grade: Length		mi	Access points/mi	2	/mi
Up/down		%			

Two-way hourly volume, V	1667	veh/h
Directional split	51 / 49	%

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.998	
Two-way flow rate,(note-1) vp	1816	pc/h
Highest directional split proportion (note-2)	926	pc/h
Free-Flow Speed from Field Measurement:		
Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	0.5	mi/h
Free-flow speed, FFS	44.5	mi/h
Adjustment for no-passing zones, fnp	1.1	mi/h

Average travel speed, ATS	29.3	mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	1812	pc/h
Highest directional split proportion (note-2)	924	
Base percent time-spent-following, BPTSF	79.7	%
Adj.for directional distribution and no-passing zones, fd/np	5.1	
Percent time-spent-following, PTSF	84.8	%

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.57	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS+: Two-Lane Highways Release 5.4

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	10/29/2011
Analysis Time Period	Sat Peak Hr W/O Project
Highway	Kamehameha Highway
From/To	Hygienic Store
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.94	
Lane width	12.0	ft	% Trucks and buses	3	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	80	%
Grade: Length		mi	Access points/mi	10	/mi
Up/down		%			

Two-way hourly volume, V 1826 veh/h
Directional split 54 / 46 %

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.997	
Two-way flow rate,(note-1) vp	1948	pc/h
Highest directional split proportion (note-2)	1052	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	2.5	mi/h
Free-flow speed, FFS	42.5	mi/h
Adjustment for no-passing zones, fnp	1.0	mi/h

Average travel speed, ATS 26.4 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	1943	pc/h
Highest directional split proportion (note-2)	1049	
Base percent time-spent-following, BPTSF	81.9	%
Adj.for directional distribution and no-passing zones, fd/np	4.4	
Percent time-spent-following, PTSF	86.3	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.61	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

TRAFFIC IMPACT ANALYSIS REPORT

FOR THE PROPOSED

TURTLE BAY RESORT MASTER PLAN

KAHUKU, OAHU, HAWAII

APPENDIX D

CAPACITY ANALYSIS WORKSHEETS

2025 TRAFFIC CONDITIONS
WITH FULL BUILD OUT ALTERNATIVE

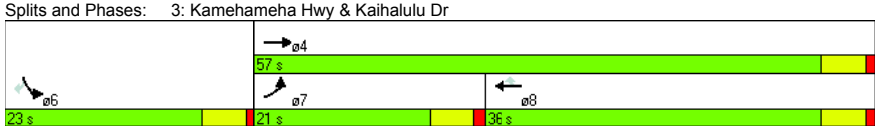
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	405	445	465	157	206	402
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300			400	0	0
Storage Lanes	2			1	1	1
Taper Length (ft)	100				100	
Satd. Flow (prot)	3367	1681	1792	1509	1703	1509
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	3367	1681	1792	1509	1703	1509
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				171		437
Link Speed (mph)		45	45		30	
Link Distance (ft)		500	3000		500	
Travel Time (s)		7.6	45.5		11.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	4%	13%	6%	7%	6%	7%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	440	484	505	171	224	437
Turn Type	Prot	NA	NA	Perm	NA	Perm
Protected Phases	7	4	8		6	
Permitted Phases				8		6
Detector Phase	7	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	21.0	57.0	36.0	36.0	23.0	23.0
Total Split (%)	26.3%	71.3%	45.0%	45.0%	28.8%	28.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Max	Max
Act Effct Green (s)	13.7	43.3	24.5	24.5	18.3	18.3
Actuated g/C Ratio	0.19	0.60	0.34	0.34	0.26	0.26
v/c Ratio	0.68	0.48	0.83	0.27	0.52	0.62
Control Delay	33.9	9.3	34.0	4.1	30.3	7.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.9	9.3	34.0	4.1	30.3	7.3
LOS	C	A	C	A	C	A
Approach Delay		21.0	26.5		15.1	
Approach LOS		C	C		B	
Queue Length 50th (ft)	96	104	204	0	90	0
Queue Length 95th (ft)	152	164	326	37	172	76
Internal Link Dist (ft)		420	2920		420	
Turn Bay Length (ft)	300			400		
Base Capacity (vph)	762	1237	786	758	434	710
Starvation Cap Reductn	0	0	0	0	0	0

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.58	0.39	0.64	0.23	0.52	0.62

Intersection Summary

Area Type: Other
Cycle Length: 80
Actuated Cycle Length: 71.7
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.83
Intersection Signal Delay: 20.9 — Intersection LOS: C
Intersection Capacity Utilization 59.9% — ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 3: Kamehameha Hwy & Kaihalulu Dr

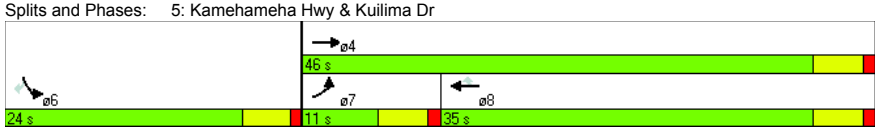


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	149	502	471	180	238	151
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200			400	0	0
Storage Lanes	2			1	1	1
Taper Length (ft)	100				100	
Satd. Flow (prot)	3367	1681	1792	1509	1703	1509
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	3363	1681	1792	1480	1677	1490
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				196		164
Link Speed (mph)		45	45		25	
Link Distance (ft)		500	5500		500	
Travel Time (s)		7.6	83.3		13.6	
Confl. Peds. (#/hr)	1			1	7	
Confl. Bikes (#/hr)				12		1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	4%	13%	6%	7%	6%	7%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	162	546	512	196	259	164
Turn Type	Prot	NA	NA	Perm	NA	Perm
Protected Phases	7	4	8		6	
Permitted Phases				8		6
Detector Phase	7	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	21.0	21.0	21.0	21.0	21.0
Total Split (s)	11.0	46.0	35.0	35.0	24.0	24.0
Total Split (%)	15.7%	65.7%	50.0%	50.0%	34.3%	34.3%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Min	Min
Act Effct Green (s)	6.6	29.5	21.4	21.4	13.8	13.8
Actuated g/C Ratio	0.12	0.54	0.39	0.39	0.25	0.25
v/c Ratio	0.40	0.60	0.73	0.28	0.60	0.33
Control Delay	30.3	11.4	22.0	3.4	26.6	6.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.3	11.4	22.0	3.4	26.6	6.0
LOS	C	B	C	A	C	A
Approach Delay		15.7	16.8		18.6	
Approach LOS		B	B		B	
Queue Length 50th (ft)	27	101	144	0	78	0
Queue Length 95th (ft)	63	211	272	33	166	41
Internal Link Dist (ft)		420	5420		420	
Turn Bay Length (ft)	200			400		

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Base Capacity (vph)	407	1269	1084	972	652	672
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.40	0.43	0.47	0.20	0.40	0.24

Intersection Summary	
Area Type: Other	
Cycle Length: 70	
Actuated Cycle Length: 54.2	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.73	
Intersection Signal Delay: 16.8	Intersection LOS: B
Intersection Capacity Utilization 54.7%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 5: Kamehameha Hwy & Kuilima Dr



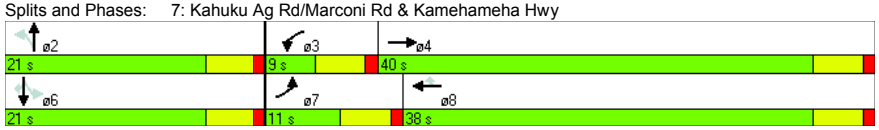
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	82	641	17	19	548	73	24	0	18	73	0	79
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	330		400	0		0	0		200
Storage Lanes	1		0	1		1	0		0	0		1
Taper Length (ft)	100			100			100			100		
Satd. Flow (prot)	1805	1661	0	1203	1792	1615	0	1160	0	0	1805	1615
Flt Permitted	0.950			0.950				0.792			0.727	
Satd. Flow (perm)	1805	1661	0	1203	1792	1570	0	944	0	0	1381	1615
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3				109		109				109
Link Speed (mph)		45			45			30			25	
Link Distance (ft)		500			1200			500			500	
Travel Time (s)		7.6			18.2			11.4			13.6	
Confl. Bikes (#/hr)						10						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	13%	50%	50%	6%	0%	50%	2%	50%	0%	2%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	89	715	0	21	596	79	0	46	0	0	79	86
Turn Type	Prot	NA		Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases						8	2			6		6
Detector Phase	7	4		3	8	8	2	2		6	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.0	21.0		9.0	21.0	21.0	21.0	21.0		21.0	21.0	21.0
Total Split (s)	11.0	40.0		9.0	38.0	38.0	21.0	21.0		21.0	21.0	21.0
Total Split (%)	15.7%	57.1%		12.9%	54.3%	54.3%	30.0%	30.0%		30.0%	30.0%	30.0%
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0		5.0			5.0	5.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?												
Recall Mode	None	None		None	None	None	Min	Min		Min	Min	Min
Act Effct Green (s)	6.4	29.8		4.3	23.0	23.0		8.8			8.8	8.8
Actuated g/C Ratio	0.13	0.59		0.08	0.45	0.45		0.17			0.17	0.17
v/c Ratio	0.39	0.73		0.21	0.73	0.10		0.18			0.33	0.23
Control Delay	32.1	14.7		32.8	18.7	1.6		1.6			25.7	5.6
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Delay	32.1	14.7		32.8	18.7	1.6		1.6			25.7	5.6
LOS	C	B		C	B	A		A			C	A
Approach Delay		16.6			17.2			1.6			15.2	
Approach LOS		B			B			A			B	
Queue Length 50th (ft)	26	109		6	146	0		0			22	0
Queue Length 95th (ft)	#89	#437		28	282	12		2			63	24
Internal Link Dist (ft)		420			1120			420			420	
Turn Bay Length (ft)	200			330		400						200
Base Capacity (vph)	229	1202		102	1222	1105		392			469	620

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Starvation Cap Reductn	0	0		0	0	0		0			0	0
Spillback Cap Reductn	0	0		0	0	0		0			0	0
Storage Cap Reductn	0	0		0	0	0		0			0	0
Reduced v/c Ratio	0.39	0.59		0.21	0.49	0.07		0.12			0.17	0.14

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 50.7
Natural Cycle: 65
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.73
Intersection Signal Delay: 16.3 — Intersection LOS: B
Intersection Capacity Utilization 59.7% — ICU Level of Service B
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Kahuku Ag Rd/Marconi Rd & Kamehameha Hwy



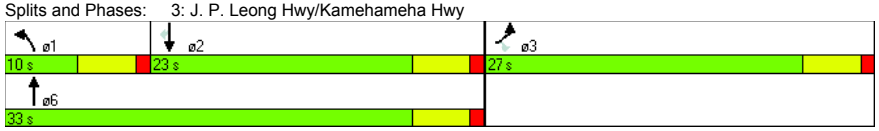
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	447	27	44	469	406	543
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	0			450
Storage Lanes	1	1	1			1
Taper Length (ft)	100		100			
Satd. Flow (prot)	1719	1615	1805	1792	1845	1568
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1719	1615	1805	1792	1845	1568
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		127				578
Link Speed (mph)	30			30	30	
Link Distance (ft)	220			382	754	
Travel Time (s)	5.0			8.7	17.1	
Peak Hour Factor	0.88	1.00	0.61	0.97	1.00	0.94
Heavy Vehicles (%)	5%	0%	0%	6%	3%	3%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	508	27	72	484	406	578
Turn Type	NA	Perm	Prot	NA	NA	Perm
Protected Phases	3		1	6	2	
Permitted Phases		3				2
Detector Phase	3	3	1	6	2	2
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.0	21.0	9.0	9.0	21.0	21.0
Total Split (s)	27.0	27.0	10.0	33.0	23.0	23.0
Total Split (%)	45.0%	45.0%	16.7%	55.0%	38.3%	38.3%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Max	Max
Act Effct Green (s)	18.9	18.9	5.1	23.8	18.5	18.5
Actuated g/C Ratio	0.36	0.36	0.10	0.45	0.35	0.35
v/c Ratio	0.83	0.04	0.41	0.60	0.63	0.63
Control Delay	30.6	0.1	33.7	15.2	23.0	5.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.6	0.1	33.7	15.2	23.0	5.4
LOS	C	A	C	B	C	A
Approach Delay	29.1			17.6	12.6	
Approach LOS	C			B	B	
Queue Length 50th (ft)	160	0	26	120	130	0
Queue Length 95th (ft)	#300	0	40	202	#249	63
Internal Link Dist (ft)	140			302	674	
Turn Bay Length (ft)						450
Base Capacity (vph)	734	763	175	975	645	924
Starvation Cap Reductn	0	0	0	0	0	0

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.69	0.04	0.41	0.50	0.63	0.63

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 53
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.83
Intersection Signal Delay: 18.2 — Intersection LOS: B
Intersection Capacity Utilization 62.0% — ICU Level of Service B
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: J. P. Leong Hwy/Kamehameha Hwy



Intersection

Intersection Delay (sec/veh): 82.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Volume (vph)	42	134	509	152	577	515
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
Right Turn Channelized	Yield	Yield	Yield	Yield	None	None
Storage Length	0	0		200	0	
Median Width	12		0			0
Grade (%)	0%		0%			0%
Peak Hour Factor	0.75	0.83	0.96	0.83	0.77	1.00
Heavy Vehicles(%)	6	7	5	4	2	3
Movement Flow Rate	56	161	530	183	749	515
Number of Lanes	1	0	1	1	0	1

Major/Minor			Major 1			Major 2
Conflicting Flow Rate - All	2635	357	0	0	713	0
Stage 1	622	-	-	-	-	-
Stage 2	2013	-	-	-	-	-
Follow-up Headway	3.554	3.363	-	-	2.218	-
Pot Capacity-1 Maneuver	# 25	676	-	-	887	-
Stage 1	528	-	-	-	-	-
Stage 2	110	-	-	-	-	-
Time blocked-Platoon(%)	0	0	-	-	0	-
Mov Capacity-1 Maneuver	# 25	676	-	-	887	-
Mov Capacity-2 Maneuver	# 25	-	-	-	-	-
Stage 1	528	-	-	-	-	-
Stage 2	110	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay (s)	$ 744.4	0	15.8
HCM LOS	F	A	C

Lane	NBT	NBR	WBLn1	SBL	SBT
Capacity (vph)			90		
HCM Control Delay (s)	-	-	$ 744.4	26.698	-
HCM Lane VC Ratio	-	-	2.416	0.845	-
HCM Lane LOS	-	-	F	D	-
HCM 95th Percentile Queue (veh)	-	-	20.007	10.239	-

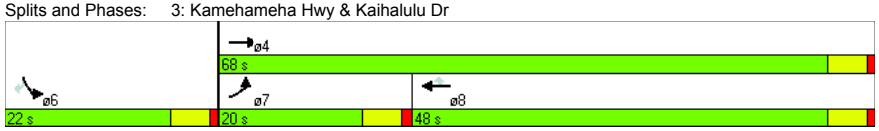
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	455	581	631	250	186	497
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300			400	0	0
Storage Lanes	2			1	1	1
Taper Length (ft)	100				100	
Satd. Flow (prot)	3433	1845	1810	1495	1736	1509
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	3433	1845	1810	1495	1736	1509
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				272		405
Link Speed (mph)		45	45		30	
Link Distance (ft)		500	3000		500	
Travel Time (s)		7.6	45.5		11.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	3%	5%	8%	4%	7%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	495	632	686	272	202	540
Turn Type	Prot	NA	NA	Perm	NA	Perm
Protected Phases	7	4	8		6	
Permitted Phases				8		6
Detector Phase	7	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	20.0	68.0	48.0	48.0	22.0	22.0
Total Split (%)	22.2%	75.6%	53.3%	53.3%	24.4%	24.4%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Max	Max
Act Effct Green (s)	14.5	55.6	36.0	36.0	17.2	17.2
Actuated g/C Ratio	0.17	0.67	0.43	0.43	0.21	0.21
v/c Ratio	0.82	0.51	0.87	0.34	0.56	0.85
Control Delay	47.2	8.3	34.5	3.0	38.5	24.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	47.2	8.3	34.5	3.0	38.5	24.1
LOS	D	A	C	A	D	C
Approach Delay		25.4	25.6		28.1	
Approach LOS		C	C		C	
Queue Length 50th (ft)	135	140	315	0	101	66
Queue Length 95th (ft)	#226	208	469	40	179	#272
Internal Link Dist (ft)		420	2920		420	
Turn Bay Length (ft)	300			400		
Base Capacity (vph)	627	1416	948	912	359	633
Starvation Cap Reductn	0	0	0	0	0	0

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.79	0.45	0.72	0.30	0.56	0.85

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 82.9
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.87
Intersection Signal Delay: 26.1 — Intersection LOS: C
Intersection Capacity Utilization 72.3% — ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Kamehameha Hwy & Kaihalulu Dr



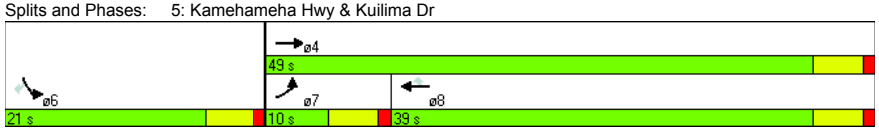
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	183	584	694	338	219	187
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200			400	0	0
Storage Lanes	2			1	1	1
Taper Length (ft)	100				100	
Satd. Flow (prot)	3406	1815	1781	1471	1715	1503
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	3406	1815	1781	1446	1703	1482
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				367		203
Link Speed (mph)		45	45		25	
Link Distance (ft)		500	5500		500	
Travel Time (s)		7.6	83.3		13.6	
Confl. Peds. (#/hr)					3	1
Confl. Bikes (#/hr)				12		1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	3%	5%	8%	4%	7%
Bus Blockages (#/hr)	4	4	4	4	3	1
Shared Lane Traffic (%)						
Lane Group Flow (vph)	199	635	754	367	238	203
Turn Type	Prot	NA	NA	Perm	NA	Perm
Protected Phases	7	4	8		6	
Permitted Phases				8		6
Detector Phase	7	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	21.0	21.0	21.0	21.0	21.0
Total Split (s)	10.0	49.0	39.0	39.0	21.0	21.0
Total Split (%)	14.3%	70.0%	55.7%	55.7%	30.0%	30.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Min	Min
Act Effct Green (s)	5.1	40.7	30.5	30.5	13.2	13.2
Actuated g/C Ratio	0.08	0.64	0.48	0.48	0.21	0.21
v/c Ratio	0.74	0.55	0.89	0.42	0.68	0.44
Control Delay	49.9	9.1	30.6	2.9	34.7	7.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	49.9	9.1	30.6	2.9	34.7	7.2
LOS	D	A	C	A	C	A
Approach Delay		18.9	21.5		22.0	
Approach LOS		B	C		C	
Queue Length 50th (ft)	43	126	260	0	92	0
Queue Length 95th (ft)	#97	217	#493	39	162	48
Internal Link Dist (ft)		420	5420		420	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Turn Bay Length (ft)	200			400		
Base Capacity (vph)	270	1270	963	950	436	528
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.74	0.50	0.78	0.39	0.55	0.38

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 64
Natural Cycle: 65
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.89
Intersection Signal Delay: 20.7 Intersection LOS: C
Intersection Capacity Utilization 66.4% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Kamehameha Hwy & Kuilima Dr



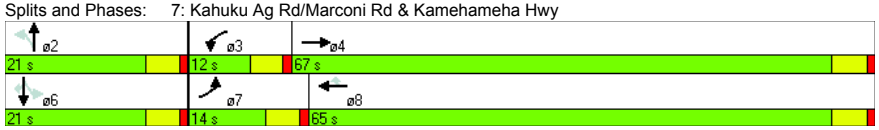
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	94	685	24	28	911	95	24	0	20	88	0	97
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	330		400	0		0	0		200
Storage Lanes	1		0	1		1	0		0	0		1
Taper Length (ft)	100			100			100			100		
Satd. Flow (prot)	1805	1655	0	1203	1792	1615	0	1157	0	0	1805	1615
Flt Permitted	0.950			0.950				0.796			0.726	
Satd. Flow (perm)	1805	1655	0	1203	1792	1573	0	946	0	0	1379	1615
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3				103		76				105
Link Speed (mph)		45			45			30			25	
Link Distance (ft)		500			1200			500			500	
Travel Time (s)		7.6			18.2			11.4			13.6	
Confl. Bikes (#/hr)						10						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	13%	50%	50%	6%	0%	50%	2%	50%	0%	2%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	102	771	0	30	990	103	0	48	0	0	96	105
Turn Type	Prot	NA		Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases						8	2			6		6
Detector Phase	7	4		3	8	8	2	2		6	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.0	21.0		9.0	21.0	21.0	21.0	21.0		21.0	21.0	21.0
Total Split (s)	14.0	67.0		12.0	65.0	65.0	21.0	21.0		21.0	21.0	21.0
Total Split (%)	14.0%	67.0%		12.0%	65.0%	65.0%	21.0%	21.0%		21.0%	21.0%	21.0%
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0		5.0			5.0	5.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?												
Recall Mode	None	None		None	None	None	Min	Min		Min	Min	Min
Act Effct Green (s)	8.8	57.1		6.8	53.1	53.1		11.1			11.1	11.1
Actuated g/C Ratio	0.10	0.67		0.08	0.62	0.62		0.13			0.13	0.13
v/c Ratio	0.55	0.69		0.31	0.89	0.10		0.25			0.54	0.35
Control Delay	54.0	14.6		52.0	26.7	2.0		7.0			50.3	11.6
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Delay	54.0	14.6		52.0	26.7	2.0		7.0			50.3	11.6
LOS	D	B		D	C	A		A			D	B
Approach Delay		19.2			25.1			7.0			30.1	
Approach LOS		B			C			A			C	
Queue Length 50th (ft)	60	272		18	449	0		0			56	0
Queue Length 95th (ft)	#134	483		49	#845	20		16			108	46
Internal Link Dist (ft)		420			1120			420			420	
Turn Bay Length (ft)	200			330		400						200
Base Capacity (vph)	203	1217		105	1282	1154		250			276	407

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Starvation Cap Reductn	0	0		0	0	0		0			0	0
Spillback Cap Reductn	0	0		0	0	0		0			0	0
Storage Cap Reductn	0	0		0	0	0		0			0	0
Reduced v/c Ratio	0.50	0.63		0.29	0.77	0.09		0.19			0.35	0.26

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 85.1
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.89
Intersection Signal Delay: 22.9 — Intersection LOS: C
Intersection Capacity Utilization 74.9% — ICU Level of Service D
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Kahuku Ag Rd/Marconi Rd & Kamehameha Hwy



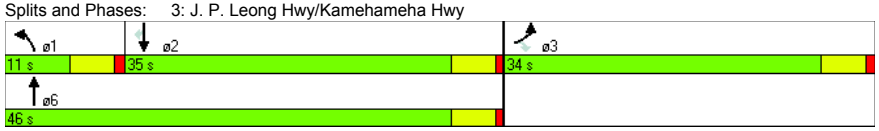
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	561	18	43	676	596	646
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	0			450
Storage Lanes	1	1	1			1
Taper Length (ft)	100		100			
Satd. Flow (prot)	1787	1615	1805	1900	1810	1583
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1787	1615	1805	1900	1810	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		95				687
Link Speed (mph)	30			30	30	
Link Distance (ft)	220			382	754	
Travel Time (s)	5.0			8.7	17.1	
Peak Hour Factor	0.95	0.64	0.60	1.00	1.00	0.94
Heavy Vehicles (%)	1%	0%	0%	0%	5%	2%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	591	28	72	676	596	687
Turn Type	NA	Perm	Prot	NA	NA	Perm
Protected Phases	3		1	6	2	
Permitted Phases		3				2
Detector Phase	3	3	1	6	2	2
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.0	21.0	9.0	9.0	21.0	21.0
Total Split (s)	34.0	34.0	11.0	46.0	35.0	35.0
Total Split (%)	42.5%	42.5%	13.8%	57.5%	43.8%	43.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Max	Max
Act Effct Green (s)	27.2	27.2	6.0	38.7	30.4	30.4
Actuated g/C Ratio	0.36	0.36	0.08	0.51	0.40	0.40
v/c Ratio	0.92	0.04	0.51	0.70	0.83	0.66
Control Delay	47.1	0.1	49.4	19.3	34.2	5.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	47.1	0.1	49.4	19.3	34.2	5.1
LOS	D	A	D	B	C	A
Approach Delay	45.0			22.2	18.6	
Approach LOS	D			C	B	
Queue Length 50th (ft)	276	0	35	241	272	0
Queue Length 95th (ft)	#474	0	50	366	#464	68
Internal Link Dist (ft)	140			302	674	
Turn Bay Length (ft)						450
Base Capacity (vph)	689	681	144	1035	722	1044
Starvation Cap Reductn	0	0	0	0	0	0

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.86	0.04	0.50	0.65	0.83	0.66

Intersection Summary

Area Type: Other
Cycle Length: 80
Actuated Cycle Length: 76.1
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.92
Intersection Signal Delay: 25.8 — Intersection LOS: C
Intersection Capacity Utilization 75.1% — ICU Level of Service D
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: J. P. Leong Hwy/Kamehameha Hwy



Intersection	
Intersection Delay (sec/veh):	106.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Volume (vph)	61	347	920	77	116	875
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
Right Turn Channelized	Yield	Yield	Yield	Yield	None	None
Storage Length	0	0		200	0	
Median Width	12		0			0
Grade (%)	0%		0%			0%
Peak Hour Factor	0.95	0.99	0.96	0.84	1.00	0.99
Heavy Vehicles(%)	6	5	3	5	3	2
Movement Flow Rate	64	351	958	92	116	884
Number of Lanes	1	0	1	1	0	1

Major/Minor			Major 1			Major 2
Conflicting Flow Rate - All	2120	525	0	0	1050	0
Stage 1	1004	-	-	-	-	-
Stage 2	1116	-	-	-	-	-
Follow-up Headway	3.554	3.345	-	-	2.227	-
Pot Capacity-1 Maneuver	# 54	547	-	-	659	-
Stage 1	348	-	-	-	-	-
Stage 2	308	-	-	-	-	-
Time blocked-Platoon(%)	0	0	-	-	0	-
Mov Capacity-1 Maneuver	# 35	547	-	-	659	-
Mov Capacity-2 Maneuver	# 35	-	-	-	-	-
Stage 1	348	-	-	-	-	-
Stage 2	201	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay (s)	$ 627.7	0	1.3
HCM LOS	F	A	A

Lane	NBT	NBR	WBLn1	SBL	SBT
Capacity (vph)			183		
HCM Control Delay (s)	-	-	$ 627.7	11.626	-
HCM Lane VC Ratio	-	-	2.266	0.176	-
HCM Lane LOS	-	-	F	B	-
HCM 95th Percentile Queue (veh)	-	-	33.594	0.635	-

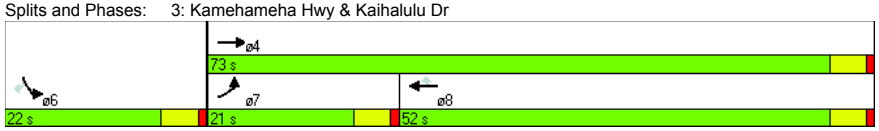
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	418	677	748	190	197	461
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300			400	0	0
Storage Lanes	2			1	1	1
Taper Length (ft)	100				100	
Satd. Flow (prot)	3400	1863	1810	1553	1752	1583
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	3400	1863	1810	1553	1752	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				207		370
Link Speed (mph)		45	45		30	
Link Distance (ft)		500	3000		500	
Travel Time (s)		7.6	45.5		11.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	2%	5%	4%	3%	2%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	454	736	813	207	214	501
Turn Type	Prot	NA	NA	Perm	NA	Perm
Protected Phases	7	4	8		6	
Permitted Phases				8		6
Detector Phase	7	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	21.0	73.0	52.0	52.0	22.0	22.0
Total Split (%)	22.1%	76.8%	54.7%	54.7%	23.2%	23.2%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Max	Max
Act Effct Green (s)	15.2	64.0	43.8	43.8	17.1	17.1
Actuated g/C Ratio	0.17	0.70	0.48	0.48	0.19	0.19
v/c Ratio	0.80	0.56	0.94	0.24	0.65	0.84
Control Delay	49.1	8.5	42.0	2.7	46.3	24.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	49.1	8.5	42.0	2.7	46.3	24.6
LOS	D	A	D	A	D	C
Approach Delay		24.0	34.0		31.1	
Approach LOS		C	C		C	
Queue Length 50th (ft)	137	178	430	0	122	74
Queue Length 95th (ft)	#206	259	#688	35	#214	#259
Internal Link Dist (ft)		420	2920		420	
Turn Bay Length (ft)	300			400		
Base Capacity (vph)	600	1398	938	905	328	597
Starvation Cap Reductn	0	0	0	0	0	0

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.76	0.53	0.87	0.23	0.65	0.84

Intersection Summary

Area Type: Other
Cycle Length: 95
Actuated Cycle Length: 91.2
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.94
Intersection Signal Delay: 29.2 Intersection LOS: C
Intersection Capacity Utilization 76.2% ICU Level of Service D
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Kamehameha Hwy & Kaihalulu Dr



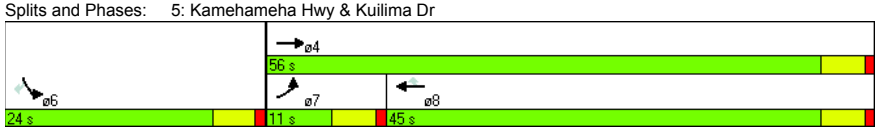
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	191	683	729	277	282	209
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200			400	0	0
Storage Lanes	2			1	1	1
Taper Length (ft)	100				100	
Satd. Flow (prot)	3386	1848	1795	1540	1738	1571
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	3386	1848	1795	1514	1738	1550
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				301		227
Link Speed (mph)		45	45		25	
Link Distance (ft)		500	5500		500	
Travel Time (s)		7.6	83.3		13.6	
Confl. Bikes (#/hr)				12		1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	2%	5%	4%	3%	2%
Bus Blockages (#/hr)	2	2	2	2	2	2
Shared Lane Traffic (%)						
Lane Group Flow (vph)	208	742	792	301	307	227
Turn Type	Prot	NA	NA	Perm	NA	Perm
Protected Phases	7	4	8		6	
Permitted Phases				8		6
Detector Phase	7	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	21.0	21.0	21.0	21.0	21.0
Total Split (s)	11.0	56.0	45.0	45.0	24.0	24.0
Total Split (%)	13.8%	70.0%	56.3%	56.3%	30.0%	30.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Min	Min
Act Effct Green (s)	6.1	47.2	36.0	36.0	16.7	16.7
Actuated g/C Ratio	0.08	0.64	0.49	0.49	0.23	0.23
v/c Ratio	0.75	0.63	0.91	0.34	0.79	0.43
Control Delay	53.8	11.4	34.1	2.6	43.7	6.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	53.8	11.4	34.1	2.6	43.7	6.8
LOS	D	B	C	A	D	A
Approach Delay		20.7	25.4		28.0	
Approach LOS		C	C		C	
Queue Length 50th (ft)	54	198	335	0	142	0
Queue Length 95th (ft)	#110	305	#575	37	#257	53
Internal Link Dist (ft)		420	5420		420	
Turn Bay Length (ft)	200			400		

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Base Capacity (vph)	279	1295	986	967	453	572
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.75	0.57	0.80	0.31	0.68	0.40

Intersection Summary	
Area Type:	Other
Cycle Length: 80	
Actuated Cycle Length: 74	
Natural Cycle: 70	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.91	
Intersection Signal Delay: 24.2	Intersection LOS: C
Intersection Capacity Utilization 71.9%	ICU Level of Service C
Analysis Period (min) 15	

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Kamehameha Hwy & Kuilima Dr



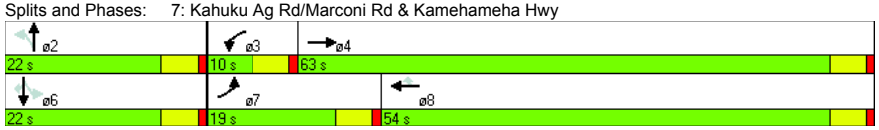
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	169	778	18	18	825	138	16	0	16	130	0	165
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	330		400	0		0	0		200
Storage Lanes	1		0	1		1	0		0	0		1
Taper Length (ft)	100			100			100			100		
Satd. Flow (prot)	1805	1664	0	1203	1792	1615	0	1152	0	0	1805	1615
Flt Permitted	0.950			0.950				0.823			0.735	
Satd. Flow (perm)	1805	1664	0	1203	1792	1571	0	972	0	0	1396	1615
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2				150		138				179
Link Speed (mph)		45			45			30			25	
Link Distance (ft)		500			1200			500			500	
Travel Time (s)		7.6			18.2			11.4			13.6	
Confl. Bikes (#/hr)						10						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	13%	50%	50%	6%	0%	50%	2%	50%	0%	2%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	184	866	0	20	897	150	0	34	0	0	141	179
Turn Type	Prot	NA		Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases						8	2			6		6
Detector Phase	7	4		3	8	8	2	2		6	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.0	21.0		9.0	21.0	21.0	21.0	21.0		21.0	21.0	21.0
Total Split (s)	19.0	63.0		10.0	54.0	54.0	22.0	22.0		22.0	22.0	22.0
Total Split (%)	20.0%	66.3%		10.5%	56.8%	56.8%	23.2%	23.2%		23.2%	23.2%	23.2%
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0		5.0			5.0	5.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?												
Recall Mode	None	None		None	None	None	Min	Min		Min	Min	Min
Act Effct Green (s)	12.6	60.8		5.1	46.8	46.8		13.4			13.4	13.4
Actuated g/C Ratio	0.14	0.69		0.06	0.53	0.53		0.15			0.15	0.15
v/c Ratio	0.71	0.75		0.29	0.94	0.17		0.13			0.67	0.45
Control Delay	53.9	16.7		54.1	39.9	2.6		1.0			51.9	9.5
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Delay	53.9	16.7		54.1	39.9	2.6		1.0			51.9	9.5
LOS	D	B		D	D	A		A			D	A
Approach Delay		23.2			34.9			1.0			28.2	
Approach LOS		C			C			A			C	
Queue Length 50th (ft)	103	232		12	468	0		0			78	0
Queue Length 95th (ft)	#197	#683		36	#781	29		0			141	56
Internal Link Dist (ft)		420			1120			420			420	
Turn Bay Length (ft)	200			330		400						200
Base Capacity (vph)	291	1178		69	1010	950		301			273	459

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Starvation Cap Reductn	0	0		0	0	0		0			0	0
Spillback Cap Reductn	0	0		0	0	0		0			0	0
Storage Cap Reductn	0	0		0	0	0		0			0	0
Reduced v/c Ratio	0.63	0.74		0.29	0.89	0.16		0.11			0.52	0.39

Intersection Summary

Area Type: Other
Cycle Length: 95
Actuated Cycle Length: 88.1
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.94
Intersection Signal Delay: 28.6 — Intersection LOS: C
Intersection Capacity Utilization 78.0% — ICU Level of Service D
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Kahuku Ag Rd/Marconi Rd & Kamehameha Hwy



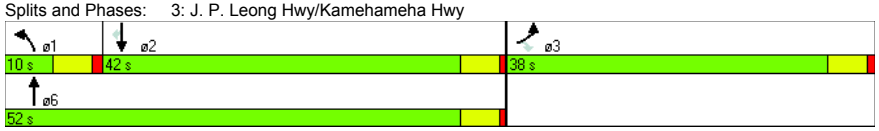
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	608	64	45	738	666	593
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	0			450
Storage Lanes	1	1	1			1
Taper Length (ft)	100		100			
Satd. Flow (prot)	1787	1615	1805	1845	1881	1583
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1787	1615	1805	1845	1881	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		91				659
Link Speed (mph)	30			30	30	
Link Distance (ft)	220			382	754	
Travel Time (s)	5.0			8.7	17.1	
Peak Hour Factor	1.00	0.70	1.00	0.89	0.90	0.90
Heavy Vehicles (%)	1%	0%	0%	3%	1%	2%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	608	91	45	829	740	659
Turn Type	NA	Perm	Prot	NA	NA	Perm
Protected Phases	3		1	6	2	
Permitted Phases		3				2
Detector Phase	3	3	1	6	2	2
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.0	21.0	9.0	9.0	21.0	21.0
Total Split (s)	38.0	38.0	10.0	52.0	42.0	42.0
Total Split (%)	42.2%	42.2%	11.1%	57.8%	46.7%	46.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Max	Max
Act Effct Green (s)	31.1	31.1	5.0	43.4	37.8	37.8
Actuated g/C Ratio	0.37	0.37	0.06	0.51	0.45	0.45
v/c Ratio	0.93	0.14	0.42	0.88	0.88	0.62
Control Delay	48.8	5.1	53.1	30.9	37.6	4.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.8	5.1	53.1	30.9	37.6	4.4
LOS	D	A	D	C	D	A
Approach Delay	43.1			32.0	22.0	
Approach LOS	D			C	C	
Queue Length 50th (ft)	327	0	25	387	399	0
Queue Length 95th (ft)	#540	15	#64	#625	#639	64
Internal Link Dist (ft)	140			302	674	
Turn Bay Length (ft)						450
Base Capacity (vph)	702	689	107	1032	840	1071
Starvation Cap Reductn	0	0	0	0	0	0

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.87	0.13	0.42	0.80	0.88	0.62

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 84.6
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.93
Intersection Signal Delay: 29.9 Intersection LOS: C
Intersection Capacity Utilization 80.9% ICU Level of Service D
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: J. P. Leong Hwy/Kamehameha Hwy



Intersection

Intersection Delay (sec/veh): 218.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Volume (vph)	56	347	997	92	104	958
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
Right Turn Channelized	Yield	Yield	Yield	Yield	None	None
Storage Length	0	0		200	0	
Median Width	12		0			0
Grade (%)	0%		0%			0%
Peak Hour Factor	1.00	1.00	0.91	0.79	0.80	0.95
Heavy Vehicles(%)	7	2	2	6	4	3
Movement Flow Rate	56	347	1096	116	130	1008
Number of Lanes	1	0	1	1	0	1

Major/Minor			Major 1			Major 2
Conflicting Flow Rate - All	2422	606	0	0	1212	0
Stage 1	1154	-	-	-	-	-
Stage 2	1268	-	-	-	-	-
Follow-up Headway	3.563	3.318	-	-	2.236	-
Pot Capacity-1 Maneuver	# 34	497	-	-	569	-
Stage 1	294	-	-	-	-	-
Stage 2	258	-	-	-	-	-
Time blocked-Platoon(%)	0	0	-	-	0	-
Mov Capacity-1 Maneuver	# 16	497	-	-	569	-
Mov Capacity-2 Maneuver	# 16	-	-	-	-	-
Stage 1	294	-	-	-	-	-
Stage 2	124	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay (s)	$ 1489.2	0	1.5
HCM LOS	F	A	A

Lane	NBT	NBR	WBLn1	SBL	SBT
Capacity (vph)			98		
HCM Control Delay (s)	-	-	$ 1489.2	13.19	-
HCM Lane VC Ratio	-	-	4.112	0.228	-
HCM Lane LOS	-	-	F	B	-
HCM 95th Percentile Queue (veh)	-	-	41.745	0.874	-

HCS+: Two-Lane Highways Release 5.4

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E-Mail: tmchawaii@aol.com

Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/3/11
Analysis Time Period	AM Peak Hour W/FBO Alternative
Highway	Kamehameha Highway
From/To	West of Kaihalulu Drive
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.92	
Lane width	12.0	ft	% Trucks and buses	8	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	50	%
Grade: Length		mi	Access points/mi	2	/mi
Up/down		%			

Two-way hourly volume, V	1717	veh/h	
Directional split	50 / 50	%	

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.992	
Two-way flow rate,(note-1) vp	1881	pc/h
Highest directional split proportion (note-2)	941	pc/h
Free-Flow Speed from Field Measurement:		
Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	0.5	mi/h
Free-flow speed, FFS	44.5	mi/h

Adjustment for no-passing zones, fnp	0.8	mi/h
Average travel speed, ATS	29.1	mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	1866	pc/h
Highest directional split proportion (note-2)	933	
Base percent time-spent-following, BPTSF	80.6	%
Adj.for directional distribution and no-passing zones, fd/np	3.9	
Percent time-spent-following, PTSF	84.5	%

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.59	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS+: Two-Lane Highways Release 5.4

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/1/2011
Analysis Time Period	AM Peak Hour W/FBO Alt.
Highway	Kamehameha Highway
From/To	Haleiwa to Kawailoa
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.94	
Lane width	12.0	ft	% Trucks and buses	5	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	80	%
Grade: Length		mi	Access points/mi	2	/mi
Up/down		%			

Two-way hourly volume, V	1865	veh/h
Directional split	51 / 49	%

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.995	
Two-way flow rate,(note-1) vp	1994	pc/h
Highest directional split proportion (note-2)	1017	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	0.5	mi/h
Free-flow speed, FFS	44.5	mi/h
Adjustment for no-passing zones, fnp	1.0	mi/h

Average travel speed, ATS	28.0	mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	1984	pc/h
Highest directional split proportion (note-2)	1012	
Base percent time-spent-following, BPTSF	82.5	%
Adj.for directional distribution and no-passing zones, fd/np	4.2	
Percent time-spent-following, PTSF	86.7	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.62	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/1/2011
Analysis Time Period	AM Peak Hour W/FBO Alternative
Highway	Kamehameha Highway
From/To	Hygienic Store
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.89	
Lane width	12.0	ft	% Trucks and buses	3	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	80	%
Grade: Length		mi	Access points/mi	10	/mi
Up/down		%			

Two-way hourly volume, V 1735 veh/h
Directional split 63 / 37 %

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.997	
Two-way flow rate,(note-1) vp	1955	pc/h
Highest directional split proportion (note-2)	1232	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	2.5	mi/h
Free-flow speed, FFS	42.5	mi/h
Adjustment for no-passing zones, fnp	1.0	mi/h

Average travel speed, ATS 26.3 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	1949	pc/h
Highest directional split proportion (note-2)	1228	
Base percent time-spent-following, BPTSF	82.0	%
Adj.for directional distribution and no-passing zones, fd/np	4.3	
Percent time-spent-following, PTSF	86.3	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.61	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/3/11
Analysis Time Period	PM Peak Hour W/FBO Alternative
Highway	Kamehameha Highway
From/To	West of Kaihalulu Drive
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.92	
Lane width	12.0	ft	% Trucks and buses	4	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	50	%
Grade: Length		mi	Access points/mi	2	/mi
Up/down		%			

Two-way hourly volume, V	2154	veh/h
Directional split	52 / 48	%

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.996	
Two-way flow rate,(note-1) vp	2351	pc/h
Highest directional split proportion (note-2)	1223	pc/h
Free-Flow Speed from Field Measurement:		
Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	0.5	mi/h
Free-flow speed, FFS	44.5	mi/h
Adjustment for no-passing zones, fnp	0.7	mi/h

Average travel speed, ATS	25.5	mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	2341	pc/h
Highest directional split proportion (note-2)	1217	
Base percent time-spent-following, BPTSF	87.2	%
Adj.for directional distribution and no-passing zones, fd/np	2.4	
Percent time-spent-following, PTSF	89.7	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.73	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/1/2011
Analysis Time Period	PM Peak Hour W/FBO Alt
Highway	Kamehameha Highway
From/To	Haleiwa to Kawailoa
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.99	
Lane width	12.0	ft	% Trucks and buses	2	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	80	%
Grade: Length		mi	Access points/mi	2	/mi
Up/down		%			

Two-way hourly volume, V 2479 veh/h
Directional split 50 / 50 %

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.998	
Two-way flow rate,(note-1) vp	2509	pc/h
Highest directional split proportion (note-2)	1255	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	0.5	mi/h
Free-flow speed, FFS	44.5	mi/h
Adjustment for no-passing zones, fnp	0.9	mi/h

Average travel speed, ATS 24.1 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	2504	pc/h
Highest directional split proportion (note-2)	1252	
Base percent time-spent-following, BPTSF	88.9	%
Adj.for directional distribution and no-passing zones, fd/np	2.6	
Percent time-spent-following, PTSF	91.5	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.78	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/1/2011
Analysis Time Period	PM Peak Hour W/FBO Alternative
Highway	Kamehameha Highway
From/To	Hygienic Store
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.99	
Lane width	12.0	ft	% Trucks and buses	5	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	80	%
Grade: Length		mi	Access points/mi	10	/mi
Up/down		%			

Two-way hourly volume, V 2258 veh/h
Directional split 56 / 44 %

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.995	
Two-way flow rate,(note-1) vp	2292	pc/h
Highest directional split proportion (note-2)	1284	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	2.5	mi/h
Free-flow speed, FFS	42.5	mi/h
Adjustment for no-passing zones, fnp	0.9	mi/h

Average travel speed, ATS 23.8 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	2281	pc/h
Highest directional split proportion (note-2)	1277	
Base percent time-spent-following, BPTSF	86.5	%
Adj.for directional distribution and no-passing zones, fd/np	3.2	
Percent time-spent-following, PTSF	89.7	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.72	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/5/11
Analysis Time Period	Sat Peak Hr W/FBO Alternative
Highway	Kamehameha Highway
From/To	West of Kaihalulu Drive
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.92	
Lane width	12.0	ft	% Trucks and buses	3	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	50	%
Grade: Length		mi	Access points/mi	2	/mi
Up/down		%			

Two-way hourly volume, V 2304 veh/h
Directional split 53 / 47 %

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.997	
Two-way flow rate,(note-1) vp	2512	pc/h
Highest directional split proportion (note-2)	1331	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	0.5	mi/h
Free-flow speed, FFS	44.5	mi/h
Adjustment for no-passing zones, fnp	0.7	mi/h

Average travel speed, ATS 24.3 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	2504	pc/h
Highest directional split proportion (note-2)	1327	
Base percent time-spent-following, BPTSF	88.9	%
Adj.for directional distribution and no-passing zones, fd/np	2.0	
Percent time-spent-following, PTSF	90.9	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.79	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	10/29/2011
Analysis Time Period	Sat. Peak Hr W/FBO Alternative
Highway	Kamehameha Highway
From/To	Haleiwa to Kawailoa
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.91	
Lane width	12.0	ft	% Trucks and buses	2	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	80	%
Grade: Length		mi	Access points/mi	2	/mi
Up/down		%			

Two-way hourly volume, V 2605 veh/h
Directional split 52 / 48 %

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.998	
Two-way flow rate,(note-1) vp	2868	pc/h
Highest directional split proportion (note-2)	1491	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	0.5	mi/h
Free-flow speed, FFS	44.5	mi/h
Adjustment for no-passing zones, fnp	0.8	mi/h

Average travel speed, ATS 21.5 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	2863	pc/h
Highest directional split proportion (note-2)	1489	
Base percent time-spent-following, BPTSF	91.9	%
Adj.for directional distribution and no-passing zones, fd/np	1.9	
Percent time-spent-following, PTSF	93.8	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.90	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	10/29/2011
Analysis Time Period	Sat Peak Hr W/FBO Alternative
Highway	Kamehameha Highway
From/To	Hygienic Store
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.95	
Lane width	12.0	ft	% Trucks and buses	3	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	80	%
Grade: Length		mi	Access points/mi	10	/mi
Up/down		%			

Two-way hourly volume, V 2389 veh/h
Directional split 56 / 44 %

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.997	
Two-way flow rate,(note-1) vp	2522	pc/h
Highest directional split proportion (note-2)	1412	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	2.5	mi/h
Free-flow speed, FFS	42.5	mi/h
Adjustment for no-passing zones, fnp	0.9	mi/h

Average travel speed, ATS 22.0 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	2515	pc/h
Highest directional split proportion (note-2)	1408	
Base percent time-spent-following, BPTSF	89.0	%
Adj.for directional distribution and no-passing zones, fd/np	2.4	
Percent time-spent-following, PTSF	91.5	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.79	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

TRAFFIC IMPACT ANALYSIS REPORT

FOR THE PROPOSED

TURTLE BAY RESORT MASTER PLAN

KAHUKU, OAHU, HAWAII

APPENDIX E

CAPACITY ANALYSIS WORKSHEETS

2025 TRAFFIC CONDITIONS WITH RESORT RESIDENTIAL ALTERNATIVE

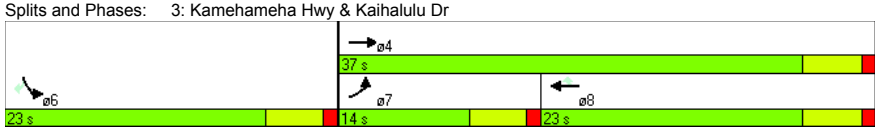
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	141	350	360	55	51	128
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300			400	0	200
Storage Lanes	1			1	1	1
Taper Length (ft)	100				100	
Satd. Flow (prot)	1736	1681	1792	1509	1703	1509
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1736	1681	1792	1509	1703	1509
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				127		139
Link Speed (mph)		45	45		30	
Link Distance (ft)		500	3000		500	
Travel Time (s)		7.6	45.5		11.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	4%	13%	6%	7%	6%	7%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	153	380	391	60	55	139
Turn Type	Prot	NA	NA	Perm	NA	Perm
Protected Phases	7	4	8		6	
Permitted Phases				8		6
Detector Phase	7	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	14.0	37.0	23.0	23.0	23.0	23.0
Total Split (%)	23.3%	61.7%	38.3%	38.3%	38.3%	38.3%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Max	Max
Act Effct Green (s)	8.4	26.0	15.6	15.6	18.6	18.6
Actuated g/C Ratio	0.15	0.47	0.28	0.28	0.34	0.34
v/c Ratio	0.57	0.48	0.77	0.12	0.10	0.23
Control Delay	33.7	11.3	30.7	0.9	15.8	4.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.7	11.3	30.7	0.9	15.8	4.8
LOS	C	B	C	A	B	A
Approach Delay		17.7	26.7		7.9	
Approach LOS		B	C		A	
Queue Length 50th (ft)	52	75	125	0	14	0
Queue Length 95th (ft)	#117	130	#241	4	36	33
Internal Link Dist (ft)		420	2920		420	
Turn Bay Length (ft)	300			400		200
Base Capacity (vph)	294	1012	606	595	576	603
Starvation Cap Reductn	0	0	0	0	0	0

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.52	0.38	0.65	0.10	0.10	0.23

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 54.9
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.77
Intersection Signal Delay: 19.6 Intersection LOS: B
Intersection Capacity Utilization 42.6% ICU Level of Service A
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Kamehameha Hwy & Kaihalulu Dr

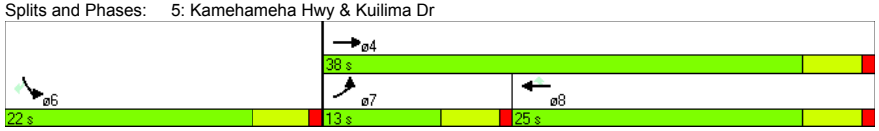


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	83	318	331	111	135	84
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200			400	0	0
Storage Lanes	1			1	1	1
Taper Length (ft)	100				100	
Satd. Flow (prot)	1736	1681	1792	1509	1703	1509
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1734	1681	1792	1478	1680	1490
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				127		127
Link Speed (mph)		45	45		25	
Link Distance (ft)		500	5500		500	
Travel Time (s)		7.6	83.3		13.6	
Confl. Peds. (#/hr)	1			1	7	
Confl. Bikes (#/hr)				12		1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	4%	13%	6%	7%	6%	7%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	90	346	360	121	147	91
Turn Type	Prot	NA	NA	Perm	NA	Perm
Protected Phases	7	4	8		6	
Permitted Phases				8		6
Detector Phase	7	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	21.0	21.0	21.0	21.0	21.0
Total Split (s)	13.0	38.0	25.0	25.0	22.0	22.0
Total Split (%)	21.7%	63.3%	41.7%	41.7%	36.7%	36.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Min	Min
Act Effct Green (s)	7.7	20.5	14.2	14.2	9.8	9.8
Actuated g/C Ratio	0.19	0.49	0.34	0.34	0.24	0.24
v/c Ratio	0.28	0.42	0.59	0.21	0.37	0.20
Control Delay	22.0	7.8	17.6	4.0	19.5	3.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.0	7.8	17.6	4.0	19.5	3.5
LOS	C	A	B	A	B	A
Approach Delay		10.7	14.2		13.4	
Approach LOS		B	B		B	
Queue Length 50th (ft)	22	41	82	0	35	0
Queue Length 95th (ft)	65	97	169	26	84	18
Internal Link Dist (ft)		420	5420		420	
Turn Bay Length (ft)	200			400		

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Base Capacity (vph)	376	1320	971	859	784	755
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.24	0.26	0.37	0.14	0.19	0.12

Intersection Summary	
Area Type:	Other
Cycle Length: 60	
Actuated Cycle Length: 41.5	
Natural Cycle: 55	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.59	
Intersection Signal Delay: 12.7	Intersection LOS: B
Intersection Capacity Utilization 42.0%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 5: Kamehameha Hwy & Kuilima Dr



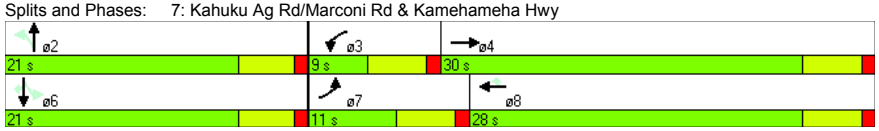
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	53	383	17	19	377	46	24	0	18	37	0	41
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	330		400	0		0	0		200
Storage Lanes	1		0	1		1	0		0	0		1
Taper Length (ft)	100			100			100			100		
Satd. Flow (prot)	1805	1649	0	1203	1792	1615	0	1160	0	0	1805	1615
Flt Permitted	0.950			0.950				0.803			0.727	
Satd. Flow (perm)	1805	1649	0	1203	1792	1567	0	957	0	0	1381	1615
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4				127		127				127
Link Speed (mph)		45			45			30			25	
Link Distance (ft)		500			1200			500			500	
Travel Time (s)		7.6			18.2			11.4			13.6	
Confl. Bikes (#/hr)						10						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	13%	50%	50%	6%	0%	50%	2%	50%	0%	2%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	58	434	0	21	410	50	0	46	0	0	40	45
Turn Type	Prot	NA		Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases						8	2			6		6
Detector Phase	7	4		3	8	8	2	2		6	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.0	21.0		9.0	21.0	21.0	21.0	21.0		21.0	21.0	21.0
Total Split (s)	11.0	30.0		9.0	28.0	28.0	21.0	21.0		21.0	21.0	21.0
Total Split (%)	18.3%	50.0%		15.0%	46.7%	46.7%	35.0%	35.0%		35.0%	35.0%	35.0%
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0		5.0			5.0	5.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?												
Recall Mode	None	None		None	None	None	Min	Min		Min	Min	Min
Act Effct Green (s)	6.4	16.5		4.4	14.5	14.5		7.2			7.2	7.2
Actuated g/C Ratio	0.18	0.46		0.12	0.40	0.40		0.20			0.20	0.20
v/c Ratio	0.18	0.57		0.14	0.57	0.07		0.16			0.14	0.11
Control Delay	19.3	10.7		22.8	12.9	0.2		1.1			17.7	0.5
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Delay	19.3	10.7		22.8	12.9	0.2		1.1			17.7	0.5
LOS	B	B		C	B	A		A			B	A
Approach Delay		11.7			12.0			1.1			8.6	
Approach LOS		B			B			A			A	
Queue Length 50th (ft)	8	43		3	40	0		0			5	0
Queue Length 95th (ft)	45	162		24	158	1		0			33	0
Internal Link Dist (ft)		420			1120			420			420	
Turn Bay Length (ft)	200			330		400						200
Base Capacity (vph)	331	1271		147	1262	1141		533			676	856

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Starvation Cap Reductn	0	0		0	0	0		0			0	0
Spillback Cap Reductn	0	0		0	0	0		0			0	0
Storage Cap Reductn	0	0		0	0	0		0			0	0
Reduced v/c Ratio	0.18	0.34		0.14	0.32	0.04		0.09			0.06	0.05

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 36
Natural Cycle: 55
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.57
Intersection Signal Delay: 11.2 — Intersection LOS: B
Intersection Capacity Utilization 46.1% — ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 7: Kahuku Ag Rd/Marconi Rd & Kamehameha Hwy



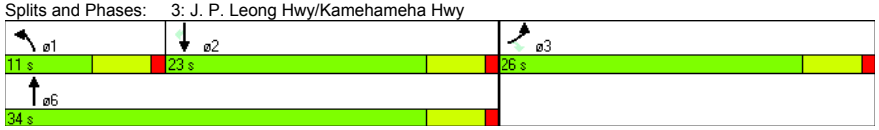
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	309	27	44	326	281	376
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	0			450
Storage Lanes	1	1	1			1
Taper Length (ft)	100		100			
Satd. Flow (prot)	1719	1615	1805	1792	1845	1568
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1719	1615	1805	1792	1845	1568
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		127				404
Link Speed (mph)	30			30	30	
Link Distance (ft)	220			382	754	
Travel Time (s)	5.0			8.7	17.1	
Peak Hour Factor	0.88	1.00	0.61	0.97	1.00	0.93
Heavy Vehicles (%)	5%	0%	0%	6%	3%	3%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	351	27	72	336	281	404
Turn Type	NA	Perm	Prot	NA	NA	Perm
Protected Phases	3		1	6	2	
Permitted Phases		3				2
Detector Phase	3	3	1	6	2	2
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.0	21.0	9.0	9.0	21.0	21.0
Total Split (s)	26.0	26.0	11.0	34.0	23.0	23.0
Total Split (%)	43.3%	43.3%	18.3%	56.7%	38.3%	38.3%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Max	Max
Act Effct Green (s)	15.1	15.1	6.1	25.5	19.7	19.7
Actuated g/C Ratio	0.30	0.30	0.12	0.50	0.39	0.39
v/c Ratio	0.69	0.05	0.33	0.37	0.39	0.47
Control Delay	24.1	0.1	28.5	10.1	16.7	4.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.1	0.1	28.5	10.1	16.7	4.3
LOS	C	A	C	B	B	A
Approach Delay	22.3			13.3	9.4	
Approach LOS	C			B	A	
Queue Length 50th (ft)	101	0	22	58	72	0
Queue Length 95th (ft)	170	0	39	125	147	54
Internal Link Dist (ft)	140			302	674	
Turn Bay Length (ft)						450
Base Capacity (vph)	732	760	219	1054	713	854
Starvation Cap Reductn	0	0	0	0	0	0

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.48	0.04	0.33	0.32	0.39	0.47

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 50.9
Natural Cycle: 55
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.69
Intersection Signal Delay: 13.8 — Intersection LOS: B
Intersection Capacity Utilization 47.7% — ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 3: J. P. Leong Hwy/Kamehameha Hwy



Intersection

Intersection Delay (sec/veh): $ 401.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Volume (vph)	42	97	373	152	503	450
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
Right Turn Channelized	Yield	Yield	Yield	Yield	None	None
Storage Length	0	0		200	0	
Median Width	12		0			0
Grade (%)	0%		0%			0%
Peak Hour Factor	0.75	0.84	0.97	0.83	0.77	1.00
Heavy Vehicles(%)	6	7	5	4	2	3
Movement Flow Rate	56	115	385	183	653	450
Number of Lanes	1	0	1	1	0	1

Major/Minor			Major 1			Major 2
Conflicting Flow Rate - All	2233	285	0	0	568	0
Stage 1	477	-	-	-	-	-
Stage 2	1756	-	-	-	-	-
Follow-up Headway	3.554	3.363	-	-	2.218	-
Pot Capacity-1 Maneuver	# 46	742	-	-	1004	-
Stage 1	616	-	-	-	-	-
Stage 2	149	-	-	-	-	-
Time blocked-Platoon(%)	0	0	-	-	0	-
Mov Capacity-1 Maneuver	# 6	742	-	-	1004	-
Mov Capacity-2 Maneuver	# 6	-	-	-	-	-
Stage 1	616	-	-	-	-	-
Stage 2	# 20	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay (s)	$ 4253.7	0	8.9
HCM LOS	F	A	A

Lane	NBT	NBR	WBLn1	SBL	SBT
Capacity (vph)			18		
HCM Control Delay (s)	-	-	$ 4253.7	15.002	-
HCM Lane VC Ratio	-	-	9.526	0.651	-
HCM Lane LOS	-	-	F	C	-
HCM 95th Percentile Queue (veh)	-	-	22.095	5.014	-

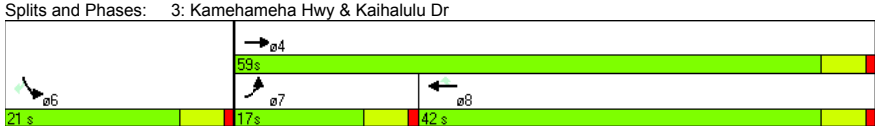
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	102	466	499	17	19	99
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300			400	0	200
Storage Lanes	1			1	1	1
Taper Length (ft)	100				100	
Satd. Flow (prot)	1770	1845	1810	1495	1736	1509
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1770	1845	1810	1495	1736	1509
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				95		108
Link Speed (mph)		45	45		30	
Link Distance (ft)		500	3000		500	
Travel Time (s)		7.6	45.5		11.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	3%	5%	8%	4%	7%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	111	507	542	18	21	108
Turn Type	Prot	NA	NA	Perm	NA	Perm
Protected Phases	7	4	8		6	
Permitted Phases				8		6
Detector Phase	7	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	17.0	59.0	42.0	42.0	21.0	21.0
Total Split (%)	21.3%	73.8%	52.5%	52.5%	26.3%	26.3%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Max	Max
Act Effct Green (s)	9.3	35.2	24.2	24.2	17.1	17.1
Actuated g/C Ratio	0.15	0.56	0.38	0.38	0.27	0.27
v/c Ratio	0.43	0.49	0.78	0.03	0.04	0.22
Control Delay	33.7	9.0	26.2	0.1	23.9	7.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.7	9.0	26.2	0.1	23.9	7.4
LOS	C	A	C	A	C	A
Approach Delay		13.4	25.3		10.1	
Approach LOS		B	C		B	
Queue Length 50th (ft)	41	97	185	0	6	0
Queue Length 95th (ft)	99	150	307	0	27	40
Internal Link Dist (ft)		420	2920		420	
Turn Bay Length (ft)	300			400		200
Base Capacity (vph)	360	1537	1136	973	471	488
Starvation Cap Reductn	0	0	0	0	0	0

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.31	0.33	0.48	0.02	0.04	0.22

Intersection Summary

Area Type: Other
Cycle Length: 80
Actuated Cycle Length: 63
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.78
Intersection Signal Delay: 18.2 — Intersection LOS: B
Intersection Capacity Utilization 47.7% — ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 3: Kamehameha Hwy & Kaihalulu Dr



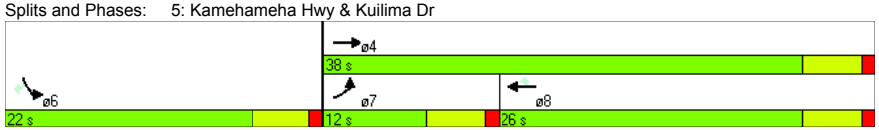
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	103	382	422	159	125	94
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200			400	0	0
Storage Lanes	1			1	1	1
Taper Length (ft)	100				100	
Satd. Flow (prot)	1741	1815	1781	1471	1715	1503
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1741	1815	1781	1443	1705	1482
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				173		127
Link Speed (mph)		45	45		25	
Link Distance (ft)		500	5500		500	
Travel Time (s)		7.6	83.3		13.6	
Confl. Peds. (#/hr)					3	1
Confl. Bikes (#/hr)				12		1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	3%	5%	8%	4%	7%
Bus Blockages (#/hr)	4	4	4	4	3	1
Shared Lane Traffic (%)						
Lane Group Flow (vph)	112	415	459	173	136	102
Turn Type	Prot	NA	NA	Perm	NA	Perm
Protected Phases	7	4	8		6	
Permitted Phases				8		6
Detector Phase	7	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	21.0	21.0	21.0	21.0	21.0
Total Split (s)	12.0	38.0	26.0	26.0	22.0	22.0
Total Split (%)	20.0%	63.3%	43.3%	43.3%	36.7%	36.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Min	Min
Act Effct Green (s)	7.2	25.2	16.6	16.6	9.4	9.4
Actuated g/C Ratio	0.16	0.55	0.36	0.36	0.21	0.21
v/c Ratio	0.41	0.41	0.71	0.27	0.38	0.25
Control Delay	26.7	7.0	20.9	3.8	21.6	4.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.7	7.0	20.9	3.8	21.6	4.8
LOS	C	A	C	A	C	A
Approach Delay		11.2	16.2		14.4	
Approach LOS		B	B		B	
Queue Length 50th (ft)	30	50	109	0	35	0
Queue Length 95th (ft)	#86	112	#219	31	79	23
Internal Link Dist (ft)		420	5420		420	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Turn Bay Length (ft)	200			400		
Base Capacity (vph)	292	1313	897	812	699	679
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.38	0.32	0.51	0.21	0.19	0.15

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 45.6
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.71
Intersection Signal Delay: 14.0 Intersection LOS: B
Intersection Capacity Utilization 47.6% ICU Level of Service A
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Kamehameha Hwy & Kuilima Dr



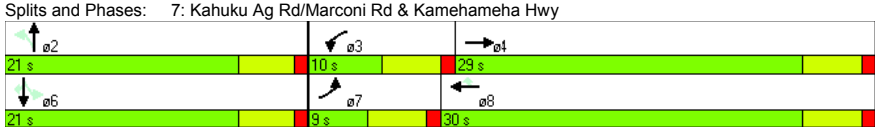
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	45	438	24	28	497	40	24	0	20	52	0	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	330		400	0		0	0		200
Storage Lanes	1		0	1		1	0		0	0		1
Taper Length (ft)	100			100			100			100		
Satd. Flow (prot)	1805	1788	0	1203	1810	1615	0	1157	0	0	1805	1615
Flt Permitted	0.950			0.950				0.806			0.726	
Satd. Flow (perm)	1805	1788	0	1203	1810	1568	0	958	0	0	1379	1615
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5				127		127				127
Link Speed (mph)		45			45			30			25	
Link Distance (ft)		500			1200			493			500	
Travel Time (s)		7.6			18.2			11.2			13.6	
Confl. Bikes (#/hr)						10						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	3%	50%	50%	5%	0%	50%	2%	50%	0%	2%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	49	502	0	30	540	43	0	48	0	0	57	65
Turn Type	Prot	NA		Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases						8	2			6		6
Detector Phase	7	4		3	8	8	2	2		6	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.0	21.0		9.0	21.0	21.0	21.0	21.0		21.0	21.0	21.0
Total Split (s)	9.0	29.0		10.0	30.0	30.0	21.0	21.0		21.0	21.0	21.0
Total Split (%)	15.0%	48.3%		16.7%	50.0%	50.0%	35.0%	35.0%		35.0%	35.0%	35.0%
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0		5.0			5.0	5.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?												
Recall Mode	None	None		None	None	None	Min	Min		Min	Min	Min
Act Effct Green (s)	4.4	16.9		5.5	17.2	17.2		7.8			7.8	7.8
Actuated g/C Ratio	0.11	0.44		0.14	0.45	0.45		0.20			0.20	0.20
v/c Ratio	0.24	0.64		0.18	0.67	0.06		0.16			0.21	0.15
Control Delay	24.2	13.8		23.4	14.2	0.1		1.2			18.8	1.9
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Delay	24.2	13.8		23.4	14.2	0.1		1.2			18.8	1.9
LOS	C	B		C	B	A		A			B	A
Approach Delay		14.7			13.6			1.2			9.8	
Approach LOS		B			B			A			A	
Queue Length 50th (ft)	9	54		5	61	0		0			9	0
Queue Length 95th (ft)	43	204		30	216	0		0			42	8
Internal Link Dist (ft)		420			1120			413			420	
Turn Bay Length (ft)	200			330		400						200
Base Capacity (vph)	206	1227		171	1289	1153		506			630	807

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Starvation Cap Reductn	0	0		0	0	0		0			0	0
Spillback Cap Reductn	0	0		0	0	0		0			0	0
Storage Cap Reductn	0	0		0	0	0		0			0	0
Reduced v/c Ratio	0.24	0.41		0.18	0.42	0.04		0.09			0.09	0.08

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 38.6
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.67
Intersection Signal Delay: 13.3 — Intersection LOS: B
Intersection Capacity Utilization 51.2% — ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 7: Kahuku Ag Rd/Marconi Rd & Kamehameha Hwy



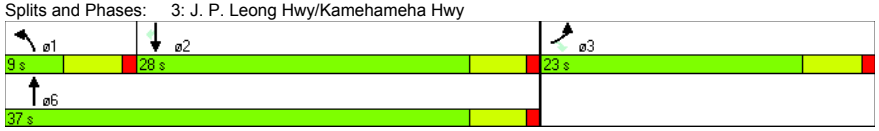
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	382	18	43	560	422	458
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	0			450
Storage Lanes	1	1	1			1
Taper Length (ft)	100		100			
Satd. Flow (prot)	1787	1615	1805	1900	1810	1583
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1787	1615	1805	1900	1810	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		127				472
Link Speed (mph)	30			30	30	
Link Distance (ft)	220			382	754	
Travel Time (s)	5.0			8.7	17.1	
Peak Hour Factor	0.97	1.00	1.00	0.99	0.85	0.97
Heavy Vehicles (%)	1%	0%	0%	0%	5%	2%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	394	18	43	566	496	472
Turn Type	NA	Perm	Prot	NA	NA	Perm
Protected Phases	3		1	6	2	
Permitted Phases		3				2
Detector Phase	3	3	1	6	2	2
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.0	21.0	9.0	9.0	21.0	21.0
Total Split (s)	23.0	23.0	9.0	37.0	28.0	28.0
Total Split (%)	38.3%	38.3%	15.0%	61.7%	46.7%	46.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Max	Max
Act Effct Green (s)	15.2	15.2	4.1	27.0	23.8	23.8
Actuated g/C Ratio	0.29	0.29	0.08	0.52	0.46	0.46
v/c Ratio	0.76	0.03	0.31	0.58	0.60	0.48
Control Delay	29.0	0.1	31.5	12.0	16.8	3.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.0	0.1	31.5	12.0	16.8	3.5
LOS	C	A	C	B	B	A
Approach Delay	27.7			13.4	10.3	
Approach LOS	C			B	B	
Queue Length 50th (ft)	95	0	12	113	96	0
Queue Length 95th (ft)	#244	0	42	203	225	50
Internal Link Dist (ft)	140			302	674	
Turn Bay Length (ft)						450
Base Capacity (vph)	624	647	140	1180	824	978
Starvation Cap Reductn	0	0	0	0	0	0

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.63	0.03	0.31	0.48	0.60	0.48

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 52.3
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.76
Intersection Signal Delay: 14.9 — Intersection LOS: B
Intersection Capacity Utilization 59.2% — ICU Level of Service B
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: J. P. Leong Hwy/Kamehameha Hwy



Intersection	
Intersection Delay (sec/veh):	11.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Volume (vph)	61	290	768	77	91	693
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
Right Turn Channelized	Yield	Yield	Yield	Yield	None	None
Storage Length	0	0		200	0	
Median Width	12		0			0
Grade (%)	0%		0%			0%
Peak Hour Factor	0.95	0.98	0.96	0.84	1.00	1.00
Heavy Vehicles(%)	6	5	3	5	3	2
Movement Flow Rate	64	296	800	92	91	693
Number of Lanes	1	0	1	1	0	1

Major/Minor			Major 1			Major 2
Conflicting Flow Rate - All	1721	446	0	0	892	0
Stage 1	846	-	-	-	-	-
Stage 2	875	-	-	-	-	-
Follow-up Headway	3.554	3.345	-	-	2.227	-
Pot Capacity-1 Maneuver	96	606	-	-	756	-
Stage 1	414	-	-	-	-	-
Stage 2	401	-	-	-	-	-
Time blocked-Platoon(%)	0	0	-	-	0	-
Mov Capacity-1 Maneuver	77	606	-	-	756	-
Mov Capacity-2 Maneuver	77	-	-	-	-	-
Stage 1	414	-	-	-	-	-
Stage 2	322	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay (s)	60.2	0	1.2
HCM LOS	F	A	A

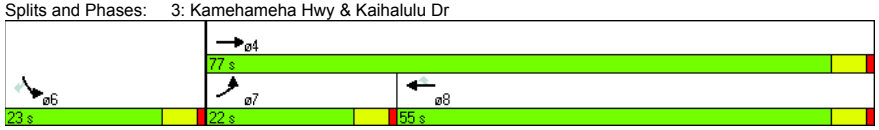
Lane	NBT	NBR	WBLn1	SBL	SBT
Capacity (vph)			392		
HCM Control Delay (s)	-	-	60.2	10.412	-
HCM Lane VC Ratio	-	-	0.919	0.12	-
HCM Lane LOS	-	-	F	B	-
HCM 95th Percentile Queue (veh)	-	-	9.799	0.409	-

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	171	598	630	37	62	192
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300			400	0	200
Storage Lanes	1			1	1	1
Taper Length (ft)	100				100	
Satd. Flow (prot)	1752	1863	1810	1553	1752	1583
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1752	1863	1810	1553	1752	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				76		209
Link Speed (mph)		45	45		30	
Link Distance (ft)		500	3000		500	
Travel Time (s)		7.6	45.5		11.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	2%	5%	4%	3%	2%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	186	650	685	40	67	209
Turn Type	Prot	NA	NA	Perm	NA	Perm
Protected Phases	7	4	8		6	
Permitted Phases				8		6
Detector Phase	7	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	22.0	77.0	55.0	55.0	23.0	23.0
Total Split (%)	22.0%	77.0%	55.0%	55.0%	23.0%	23.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Max	Max
Act Effct Green (s)	13.4	55.1	36.5	36.5	18.5	18.5
Actuated g/C Ratio	0.16	0.66	0.44	0.44	0.22	0.22
v/c Ratio	0.66	0.53	0.87	0.06	0.17	0.41
Control Delay	47.6	8.8	34.2	0.9	33.0	7.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	47.6	8.8	34.2	0.9	33.0	7.9
LOS	D	A	C	A	C	A
Approach Delay		17.5	32.3		14.0	
Approach LOS		B	C		B	
Queue Length 50th (ft)	93	153	316	0	29	0
Queue Length 95th (ft)	185	220	489	5	76	61
Internal Link Dist (ft)		420	2920		420	
Turn Bay Length (ft)	300			400		200
Base Capacity (vph)	365	1593	1109	981	386	512
Starvation Cap Reductn	0	0	0	0	0	0

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.51	0.41	0.62	0.04	0.17	0.41

Intersection Summary	
Area Type:	Other
Cycle Length: 100	
Actuated Cycle Length: 83.9	
Natural Cycle: 70	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.87	
Intersection Signal Delay: 22.8	Intersection LOS: C
Intersection Capacity Utilization 58.6%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 3: Kamehameha Hwy & Kaihalulu Dr



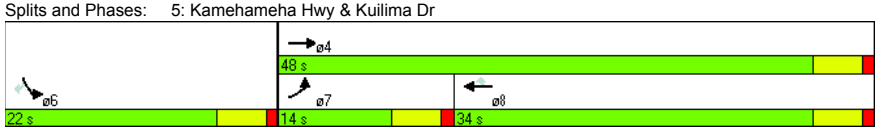
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	125	535	533	175	177	134
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200			400	0	0
Storage Lanes	1			1	1	1
Taper Length (ft)	100				100	
Satd. Flow (prot)	1738	1848	1795	1540	1738	1571
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1738	1848	1795	1512	1738	1550
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				190		146
Link Speed (mph)		45	45		25	
Link Distance (ft)		500	5500		500	
Travel Time (s)		7.6	83.3		13.6	
Confl. Bikes (#/hr)				12		1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	2%	5%	4%	3%	2%
Bus Blockages (#/hr)	2	2	2	2	2	2
Shared Lane Traffic (%)						
Lane Group Flow (vph)	136	582	579	190	192	146
Turn Type	Prot	NA	NA	Perm	NA	Perm
Protected Phases	7	4	8		6	
Permitted Phases				8		6
Detector Phase	7	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	21.0	21.0	21.0	21.0	21.0
Total Split (s)	14.0	48.0	34.0	34.0	22.0	22.0
Total Split (%)	20.0%	68.6%	48.6%	48.6%	31.4%	31.4%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Min	Min
Act Effct Green (s)	8.9	32.8	22.9	22.9	12.1	12.1
Actuated g/C Ratio	0.16	0.58	0.41	0.41	0.22	0.22
v/c Ratio	0.50	0.54	0.79	0.26	0.51	0.33
Control Delay	34.4	8.8	25.6	3.4	27.8	6.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	34.4	8.8	25.6	3.4	27.8	6.9
LOS	C	A	C	A	C	A
Approach Delay		13.7	20.1		18.8	
Approach LOS		B	C		B	
Queue Length 50th (ft)	48	96	180	0	66	0
Queue Length 95th (ft)	#124	197	#372	34	128	40
Internal Link Dist (ft)		420	5420		420	
Turn Bay Length (ft)	200			400		

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Base Capacity (vph)	312	1387	1025	945	591	623
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.44	0.42	0.56	0.20	0.32	0.23

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 56.1
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.79
Intersection Signal Delay: 17.3 — Intersection LOS: B
Intersection Capacity Utilization 57.3% — ICU Level of Service B
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Kamehameha Hwy & Kuilima Dr



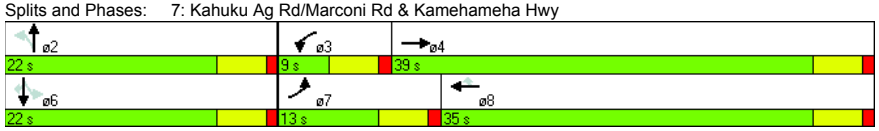
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	125	569	18	18	579	103	16	0	16	81	0	113
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	330		400	0		0	0		200
Storage Lanes	1		0	1		1	0		0	0		1
Taper Length (ft)	100			100			100			100		
Satd. Flow (prot)	1805	1812	0	1203	1812	1615	0	1152	0	0	1805	1615
Flt Permitted	0.950			0.950				0.828			0.735	
Satd. Flow (perm)	1805	1812	0	1203	1812	1569	0	977	0	0	1396	1615
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3				112		109				123
Link Speed (mph)		45			45			30			25	
Link Distance (ft)		500			1200			500			500	
Travel Time (s)		7.6			18.2			11.4			13.6	
Confl. Bikes (#/hr)						10						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	2%	50%	50%	4%	0%	50%	2%	50%	0%	2%	0%
Bus Blockages (#/hr)	0	2	0	0	2	0	0	0	0	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	136	638	0	20	629	112	0	34	0	0	88	123
Turn Type	Prot	NA		Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases						8	2			6		6
Detector Phase	7	4		3	8	8	2	2		6	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.0	21.0		9.0	21.0	21.0	21.0	21.0		21.0	21.0	21.0
Total Split (s)	13.0	39.0		9.0	35.0	35.0	22.0	22.0		22.0	22.0	22.0
Total Split (%)	18.6%	55.7%		12.9%	50.0%	50.0%	31.4%	31.4%		31.4%	31.4%	31.4%
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0		5.0			5.0	5.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?												
Recall Mode	None	None		None	None	None	Min	Min		Min	Min	Min
Act Effct Green (s)	8.2	31.4		4.5	23.5	23.5		9.4			9.4	9.4
Actuated g/C Ratio	0.15	0.59		0.08	0.44	0.44		0.18			0.18	0.18
v/c Ratio	0.49	0.60		0.20	0.79	0.15		0.13			0.36	0.32
Control Delay	33.4	10.4		33.8	22.7	3.1		1.0			27.3	7.9
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Delay	33.4	10.4		33.8	22.7	3.1		1.0			27.3	7.9
LOS	C	B		C	C	A		A			C	A
Approach Delay		14.4			20.1			1.0			16.0	
Approach LOS		B			C			A			B	
Queue Length 50th (ft)	45	90		7	176	0		0			28	0
Queue Length 95th (ft)	#122	293		28	#347	24		0			68	38
Internal Link Dist (ft)		420			1120			420			420	
Turn Bay Length (ft)	200			330		400						200

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	301	1278		100	1096	993		417			495	652
Starvation Cap Reductn	0	0		0	0	0		0			0	0
Spillback Cap Reductn	0	0		0	0	0		0			0	0
Storage Cap Reductn	0	0		0	0	0		0			0	0
Reduced v/c Ratio	0.45	0.50		0.20	0.57	0.11		0.08			0.18	0.19

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 53.3
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.79
Intersection Signal Delay: 16.8 Intersection LOS: B
Intersection Capacity Utilization 58.4% ICU Level of Service B
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Kahuku Ag Rd/Marconi Rd & Kamehameha Hwy



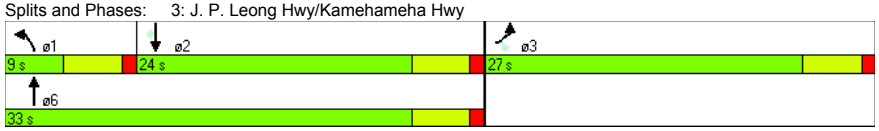
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	440	41	76	567	459	523
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	0			450
Storage Lanes	1	1	1			1
Taper Length (ft)	100		100			
Satd. Flow (prot)	1787	1615	1805	1845	1881	1583
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1787	1615	1805	1845	1881	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		127				588
Link Speed (mph)	30			30	30	
Link Distance (ft)	220			382	754	
Travel Time (s)	5.0			8.7	17.1	
Peak Hour Factor	0.84	0.68	1.00	1.00	0.97	0.89
Heavy Vehicles (%)	1%	0%	0%	3%	1%	2%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	524	60	76	567	473	588
Turn Type	NA	Perm	Prot	NA	NA	Perm
Protected Phases	3		1	6	2	
Permitted Phases		3				2
Detector Phase	3	3	1	6	2	2
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.0	21.0	9.0	9.0	21.0	21.0
Total Split (s)	27.0	27.0	9.0	33.0	24.0	24.0
Total Split (%)	45.0%	45.0%	15.0%	55.0%	40.0%	40.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Max	Max
Act Effct Green (s)	19.4	19.4	4.1	26.2	19.4	19.4
Actuated g/C Ratio	0.35	0.35	0.07	0.47	0.35	0.35
v/c Ratio	0.84	0.09	0.58	0.66	0.72	0.63
Control Delay	31.9	0.7	48.2	16.3	26.5	5.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	31.9	0.7	48.2	16.3	26.5	5.3
LOS	C	A	D	B	C	A
Approach Delay	28.7			20.1	14.7	
Approach LOS	C			C	B	
Queue Length 50th (ft)	165	0	28	148	154	0
Queue Length 95th (ft)	#278	0	#84	246	#294	59
Internal Link Dist (ft)	140			302	674	
Turn Bay Length (ft)						450
Base Capacity (vph)	718	725	132	944	653	933
Starvation Cap Reductn	0	0	0	0	0	0

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.73	0.08	0.58	0.60	0.72	0.63

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 55.8
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.84
Intersection Signal Delay: 19.8 — Intersection LOS: B
Intersection Capacity Utilization 65.2% — ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: J. P. Leong Hwy/Kamehameha Hwy



Intersection

Intersection Delay (sec/veh): 19

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Volume (vph)	56	250	718	92	82	748
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
Right Turn Channelized	Yield	Yield	Yield	Yield	None	None
Storage Length	0	0		200	0	
Median Width	12		0			0
Grade (%)	0%		0%			0%
Peak Hour Factor	1.00	1.00	0.92	0.79	0.76	0.92
Heavy Vehicles(%)	7	2	2	6	4	3
Movement Flow Rate	56	250	780	116	108	813
Number of Lanes	1	0	1	1	0	1

Major/Minor			Major 1			Major 2
Conflicting Flow Rate - All	1867	448	0	0	896	0
Stage 1	838	-	-	-	-	-
Stage 2	1029	-	-	-	-	-
Follow-up Headway	3.563	3.318	-	-	2.236	-
Pot Capacity-1 Maneuver	77	611	-	-	749	-
Stage 1	416	-	-	-	-	-
Stage 2	337	-	-	-	-	-
Time blocked-Platoon(%)	0	0	-	-	0	-
Mov Capacity-1 Maneuver	57	611	-	-	749	-
Mov Capacity-2 Maneuver	57	-	-	-	-	-
Stage 1	416	-	-	-	-	-
Stage 2	248	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay (s)	128.3	0	1.2
HCM LOS	F	A	A

Lane	NBT	NBR	WBLn1	SBL	SBT
Capacity (vph)			275		
HCM Control Delay (s)	-	-	128.3	10.614	-
HCM Lane VC Ratio	-	-	1.113	0.144	-
HCM Lane LOS	-	-	F	B	-
HCM 95th Percentile Queue (veh)	-	-	12.823	0.502	-

HCS+: Two-Lane Highways Release 5.4

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/3/11
Analysis Time Period	AM Peak Hour W/Resort Res Alt
Highway	Kamehameha Highway
From/To	West of Kaihalulu Drive
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.92	
Lane width	12.0	ft	% Trucks and buses	8	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	50	%
Grade: Length		mi	Access points/mi	2	/mi
Up/down		%			

Two-way hourly volume, V 979 veh/h
Directional split 50 / 50 %

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.2	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.984	
Two-way flow rate,(note-1) vp	1081	pc/h
Highest directional split proportion (note-2)	541	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	0.5	mi/h
Free-flow speed, FFS	44.5	mi/h

Adjustment for no-passing zones, fnp	1.6	mi/h
Average travel speed, ATS	34.5	mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	0.992	
Two-way flow rate,(note-1) vp	1073	pc/h
Highest directional split proportion (note-2)	537	
Base percent time-spent-following, BPTSF	61.1	%
Adj.for directional distribution and no-passing zones, fd/np	10.0	
Percent time-spent-following, PTSF	71.0	%

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.34	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS+: Two-Lane Highways Release 5.4

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/1/2011
Analysis Time Period	AM Peak Hour W/Resort Alt.
Highway	Kamehameha Highway
From/To	Haleiwa to Kawailoa
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.95	
Lane width	12.0	ft	% Trucks and buses	5	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	80	%
Grade: Length		mi	Access points/mi	2	/mi
Up/down		%			

Two-way hourly volume, V	1306	veh/h
Directional split	51 / 49	%

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.995	
Two-way flow rate,(note-1) vp	1382	pc/h
Highest directional split proportion (note-2)	705	pc/h
Free-Flow Speed from Field Measurement:		
Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	0.5	mi/h
Free-flow speed, FFS	44.5	mi/h
Adjustment for no-passing zones, fnp	1.4	mi/h

Average travel speed, ATS	32.3	mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	1375	pc/h
Highest directional split proportion (note-2)	701	
Base percent time-spent-following, BPTSF	70.1	%
Adj.for directional distribution and no-passing zones, fd/np	7.6	
Percent time-spent-following, PTSF	77.8	%

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.43	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS+: Two-Lane Highways Release 5.4

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/1/2011
Analysis Time Period	AM Peak Hour W/Resort Res Alt
Highway	Kamehameha Highway
From/To	Hygienic Store
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.89	
Lane width	12.0	ft	% Trucks and buses	3	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	80	%
Grade: Length		mi	Access points/mi	10	/mi
Up/down		%			

Two-way hourly volume, V 1569 veh/h
Directional split 65 / 35 %

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.997	
Two-way flow rate,(note-1) vp	1768	pc/h
Highest directional split proportion (note-2)	1149	pc/h
Free-Flow Speed from Field Measurement:		
Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	2.5	mi/h
Free-flow speed, FFS	42.5	mi/h
Adjustment for no-passing zones, fnp	1.1	mi/h

Average travel speed, ATS 27.6 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	1763	pc/h
Highest directional split proportion (note-2)	1146	
Base percent time-spent-following, BPTSF	78.8	%
Adj.for directional distribution and no-passing zones, fd/np	5.5	
Percent time-spent-following, PTSF	84.2	%

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.55	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS+: Two-Lane Highways Release 5.4

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/3/11
Analysis Time Period	PM Peak Hour W/Resort Res Alt
Highway	Kamehameha Highway
From/To	West of Kaihalulu Drive
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.92	
Lane width	12.0	ft	% Trucks and buses	4	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	50	%
Grade: Length		mi	Access points/mi	2	/mi
Up/down		%			

Two-way hourly volume, V	1166	veh/h
Directional split	51 / 49	%

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.996	
Two-way flow rate,(note-1) vp	1272	pc/h
Highest directional split proportion (note-2)	649	pc/h
Free-Flow Speed from Field Measurement:		
Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	0.5	mi/h
Free-flow speed, FFS	44.5	mi/h
Adjustment for no-passing zones, fnp	1.3	mi/h

Average travel speed, ATS	33.4	mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	1267	pc/h
Highest directional split proportion (note-2)	646	
Base percent time-spent-following, BPTSF	67.2	%
Adj.for directional distribution and no-passing zones, fd/np	7.7	
Percent time-spent-following, PTSF	74.8	%

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.40	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS+: Two-Lane Highways Release 5.4

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/1/2011
Analysis Time Period	PM Peak Hour W/Resort Alt
Highway	Kamehameha Highway
From/To	Haleiwa to Kawailoa
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.94	
Lane width	12.0	ft	% Trucks and buses	2	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	80	%
Grade: Length		mi	Access points/mi	2	/mi
Up/down		%			

Two-way hourly volume, V	1722	veh/h
Directional split	51 / 49	%

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.998	
Two-way flow rate,(note-1) vp	1836	pc/h
Highest directional split proportion (note-2)	936	pc/h
Free-Flow Speed from Field Measurement:		
Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	0.5	mi/h
Free-flow speed, FFS	44.5	mi/h
Adjustment for no-passing zones, fnp	1.1	mi/h

Average travel speed, ATS	29.2	mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	1832	pc/h
Highest directional split proportion (note-2)	934	
Base percent time-spent-following, BPTSF	80.0	%
Adj.for directional distribution and no-passing zones, fd/np	5.0	
Percent time-spent-following, PTSF	85.0	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.57	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS+: Two-Lane Highways Release 5.4

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/1/2011
Analysis Time Period	PM Peak Hour W/Resort Res Alt
Highway	Kamehameha Highway
From/To	Hygienic Store
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.99	
Lane width	12.0	ft	% Trucks and buses	5	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	80	%
Grade: Length		mi	Access points/mi	10	/mi
Up/down		%			

Two-way hourly volume, V 2005 veh/h
Directional split 57 / 43 %

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.995	
Two-way flow rate,(note-1) vp	2035	pc/h
Highest directional split proportion (note-2)	1160	pc/h
Free-Flow Speed from Field Measurement:		
Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	2.5	mi/h
Free-flow speed, FFS	42.5	mi/h
Adjustment for no-passing zones, fnp	1.0	mi/h

Average travel speed, ATS 25.7 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	2025	pc/h
Highest directional split proportion (note-2)	1154	
Base percent time-spent-following, BPTSF	83.1	%
Adj.for directional distribution and no-passing zones, fd/np	4.0	
Percent time-spent-following, PTSF	87.1	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.64	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS+: Two-Lane Highways Release 5.4

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/5/11
Analysis Time Period	Sat Peak Hr W/Resort Res Alt
Highway	Kamehameha Highway
From/To	West of Kaihalulu Drive
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.92	
Lane width	12.0	ft	% Trucks and buses	3	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	50	%
Grade: Length		mi	Access points/mi	2	/mi
Up/down		%			

Two-way hourly volume, V 1591 veh/h
Directional split 52 / 48 %

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.997	
Two-way flow rate,(note-1) vp	1735	pc/h
Highest directional split proportion (note-2)	902	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	0.5	mi/h
Free-flow speed, FFS	44.5	mi/h
Adjustment for no-passing zones, fnp	0.9	mi/h

Average travel speed, ATS 30.2 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	1729	pc/h
Highest directional split proportion (note-2)	899	
Base percent time-spent-following, BPTSF	78.1	%
Adj.for directional distribution and no-passing zones, fd/np	4.6	
Percent time-spent-following, PTSF	82.7	%

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.54	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS+: Two-Lane Highways Release 5.4

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	10/29/2011
Analysis Time Period	Sat. Peak Hr W/Resort Alt
Highway	Kamehameha Highway
From/To	Haleiwa to Kawailoa
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.93	
Lane width	12.0	ft	% Trucks and buses	2	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	80	%
Grade: Length		mi	Access points/mi	2	/mi
Up/down		%			

Two-way hourly volume, V	1990		veh/h
Directional split	50	/ 50	%

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.998	
Two-way flow rate,(note-1) vp	2144	pc/h
Highest directional split proportion (note-2)	1072	pc/h
Free-Flow Speed from Field Measurement:		
Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	0.5	mi/h
Free-flow speed, FFS	44.5	mi/h
Adjustment for no-passing zones, fnp	0.9	mi/h

Average travel speed, ATS	26.9	mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	2140	pc/h
Highest directional split proportion (note-2)	1070	
Base percent time-spent-following, BPTSF	84.8	%
Adj.for directional distribution and no-passing zones, fd/np	3.7	
Percent time-spent-following, PTSF	88.4	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.67	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS+: Two-Lane Highways Release 5.4

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	10/29/2011
Analysis Time Period	Sat Peak Hr W/Resort Res Alt
Highway	Kamehameha Highway
From/To	Hygienic Store
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.94	
Lane width	12.0	ft	% Trucks and buses	3	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	80	%
Grade: Length		mi	Access points/mi	10	/mi
Up/down		%			

Two-way hourly volume, V 2056 veh/h
Directional split 54 / 46 %

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.997	
Two-way flow rate,(note-1) vp	2194	pc/h
Highest directional split proportion (note-2)	1185	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	2.5	mi/h
Free-flow speed, FFS	42.5	mi/h
Adjustment for no-passing zones, fnp	0.9	mi/h

Average travel speed, ATS 24.6 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	2187	pc/h
Highest directional split proportion (note-2)	1181	
Base percent time-spent-following, BPTSF	85.4	%
Adj.for directional distribution and no-passing zones, fd/np	3.5	
Percent time-spent-following, PTSF	88.9	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.69	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

TRAFFIC IMPACT ANALYSIS REPORT

FOR THE PROPOSED

TURTLE BAY RESORT MASTER PLAN

KAHUKU, OAHU, HAWAII

APPENDIX F

CAPACITY ANALYSIS WORKSHEETS

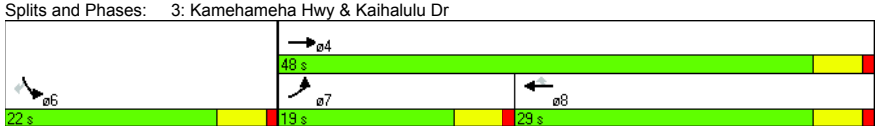
2025 TRAFFIC CONDITIONS WITH CONSERVATION PARTNER ALTERNATIVE

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	182	362	371	68	73	173
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300			400	0	200
Storage Lanes	1			1	1	1
Taper Length (ft)	100				100	
Satd. Flow (prot)	1736	1681	1792	1509	1703	1509
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1736	1681	1792	1509	1703	1509
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				109		188
Link Speed (mph)		45	45		30	
Link Distance (ft)		500	3000		500	
Travel Time (s)		7.6	45.5		11.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	4%	13%	6%	7%	6%	7%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	198	393	403	74	79	188
Turn Type	Prot	NA	NA	Perm	NA	Perm
Protected Phases	7	4	8		6	
Permitted Phases				8		6
Detector Phase	7	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	19.0	48.0	29.0	29.0	22.0	22.0
Total Split (%)	27.1%	68.6%	41.4%	41.4%	31.4%	31.4%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Max	Max
Act Effct Green (s)	11.4	35.0	18.5	18.5	17.3	17.3
Actuated g/C Ratio	0.18	0.56	0.30	0.30	0.28	0.28
v/c Ratio	0.62	0.42	0.76	0.14	0.17	0.34
Control Delay	33.9	9.0	30.2	2.4	21.1	5.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.9	9.0	30.2	2.4	21.1	5.9
LOS	C	A	C	A	C	A
Approach Delay		17.3	25.9		10.4	
Approach LOS		B	C		B	
Queue Length 50th (ft)	70	75	139	0	23	0
Queue Length 95th (ft)	140	124	236	14	60	45
Internal Link Dist (ft)		420	2920		420	
Turn Bay Length (ft)	300			400		200
Base Capacity (vph)	395	1175	699	655	471	553
Starvation Cap Reductn	0	0	0	0	0	0

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.50	0.33	0.58	0.11	0.17	0.34

Intersection Summary	
Area Type: Other	
Cycle Length: 70	
Actuated Cycle Length: 62.4	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.76	
Intersection Signal Delay: 19.0	Intersection LOS: B
Intersection Capacity Utilization 46.2%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 3: Kamehameha Hwy & Kaihalulu Dr

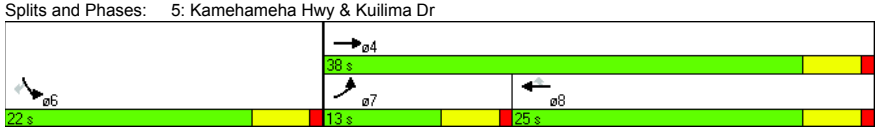


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	100	335	339	128	156	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200			400	0	0
Storage Lanes	1			1	1	1
Taper Length (ft)	100				100	
Satd. Flow (prot)	1736	1681	1792	1509	1703	1509
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1734	1681	1792	1478	1680	1490
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				139		127
Link Speed (mph)		45	45		25	
Link Distance (ft)		500	5500		500	
Travel Time (s)		7.6	83.3		13.6	
Confl. Peds. (#/hr)	1			1	7	
Confl. Bikes (#/hr)				12		1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	4%	13%	6%	7%	6%	7%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	109	364	368	139	170	109
Turn Type	Prot	NA	NA	Perm	NA	Perm
Protected Phases	7	4	8		6	
Permitted Phases				8		6
Detector Phase	7	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	21.0	21.0	21.0	21.0	21.0
Total Split (s)	13.0	38.0	25.0	25.0	22.0	22.0
Total Split (%)	21.7%	63.3%	41.7%	41.7%	36.7%	36.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Min	Min
Act Effct Green (s)	7.7	23.7	14.4	14.4	10.4	10.4
Actuated g/C Ratio	0.17	0.53	0.32	0.32	0.23	0.23
v/c Ratio	0.37	0.41	0.64	0.25	0.43	0.25
Control Delay	24.7	7.8	20.5	4.4	21.1	4.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.7	7.8	20.5	4.4	21.1	4.9
LOS	C	A	C	A	C	A
Approach Delay		11.7	16.1		14.8	
Approach LOS		B	B		B	
Queue Length 50th (ft)	27	46	87	0	42	0
Queue Length 95th (ft)	77	109	179	30	95	25
Internal Link Dist (ft)		420	5420		420	
Turn Bay Length (ft)	200			400		

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Base Capacity (vph)	340	1229	879	795	710	695
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.32	0.30	0.42	0.17	0.24	0.16

Intersection Summary	
Area Type:	Other
Cycle Length: 60	
Actuated Cycle Length: 45.1	
Natural Cycle: 55	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.64	
Intersection Signal Delay: 14.1	Intersection LOS: B
Intersection Capacity Utilization 44.5%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 5: Kamehameha Hwy & Kuilima Dr

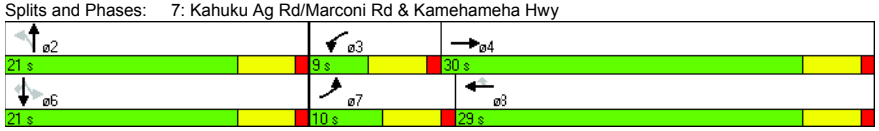


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	48	426	17	19	407	41	24	0	18	33	0	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	330		400	0		0	0		200
Storage Lanes	1		0	1		1	0		0	0		1
Taper Length (ft)	100			100			100			100		
Satd. Flow (prot)	1805	1805	0	1203	1812	1615	0	1160	0	0	1805	1615
Flt Permitted	0.950			0.950				0.805			0.727	
Satd. Flow (perm)	1805	1805	0	1203	1812	1568	0	960	0	0	1381	1615
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4				127		127				127
Link Speed (mph)		45			45			30			25	
Link Distance (ft)		500			1200			500			500	
Travel Time (s)		7.6			18.2			11.4			13.6	
Confl. Bikes (#/hr)						10						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	2%	50%	50%	4%	0%	50%	2%	50%	0%	2%	0%
Bus Blockages (#/hr)	0	2	0	0	2	0	0	0	0	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	52	481	0	21	442	45	0	46	0	0	36	39
Turn Type	Prot	NA		Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases						8	2			6		6
Detector Phase	7	4		3	8	8	2	2		6	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.0	21.0		9.0	21.0	21.0	21.0	21.0		21.0	21.0	21.0
Total Split (s)	10.0	30.0		9.0	29.0	29.0	21.0	21.0		21.0	21.0	21.0
Total Split (%)	16.7%	50.0%		15.0%	48.3%	48.3%	35.0%	35.0%		35.0%	35.0%	35.0%
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0		5.0			5.0	5.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?												
Recall Mode	None	None		None	None	None	Min	Min		Min	Min	Min
Act Effct Green (s)	5.5	16.6		4.4	14.9	14.9		7.1			7.1	7.1
Actuated g/C Ratio	0.15	0.46		0.12	0.42	0.42		0.20			0.20	0.20
v/c Ratio	0.19	0.57		0.14	0.59	0.06		0.16			0.13	0.09
Control Delay	20.4	10.3		22.7	12.6	0.2		1.2			17.7	0.4
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Delay	20.4	10.3		22.7	12.6	0.2		1.2			17.7	0.4
LOS	C	B		C	B	A		A			B	A
Approach Delay		11.3			12.0			1.2			8.7	
Approach LOS		B			B			A			A	
Queue Length 50th (ft)	8	48		3	43	0		0			5	0
Queue Length 95th (ft)	42	173		24	163	0		0			30	0
Internal Link Dist (ft)		420			1120			420			420	
Turn Bay Length (ft)	200			330		400						200

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	275	1386		146	1328	1183		533			674	854
Starvation Cap Reductn	0	0		0	0	0		0			0	0
Spillback Cap Reductn	0	0		0	0	0		0			0	0
Storage Cap Reductn	0	0		0	0	0		0			0	0
Reduced v/c Ratio	0.19	0.35		0.14	0.33	0.04		0.09			0.05	0.05

Intersection Summary	
Area Type:	Other
Cycle Length: 60	
Actuated Cycle Length: 35.9	
Natural Cycle: 55	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.59	
Intersection Signal Delay: 11.0	Intersection LOS: B
Intersection Capacity Utilization 48.4%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 7: Kahuku Ag Rd/Marconi Rd & Kamehameha Hwy

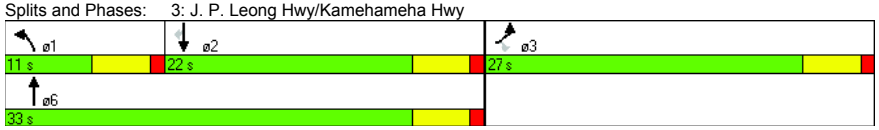


Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	330	27	44	347	300	401
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	0			450
Storage Lanes	1	1	1			1
Taper Length (ft)	100		100			
Satd. Flow (prot)	1719	1615	1805	1792	1845	1568
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1719	1615	1805	1792	1845	1568
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		127				427
Link Speed (mph)	30			30	30	
Link Distance (ft)	220			382	754	
Travel Time (s)	5.0			8.7	17.1	
Peak Hour Factor	0.88	1.00	0.61	0.96	1.00	0.94
Heavy Vehicles (%)	5%	0%	0%	6%	3%	3%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	375	27	72	361	300	427
Turn Type	NA	Perm	Prot	NA	NA	Perm
Protected Phases	3		1	6	2	
Permitted Phases		3				2
Detector Phase	3	3	1	6	2	2
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.0	21.0	9.0	9.0	21.0	21.0
Total Split (s)	27.0	27.0	11.0	33.0	22.0	22.0
Total Split (%)	45.0%	45.0%	18.3%	55.0%	36.7%	36.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Max	Max
Act Effct Green (s)	15.6	15.6	6.1	24.1	18.4	18.4
Actuated g/C Ratio	0.31	0.31	0.12	0.48	0.37	0.37
v/c Ratio	0.70	0.05	0.33	0.42	0.44	0.51
Control Delay	23.5	0.1	28.2	11.1	18.0	4.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.5	0.1	28.2	11.1	18.0	4.7
LOS	C	A	C	B	B	A
Approach Delay	22.0			13.9	10.2	
Approach LOS	C			B	B	
Queue Length 50th (ft)	107	0	22	65	79	0
Queue Length 95th (ft)	178	0	39	141	162	57
Internal Link Dist (ft)	140			302	674	
Turn Bay Length (ft)						450
Base Capacity (vph)	783	804	224	1038	677	845
Starvation Cap Reductn	0	0	0	0	0	0

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.48	0.03	0.32	0.35	0.44	0.51

Intersection Summary	
Area Type:	Other
Cycle Length: 60	
Actuated Cycle Length: 50.1	
Natural Cycle: 55	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.70	
Intersection Signal Delay: 14.3	Intersection LOS: B
Intersection Capacity Utilization 49.9%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 3: J. P. Leong Hwy/Kamehameha Hwy



Intersection	
Intersection Delay (sec/veh):	$ 506.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Volume (vph)	42	102	386	152	508	455
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
Right Turn Channelized	Yield	Yield	Yield	Yield	None	None
Storage Length	0	0		200	0	
Median Width	12		0			0
Grade (%)	0%		0%			0%
Peak Hour Factor	0.75	0.85	0.97	0.83	0.77	1.00
Heavy Vehicles(%)	6	7	5	4	2	3
Movement Flow Rate	56	120	398	183	660	455
Number of Lanes	1	0	1	1	0	1

Major/Minor			Major 1		Major 2	
Conflicting Flow Rate - All	2265	291	0	0	581	0
Stage 1	490	-	-	-	-	-
Stage 2	1775	-	-	-	-	-
Follow-up Headway	3.554	3.363	-	-	2.218	-
Pot Capacity-1 Maneuver	# 44	736	-	-	993	-
Stage 1	608	-	-	-	-	-
Stage 2	145	-	-	-	-	-
Time blocked-Platoon(%)	0	0	-	-	0	-
Mov Capacity-1 Maneuver	# 5	736	-	-	993	-
Mov Capacity-2 Maneuver	# 5	-	-	-	-	-
Stage 1	608	-	-	-	-	-
Stage 2	# 16	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay (s)	$ 5324.5	0	9.2
HCM LOS	F	A	A

Lane	NBT	NBR	WBLn1	SBL	SBT
Capacity (vph)			15		
HCM Control Delay (s)	-	-	$ 5324.5	15.49	-
HCM Lane VC Ratio	-	-	11.733	0.664	-
HCM Lane LOS	-	-	F	C	-
HCM 95th Percentile Queue (veh)	-	-	22.995	5.272	-

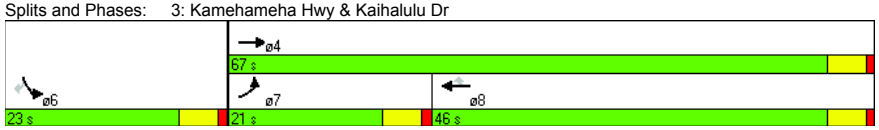
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	163	464	515	51	45	158
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300			400	0	200
Storage Lanes	1			1	1	1
Taper Length (ft)	100				100	
Satd. Flow (prot)	1770	1845	1810	1495	1736	1509
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1770	1845	1810	1495	1736	1509
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				85		172
Link Speed (mph)		45	45		30	
Link Distance (ft)		500	3000		500	
Travel Time (s)		7.6	45.5		11.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	3%	5%	8%	4%	7%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	177	504	560	55	49	172
Turn Type	Prot	NA	NA	Perm	NA	Perm
Protected Phases	7	4	8		6	
Permitted Phases				8		6
Detector Phase	7	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	21.0	67.0	46.0	46.0	23.0	23.0
Total Split (%)	23.3%	74.4%	51.1%	51.1%	25.6%	25.6%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Max	Max
Act Effct Green (s)	12.2	45.4	28.0	28.0	18.5	18.5
Actuated g/C Ratio	0.16	0.61	0.38	0.38	0.25	0.25
v/c Ratio	0.61	0.45	0.82	0.09	0.11	0.34
Control Delay	40.1	8.5	31.4	1.8	27.1	7.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	40.1	8.5	31.4	1.8	27.1	7.3
LOS	D	A	C	A	C	A
Approach Delay		16.7	28.8		11.7	
Approach LOS		B	C		B	
Queue Length 50th (ft)	76	106	224	0	18	0
Queue Length 95th (ft)	160	158	361	10	54	52
Internal Link Dist (ft)		420	2920		420	
Turn Bay Length (ft)	300			400		200
Base Capacity (vph)	392	1554	1027	885	432	505
Starvation Cap Reductn	0	0	0	0	0	0

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.45	0.32	0.55	0.06	0.11	0.34

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 74.1
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.82
Intersection Signal Delay: 20.9 — Intersection LOS: C
Intersection Capacity Utilization 52.0% — ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 3: Kamehameha Hwy & Kaihalulu Dr



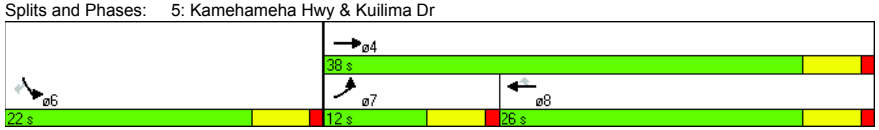
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	120	389	453	191	148	113
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200			400	0	0
Storage Lanes	1			1	1	1
Taper Length (ft)	100				100	
Satd. Flow (prot)	1741	1815	1781	1471	1715	1503
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1741	1815	1781	1443	1705	1482
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				208		127
Link Speed (mph)		45	45		25	
Link Distance (ft)		500	5500		500	
Travel Time (s)		7.6	83.3		13.6	
Confl. Peds. (#/hr)					3	1
Confl. Bikes (#/hr)				12		1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	3%	5%	8%	4%	7%
Bus Blockages (#/hr)	4	4	4	4	3	1
Shared Lane Traffic (%)						
Lane Group Flow (vph)	130	423	492	208	161	123
Turn Type	Prot	NA	NA	Perm	NA	Perm
Protected Phases	7	4	8		6	
Permitted Phases				8		6
Detector Phase	7	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	21.0	21.0	21.0	21.0	21.0
Total Split (s)	12.0	38.0	26.0	26.0	22.0	22.0
Total Split (%)	20.0%	63.3%	43.3%	43.3%	36.7%	36.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Min	Min
Act Effct Green (s)	7.3	26.3	17.7	17.7	10.2	10.2
Actuated g/C Ratio	0.15	0.55	0.37	0.37	0.21	0.21
v/c Ratio	0.49	0.42	0.74	0.31	0.44	0.29
Control Delay	31.1	7.4	23.1	3.8	22.5	6.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	31.1	7.4	23.1	3.8	22.5	6.2
LOS	C	A	C	A	C	A
Approach Delay		13.0	17.4		15.4	
Approach LOS		B	B		B	
Queue Length 50th (ft)	39	55	124	0	45	0
Queue Length 95th (ft)	#108	122	#281	35	91	32
Internal Link Dist (ft)		420	5420		420	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Turn Bay Length (ft)	200			400		
Base Capacity (vph)	280	1273	860	804	670	656
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.46	0.33	0.57	0.26	0.24	0.19

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 47.5
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.74
Intersection Signal Delay: 15.4 — Intersection LOS: B
Intersection Capacity Utilization 51.4% — ICU Level of Service A
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Kamehameha Hwy & Kuilima Dr



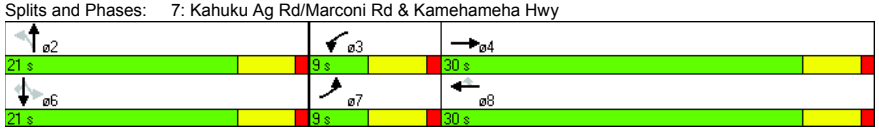
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	473	24	28	565	35	24	0	20	47	0	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	330		400	0		0	0		200
Storage Lanes	1		0	1		1	0		0	0		1
Taper Length (ft)	100			100			100			100		
Satd. Flow (prot)	1805	1794	0	1203	1812	1615	0	1157	0	0	1805	1615
Flt Permitted	0.950			0.950				0.803			0.726	
Satd. Flow (perm)	1805	1794	0	1203	1812	1568	0	954	0	0	1379	1615
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5				127		127				127
Link Speed (mph)		45			45			30			25	
Link Distance (ft)		500			1200			500			500	
Travel Time (s)		7.6			18.2			11.4			13.6	
Confl. Bikes (#/hr)						10						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	2%	50%	50%	4%	0%	50%	2%	50%	0%	2%	0%
Bus Blockages (#/hr)	0	2	0	0	2	0	0	0	0	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	43	540	0	30	614	38	0	48	0	0	51	60
Turn Type	Prot	NA		Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases						8	2			6		6
Detector Phase	7	4		3	8	8	2	2		6	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.0	21.0		9.0	21.0	21.0	21.0	21.0		21.0	21.0	21.0
Total Split (s)	9.0	30.0		9.0	30.0	30.0	21.0	21.0		21.0	21.0	21.0
Total Split (%)	15.0%	50.0%		15.0%	50.0%	50.0%	35.0%	35.0%		35.0%	35.0%	35.0%
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0		5.0			5.0	5.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?												
Recall Mode	None	None		None	None	None	Min	Min		Min	Min	Min
Act Effct Green (s)	4.3	18.3		4.3	18.3	18.3		7.5			7.5	7.5
Actuated g/C Ratio	0.11	0.47		0.11	0.47	0.47		0.19			0.19	0.19
v/c Ratio	0.22	0.65		0.23	0.73	0.05		0.17			0.19	0.15
Control Delay	24.1	13.1		26.1	15.9	0.1		1.3			19.2	1.5
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Delay	24.1	13.1		26.1	15.9	0.1		1.3			19.2	1.5
LOS	C	B		C	B	A		A			B	A
Approach Delay		13.9			15.4			1.3			9.7	
Approach LOS		B			B			A			A	
Queue Length 50th (ft)	7	58		5	71	0		0			8	0
Queue Length 95th (ft)	39	212		#34	#265	0		0			39	6
Internal Link Dist (ft)		420			1120			420			420	
Turn Bay Length (ft)	200			330		400						200

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	199	1300		133	1312	1170		492			609	784
Starvation Cap Reductn	0	0		0	0	0		0			0	0
Spillback Cap Reductn	0	0		0	0	0		0			0	0
Storage Cap Reductn	0	0		0	0	0		0			0	0
Reduced v/c Ratio	0.22	0.42		0.23	0.47	0.03		0.10			0.08	0.08

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 39.3
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.73
Intersection Signal Delay: 13.9 — Intersection LOS: B
Intersection Capacity Utilization 50.8% — ICU Level of Service A
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Kahuku Ag Rd/Marconi Rd & Kamehameha Hwy



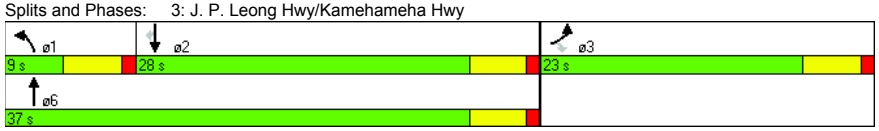
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	410	18	43	494	451	487
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	0			450
Storage Lanes	1	1	1			1
Taper Length (ft)	100		100			
Satd. Flow (prot)	1787	1615	1805	1900	1810	1583
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1787	1615	1805	1900	1810	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		127				497
Link Speed (mph)	30			30	30	
Link Distance (ft)	220			382	754	
Travel Time (s)	5.0			8.7	17.1	
Peak Hour Factor	0.98	1.00	1.00	1.00	0.86	0.98
Heavy Vehicles (%)	1%	0%	0%	0%	5%	2%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	418	18	43	494	524	497
Turn Type	NA	Perm	Prot	NA	NA	Perm
Protected Phases	3		1	6	2	
Permitted Phases		3				2
Detector Phase	3	3	1	6	2	2
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.0	21.0	9.0	9.0	21.0	21.0
Total Split (s)	23.0	23.0	9.0	37.0	28.0	28.0
Total Split (%)	38.3%	38.3%	15.0%	61.7%	46.7%	46.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Max	Max
Act Effct Green (s)	15.8	15.8	4.1	26.7	23.6	23.6
Actuated g/C Ratio	0.30	0.30	0.08	0.51	0.45	0.45
v/c Ratio	0.78	0.03	0.31	0.51	0.65	0.51
Control Delay	30.2	0.1	31.8	11.2	18.5	3.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.2	0.1	31.8	11.2	18.5	3.6
LOS	C	A	C	B	B	A
Approach Delay	28.9			12.8	11.3	
Approach LOS	C			B	B	
Queue Length 50th (ft)	102	0	12	98	109	0
Queue Length 95th (ft)	#267	0	42	169	#252	51
Internal Link Dist (ft)	140			302	674	
Turn Bay Length (ft)						450
Base Capacity (vph)	620	643	139	1172	810	983
Starvation Cap Reductn	0	0	0	0	0	0

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.67	0.03	0.31	0.42	0.65	0.51

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 52.6
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.78
Intersection Signal Delay: 15.5 — Intersection LOS: B
Intersection Capacity Utilization 62.3% — ICU Level of Service B
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: J. P. Leong Hwy/Kamehameha Hwy



Intersection	
Intersection Delay (sec/veh):	13.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Volume (vph)	61	295	780	77	93	709
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
Right Turn Channelized	Yield	Yield	Yield	Yield	None	None
Storage Length	0	0		200	0	
Median Width	12		0			0
Grade (%)	0%		0%			0%
Peak Hour Factor	0.95	0.98	0.96	0.84	1.00	1.00
Heavy Vehicles(%)	6	5	3	5	3	2
Movement Flow Rate	64	301	813	92	93	709
Number of Lanes	1	0	1	1	0	1

Major/Minor			Major 1			Major 2
Conflicting Flow Rate - All	1754	453	0	0	905	0
Stage 1	859	-	-	-	-	-
Stage 2	895	-	-	-	-	-
Follow-up Headway	3.554	3.345	-	-	2.227	-
Pot Capacity-1 Maneuver	92	601	-	-	747	-
Stage 1	408	-	-	-	-	-
Stage 2	393	-	-	-	-	-
Time blocked-Platoon(%)	0	0	-	-	0	-
Mov Capacity-1 Maneuver	73	601	-	-	747	-
Mov Capacity-2 Maneuver	73	-	-	-	-	-
Stage 1	408	-	-	-	-	-
Stage 2	312	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay (s)	71.7	0	1.2
HCM LOS	F	A	A

Lane	NBT	NBR	WBLn1	SBL	SBT
Capacity (vph)			378		
HCM Control Delay (s)	-	-	71.7	10.503	-
HCM Lane VC Ratio	-	-	0.966	0.124	-
HCM Lane LOS	-	-	F	B	-
HCM 95th Percentile Queue (veh)	-	-	10.932	0.424	-

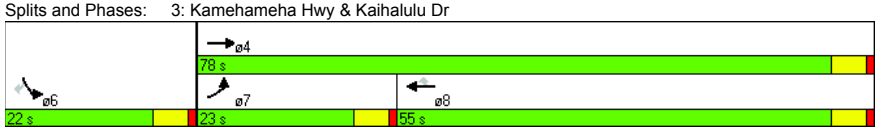
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	209	599	642	59	74	231
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300			400	0	200
Storage Lanes	1			1	1	1
Taper Length (ft)	100				100	
Satd. Flow (prot)	1752	1863	1810	1553	1752	1583
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1752	1863	1810	1553	1752	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				76		251
Link Speed (mph)		45	45		30	
Link Distance (ft)		500	3000		500	
Travel Time (s)		7.6	45.5		11.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	2%	5%	4%	3%	2%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	227	651	698	64	80	251
Turn Type	Prot	NA	NA	Perm	NA	Perm
Protected Phases	7	4	8		6	
Permitted Phases				8		6
Detector Phase	7	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	23.0	78.0	55.0	55.0	22.0	22.0
Total Split (%)	23.0%	78.0%	55.0%	55.0%	22.0%	22.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Max	Max
Act Effct Green (s)	15.2	58.2	37.9	37.9	17.4	17.4
Actuated g/C Ratio	0.18	0.68	0.44	0.44	0.20	0.20
v/c Ratio	0.73	0.52	0.88	0.09	0.23	0.48
Control Delay	50.4	8.1	34.9	2.9	35.4	8.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	50.4	8.1	34.9	2.9	35.4	8.4
LOS	D	A	C	A	D	A
Approach Delay		19.0	32.2		14.9	
Approach LOS		B	C		B	
Queue Length 50th (ft)	120	146	340	0	39	0
Queue Length 95th (ft)	#241	211	504	17	88	66
Internal Link Dist (ft)		420	2920		420	
Turn Bay Length (ft)	300			400		200
Base Capacity (vph)	376	1577	1081	958	355	521
Starvation Cap Reductn	0	0	0	0	0	0

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.60	0.41	0.65	0.07	0.23	0.48

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 85.9
Natural Cycle: 75
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.88
Intersection Signal Delay: 23.4 Intersection LOS: C
Intersection Capacity Utilization 62.0% ICU Level of Service B
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Kamehameha Hwy & Kaihalulu Dr



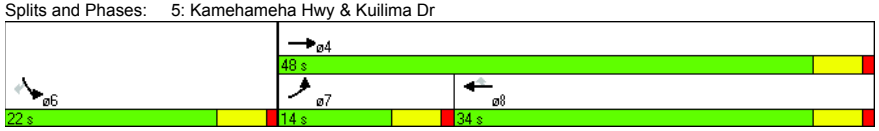
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	142	531	543	198	200	155
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200			400	0	0
Storage Lanes	1			1	1	1
Taper Length (ft)	100				100	
Satd. Flow (prot)	1738	1848	1795	1540	1738	1571
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1738	1848	1795	1512	1738	1550
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				215		168
Link Speed (mph)		45	45		25	
Link Distance (ft)		500	5500		500	
Travel Time (s)		7.6	83.3		13.6	
Confl. Bikes (#/hr)				12		1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	2%	5%	4%	3%	2%
Bus Blockages (#/hr)	2	2	2	2	2	2
Shared Lane Traffic (%)						
Lane Group Flow (vph)	154	577	590	215	217	168
Turn Type	Prot	NA	NA	Perm	NA	Perm
Protected Phases	7	4	8		6	
Permitted Phases				8		6
Detector Phase	7	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	21.0	21.0	21.0	21.0	21.0
Total Split (s)	14.0	48.0	34.0	34.0	22.0	22.0
Total Split (%)	20.0%	68.6%	48.6%	48.6%	31.4%	31.4%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Max	Max
Act Effct Green (s)	8.6	39.0	25.4	25.4	17.1	17.1
Actuated g/C Ratio	0.13	0.59	0.38	0.38	0.26	0.26
v/c Ratio	0.68	0.53	0.86	0.30	0.48	0.32
Control Delay	46.3	10.0	32.9	3.4	26.5	6.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	46.3	10.0	32.9	3.4	26.5	6.0
LOS	D	B	C	A	C	A
Approach Delay		17.7	25.1		17.6	
Approach LOS		B	C		B	
Queue Length 50th (ft)	64	122	214	0	81	0
Queue Length 95th (ft)	#145	194	#383	36	144	43
Internal Link Dist (ft)		420	5420		420	
Turn Bay Length (ft)	200			400		

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Base Capacity (vph)	238	1208	791	787	449	525
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.65	0.48	0.75	0.27	0.48	0.32

Intersection Summary	
Area Type:	Other
Cycle Length: 70	
Actuated Cycle Length: 66.2	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.86	
Intersection Signal Delay: 20.7	Intersection LOS: C
Intersection Capacity Utilization 60.0%	ICU Level of Service B
Analysis Period (min) 15	

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Kamehameha Hwy & Kuilima Dr



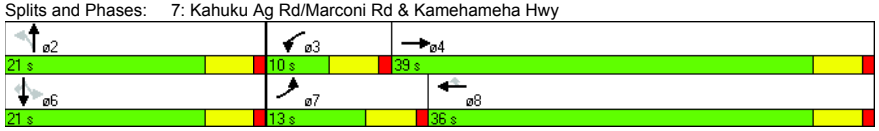
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	118	595	18	18	624	98	16	0	16	73	0	104
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	330		400	0		0	0		200
Storage Lanes	1		0	1		1	0		0	0		1
Taper Length (ft)	100			100			100			100		
Satd. Flow (prot)	1805	1815	0	1203	1812	1615	0	1152	0	0	1805	1615
Flt Permitted	0.950			0.950				0.828			0.735	
Satd. Flow (perm)	1805	1815	0	1203	1812	1569	0	977	0	0	1396	1615
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3				109		109				113
Link Speed (mph)		45			45			30			25	
Link Distance (ft)		500			1200			500			500	
Travel Time (s)		7.6			18.2			11.4			13.6	
Confl. Bikes (#/hr)						10						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	2%	50%	50%	4%	0%	50%	2%	50%	0%	2%	0%
Bus Blockages (#/hr)	0	2	0	0	2	0	0	0	0	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	128	667	0	20	678	107	0	34	0	0	79	113
Turn Type	Prot	NA		Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases						8	2			6		6
Detector Phase	7	4		3	8	8	2	2		6	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.0	21.0		9.0	21.0	21.0	21.0	21.0		21.0	21.0	21.0
Total Split (s)	13.0	39.0		10.0	36.0	36.0	21.0	21.0		21.0	21.0	21.0
Total Split (%)	18.6%	55.7%		14.3%	51.4%	51.4%	30.0%	30.0%		30.0%	30.0%	30.0%
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0		5.0			5.0	5.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?												
Recall Mode	None	None		None	None	None	Min	Min		Min	Min	Min
Act Effct Green (s)	8.1	32.8		5.5	25.1	25.1		9.1			9.1	9.1
Actuated g/C Ratio	0.15	0.60		0.10	0.46	0.46		0.17			0.17	0.17
v/c Ratio	0.48	0.61		0.16	0.81	0.14		0.13			0.34	0.31
Control Delay	33.4	10.5		31.7	23.7	2.9		1.1			28.0	8.3
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Delay	33.4	10.5		31.7	23.7	2.9		1.1			28.0	8.3
LOS	C	B		C	C	A		A			C	A
Approach Delay		14.2			21.1			1.1			16.4	
Approach LOS		B			C			A			B	
Queue Length 50th (ft)	45	93		7	194	0		0			27	0
Queue Length 95th (ft)	#114	318		28	#413	22		0			63	37
Internal Link Dist (ft)		420			1120			420			420	
Turn Bay Length (ft)	200			330		400						200

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	293	1291		122	1103	997		390			453	600
Starvation Cap Reductn	0	0		0	0	0		0			0	0
Spillback Cap Reductn	0	0		0	0	0		0			0	0
Storage Cap Reductn	0	0		0	0	0		0			0	0
Reduced v/c Ratio	0.44	0.52		0.16	0.61	0.11		0.09			0.17	0.19

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 54.6
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.81
Intersection Signal Delay: 17.2 — Intersection LOS: B
Intersection Capacity Utilization 60.4% — ICU Level of Service B
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Kahuku Ag Rd/Marconi Rd & Kamehameha Hwy



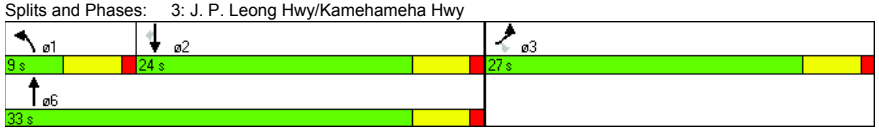
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	461	41	76	594	473	538
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	0			450
Storage Lanes	1	1	1			1
Taper Length (ft)	100		100			
Satd. Flow (prot)	1787	1615	1805	1845	1881	1583
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1787	1615	1805	1845	1881	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		127				611
Link Speed (mph)	30			30	30	
Link Distance (ft)	220			382	754	
Travel Time (s)	5.0			8.7	17.1	
Peak Hour Factor	0.83	0.68	1.00	1.00	0.96	0.88
Heavy Vehicles (%)	1%	0%	0%	3%	1%	2%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	555	60	76	594	493	611
Turn Type	NA	Perm	Prot	NA	NA	Perm
Protected Phases	3		1	6	2	
Permitted Phases		3				2
Detector Phase	3	3	1	6	2	2
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.0	21.0	9.0	9.0	21.0	21.0
Total Split (s)	27.0	27.0	9.0	33.0	24.0	24.0
Total Split (%)	45.0%	45.0%	15.0%	55.0%	40.0%	40.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Max	Max
Act Effct Green (s)	20.2	20.2	4.1	26.1	19.3	19.3
Actuated g/C Ratio	0.36	0.36	0.07	0.46	0.34	0.34
v/c Ratio	0.87	0.09	0.58	0.70	0.77	0.65
Control Delay	34.4	0.7	49.1	17.7	28.8	5.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	34.4	0.7	49.1	17.7	28.8	5.5
LOS	C	A	D	B	C	A
Approach Delay	31.1			21.2	15.9	
Approach LOS	C			C	B	
Queue Length 50th (ft)	179	0	28	158	163	0
Queue Length 95th (ft)	#298	0	#84	264	#312	57
Internal Link Dist (ft)	140			302	674	
Turn Bay Length (ft)						450
Base Capacity (vph)	708	716	130	930	643	943
Starvation Cap Reductn	0	0	0	0	0	0

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.78	0.08	0.58	0.64	0.77	0.65

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 56.5
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.87
Intersection Signal Delay: 21.3 Intersection LOS: C
Intersection Capacity Utilization 67.1% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: J. P. Leong Hwy/Kamehameha Hwy



Intersection

Intersection Delay (sec/veh): 89.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Volume (vph)	56	297	853	92	96	868
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
Right Turn Channelized	Yield	Yield	Yield	Yield	None	None
Storage Length	0	0		200	0	
Median Width	12		0			0
Grade (%)	0%		0%			0%
Peak Hour Factor	1.00	1.00	0.91	0.79	0.78	0.93
Heavy Vehicles(%)	7	2	2	6	4	3
Movement Flow Rate	56	297	937	116	123	933
Number of Lanes	1	0	1	1	0	1

Major/Minor			Major 1		Major 2	
Conflicting Flow Rate - All	2174	527	0	0	1053	0
Stage 1	995	-	-	-	-	-
Stage 2	1179	-	-	-	-	-
Follow-up Headway	3.563	3.318	-	-	2.236	-
Pot Capacity-1 Maneuver	# 49	551	-	-	653	-
Stage 1	350	-	-	-	-	-
Stage 2	285	-	-	-	-	-
Time blocked-Platoon(%)	0	0	-	-	0	-
Mov Capacity-1 Maneuver	# 30	551	-	-	653	-
Mov Capacity-2 Maneuver	# 30	-	-	-	-	-
Stage 1	350	-	-	-	-	-
Stage 2	174	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay (s)	$ 621.7	0	1.4
HCM LOS	F	A	A

Lane	NBT	NBR	WBLn1	SBL	SBT
Capacity (vph)			158		
HCM Control Delay (s)	-	-	$ 621.7	11.789	-
HCM Lane VC Ratio	-	-	2.234	0.188	-
HCM Lane LOS	-	-	F	B	-
HCM 95th Percentile Queue (veh)	-	-	28.948	0.69	-

HCS+: Two-Lane Highways Release 5.4

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/3/11
Analysis Time Period	AM Peak Hr W/Conservation Alt
Highway	Kamehameha Highway
From/To	West of Kaihalulu Drive
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.92	
Lane width	12.0	ft	% Trucks and buses	8	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	50	%
Grade: Length		mi	Access points/mi	2	/mi
Up/down		%			

Two-way hourly volume, V 1088 veh/h
Directional split 50 / 50 %

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.992	
Two-way flow rate,(note-1) vp	1192	pc/h
Highest directional split proportion (note-2)	596	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	0.5	mi/h
Free-flow speed, FFS	44.5	mi/h

Adjustment for no-passing zones, fnp	1.4	mi/h
Average travel speed, ATS	33.8	mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	0.992	
Two-way flow rate,(note-1) vp	1192	pc/h
Highest directional split proportion (note-2)	596	
Base percent time-spent-following, BPTSF	64.9	%
Adj.for directional distribution and no-passing zones, fd/np	8.6	
Percent time-spent-following, PTSF	73.5	%

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.37	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS+: Two-Lane Highways Release 5.4

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/1/2011
Analysis Time Period	AM Peak Hr W/Conservation Alt
Highway	Kamehameha Highway
From/To	Haleiwa to Kawailoa
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.95	
Lane width	12.0	ft	% Trucks and buses	5	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	80	%
Grade: Length		mi	Access points/mi	2	/mi
Up/down		%			

Two-way hourly volume, V 1384 veh/h
Directional split 51 / 49 %

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.995	
Two-way flow rate,(note-1) vp	1464	pc/h
Highest directional split proportion (note-2)	747	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	0.5	mi/h
Free-flow speed, FFS	44.5	mi/h
Adjustment for no-passing zones, fnp	1.4	mi/h

Average travel speed, ATS 31.8 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	1457	pc/h
Highest directional split proportion (note-2)	743	
Base percent time-spent-following, BPTSF	72.2	%
Adj.for directional distribution and no-passing zones, fd/np	7.0	
Percent time-spent-following, PTSF	79.2	%

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.46	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS+: Two-Lane Highways Release 5.4

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/1/2011
Analysis Time Period	AM Peak Hr W/Conservation Alt
Highway	Kamehameha Highway
From/To	Hygienic Store
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.89	
Lane width	12.0	ft	% Trucks and buses	3	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	80	%
Grade: Length		mi	Access points/mi	10	/mi
Up/down		%			

Two-way hourly volume, V 1597 veh/h
Directional split 65 / 35 %

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.997	
Two-way flow rate,(note-1) vp	1800	pc/h
Highest directional split proportion (note-2)	1170	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	2.5	mi/h
Free-flow speed, FFS	42.5	mi/h
Adjustment for no-passing zones, fnp	1.1	mi/h

Average travel speed, ATS 27.4 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	1794	pc/h
Highest directional split proportion (note-2)	1166	
Base percent time-spent-following, BPTSF	79.3	%
Adj.for directional distribution and no-passing zones, fd/np	5.3	
Percent time-spent-following, PTSF	84.6	%

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.56	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/3/11
Analysis Time Period	PM Peak Hr W/Conservation Alt
Highway	Kamehameha Highway
From/To	West of Kaihalulu Drive
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.92	
Lane width	12.0	ft	% Trucks and buses	4	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	50	%
Grade: Length		mi	Access points/mi	2	/mi
Up/down		%			

Two-way hourly volume, V	1300	veh/h
Directional split	52 / 48	%

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.996	
Two-way flow rate,(note-1) vp	1419	pc/h
Highest directional split proportion (note-2)	738	pc/h
Free-Flow Speed from Field Measurement:		
Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	0.5	mi/h
Free-flow speed, FFS	44.5	mi/h
Adjustment for no-passing zones, fnp	1.0	mi/h

Average travel speed, ATS	32.4	mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	1413	pc/h
Highest directional split proportion (note-2)	735	
Base percent time-spent-following, BPTSF	71.1	%
Adj.for directional distribution and no-passing zones, fd/np	6.1	
Percent time-spent-following, PTSF	77.2	%

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.44	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/1/2011
Analysis Time Period	PM Peak Hour W/Resort Alt
Highway	Kamehameha Highway
From/To	Haleiwa to Kawailoa
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.96	
Lane width	12.0	ft	% Trucks and buses	2	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	80	%
Grade: Length		mi	Access points/mi	2	/mi
Up/down		%			

Two-way hourly volume, V	1842	veh/h
Directional split	51 / 49	%

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.998	
Two-way flow rate,(note-1) vp	1923	pc/h
Highest directional split proportion (note-2)	981	pc/h
Free-Flow Speed from Field Measurement:		
Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	0.5	mi/h
Free-flow speed, FFS	44.5	mi/h
Adjustment for no-passing zones, fnp	1.0	mi/h

Average travel speed, ATS	28.5	mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	1919	pc/h
Highest directional split proportion (note-2)	979	
Base percent time-spent-following, BPTSF	81.5	%
Adj.for directional distribution and no-passing zones, fd/np	4.5	
Percent time-spent-following, PTSF	86.0	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.60	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/1/2011
Analysis Time Period	PM Peak Hr W/Conservation Alt
Highway	Kamehameha Highway
From/To	Hygienic Store
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.99	
Lane width	12.0	ft	% Trucks and buses	5	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	80	%
Grade: Length		mi	Access points/mi	10	/mi
Up/down		%			

Two-way hourly volume, V 2040 veh/h
Directional split 57 / 43 %

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.995	
Two-way flow rate,(note-1) vp	2071	pc/h
Highest directional split proportion (note-2)	1180	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	2.5	mi/h
Free-flow speed, FFS	42.5	mi/h
Adjustment for no-passing zones, fnp	1.0	mi/h

Average travel speed, ATS 25.5 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	2061	pc/h
Highest directional split proportion (note-2)	1175	
Base percent time-spent-following, BPTSF	83.7	%
Adj.for directional distribution and no-passing zones, fd/np	3.8	
Percent time-spent-following, PTSF	87.5	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.65	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS+: Two-Lane Highways Release 5.4

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/5/11
Analysis Time Period	Sat Peak Hr W/Conservation Alt
Highway	Kamehameha Highway
From/To	West of Kaihalulu Drive
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.92	
Lane width	12.0	ft	% Trucks and buses	3	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	50	%
Grade: Length		mi	Access points/mi	2	/mi
Up/down		%			

Two-way hourly volume, V 1681 veh/h
Directional split 52 / 48 %

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.997	
Two-way flow rate,(note-1) vp	1833	pc/h
Highest directional split proportion (note-2)	953	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	0.5	mi/h
Free-flow speed, FFS	44.5	mi/h
Adjustment for no-passing zones, fnp	0.8	mi/h

Average travel speed, ATS 29.4 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	1827	pc/h
Highest directional split proportion (note-2)	950	
Base percent time-spent-following, BPTSF	79.9	%
Adj.for directional distribution and no-passing zones, fd/np	4.1	
Percent time-spent-following, PTSF	84.1	%

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.57	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS+: Two-Lane Highways Release 5.4

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	10/29/2011
Analysis Time Period	Sat Peak Hr W/Conservation Alt
Highway	Kamehameha Highway
From/To	Haleiwa to Kawailoa
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.92	
Lane width	12.0	ft	% Trucks and buses	2	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	80	%
Grade: Length		mi	Access points/mi	2	/mi
Up/down		%			

Two-way hourly volume, V	2067	veh/h
Directional split	51 / 49	%

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.998	
Two-way flow rate,(note-1) vp	2251	pc/h
Highest directional split proportion (note-2)	1148	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	0.5	mi/h
Free-flow speed, FFS	44.5	mi/h
Adjustment for no-passing zones, fnp	0.9	mi/h

Average travel speed, ATS	26.1	mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	2247	pc/h
Highest directional split proportion (note-2)	1146	
Base percent time-spent-following, BPTSF	86.1	%
Adj.for directional distribution and no-passing zones, fd/np	3.3	
Percent time-spent-following, PTSF	89.5	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.70	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS+: Two-Lane Highways Release 5.4

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	10/29/2011
Analysis Time Period	Sat Peak Hr W/Conservation Alt
Highway	Kamehameha Highway
From/To	Hygienic Store
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.95	
Lane width	12.0	ft	% Trucks and buses	3	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	80	%
Grade: Length		mi	Access points/mi	10	/mi
Up/down		%			

Two-way hourly volume, V 2114 veh/h
Directional split 54 / 46 %

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.997	
Two-way flow rate,(note-1) vp	2232	pc/h
Highest directional split proportion (note-2)	1205	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	2.5	mi/h
Free-flow speed, FFS	42.5	mi/h
Adjustment for no-passing zones, fnp	0.9	mi/h

Average travel speed, ATS 24.3 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	2225	pc/h
Highest directional split proportion (note-2)	1202	
Base percent time-spent-following, BPTSF	85.9	%
Adj.for directional distribution and no-passing zones, fd/np	3.4	
Percent time-spent-following, PTSF	89.2	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.70	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

TRAFFIC IMPACT ANALYSIS REPORT

FOR THE PROPOSED

TURTLE BAY RESORT MASTER PLAN

KAHUKU, OAHU, HAWAII

APPENDIX G

CAPACITY ANALYSIS WORKSHEETS

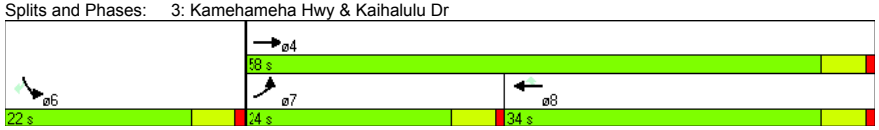
2025 TRAFFIC CONDITIONS WITH PROPOSED ACTION

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	196	405	413	68	69	185
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300			400	0	200
Storage Lanes	1			1	1	1
Taper Length (ft)	100				100	
Satd. Flow (prot)	1736	1681	1792	1509	1703	1509
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1736	1681	1792	1509	1703	1509
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				95		201
Link Speed (mph)		45	45		30	
Link Distance (ft)		500	3000		500	
Travel Time (s)		7.6	45.5		11.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	4%	13%	6%	7%	6%	7%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	213	440	449	74	75	201
Turn Type	Prot	NA	NA	Perm	NA	Perm
Protected Phases	7	4	8		6	
Permitted Phases				8		6
Detector Phase	7	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	24.0	58.0	34.0	34.0	22.0	22.0
Total Split (%)	30.0%	72.5%	42.5%	42.5%	27.5%	27.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Max	Max
Act Effct Green (s)	13.4	39.9	21.4	21.4	17.4	17.4
Actuated g/C Ratio	0.20	0.59	0.32	0.32	0.26	0.26
v/c Ratio	0.62	0.44	0.79	0.14	0.17	0.37
Control Delay	34.2	8.7	32.4	3.4	24.6	6.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	34.2	8.7	32.4	3.4	24.6	6.7
LOS	C	A	C	A	C	A
Approach Delay		17.0	28.3		11.5	
Approach LOS		B	C		B	
Queue Length 50th (ft)	81	87	165	0	24	0
Queue Length 95th (ft)	160	138	293	19	67	52
Internal Link Dist (ft)		420	2920		420	
Turn Bay Length (ft)	300			400		200
Base Capacity (vph)	499	1349	787	716	438	537
Starvation Cap Reductn	0	0	0	0	0	0

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.43	0.33	0.57	0.10	0.17	0.37

Intersection Summary	
Area Type:	Other
Cycle Length: 80	
Actuated Cycle Length: 67.5	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.79	
Intersection Signal Delay: 20.1	Intersection LOS: C
Intersection Capacity Utilization 48.9%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 3: Kamehameha Hwy & Kaihalulu Dr



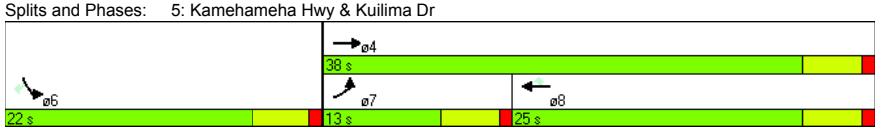
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	118	357	364	144	182	117
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200			400	0	0
Storage Lanes	1			1	1	1
Taper Length (ft)	100				100	
Satd. Flow (prot)	1736	1681	1792	1509	1703	1509
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1734	1681	1792	1478	1680	1490
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				157		127
Link Speed (mph)		45	45		25	
Link Distance (ft)		500	5500		500	
Travel Time (s)		7.6	83.3		13.6	
Confl. Peds. (#/hr)	1			1	7	
Confl. Bikes (#/hr)				12		1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	4%	13%	6%	7%	6%	7%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	128	388	396	157	198	127
Turn Type	Prot	NA	NA	Perm	NA	Perm
Protected Phases	7	4	8		6	
Permitted Phases				8		6
Detector Phase	7	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	21.0	21.0	21.0	21.0	21.0
Total Split (s)	13.0	38.0	25.0	25.0	22.0	22.0
Total Split (%)	21.7%	63.3%	41.7%	41.7%	36.7%	36.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Min	Min
Act Effct Green (s)	8.0	24.6	15.3	15.3	11.4	11.4
Actuated g/C Ratio	0.17	0.52	0.32	0.32	0.24	0.24
v/c Ratio	0.44	0.44	0.68	0.27	0.48	0.28
Control Delay	27.7	8.6	22.2	4.4	21.9	5.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.7	8.6	22.2	4.4	21.9	5.9
LOS	C	A	C	A	C	A
Approach Delay		13.4	17.1		15.6	
Approach LOS		B	B		B	
Queue Length 50th (ft)	35	53	99	0	51	0
Queue Length 95th (ft)	#101	128	205	33	109	33
Internal Link Dist (ft)		420	5420		420	
Turn Bay Length (ft)	200			400		

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Base Capacity (vph)	327	1188	845	780	683	673
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.39	0.33	0.47	0.20	0.29	0.19

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 47.1
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.68
Intersection Signal Delay: 15.4 — Intersection LOS: B
Intersection Capacity Utilization 48.3% — ICU Level of Service A
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Kamehameha Hwy & Kuilima Dr



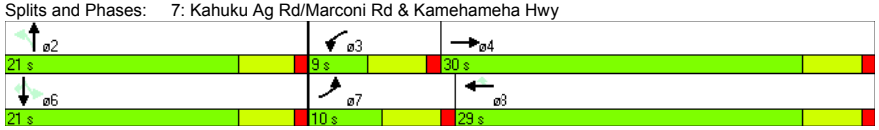
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	69	453	17	19	415	58	24	0	18	63	0	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	330		400	0		0	200		200
Storage Lanes	1		0	1		1	0		0	0		1
Taper Length (ft)	100			100			100			100		
Satd. Flow (prot)	1805	1654	0	1203	1792	1615	0	1160	0	0	1805	1615
Flt Permitted	0.950			0.950				0.795			0.727	
Satd. Flow (perm)	1805	1654	0	1203	1792	1568	0	948	0	0	1381	1615
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4				127		127				127
Link Speed (mph)		45			45			30			25	
Link Distance (ft)		500			1200			500			500	
Travel Time (s)		7.6			18.2			11.4			13.6	
Confl. Bikes (#/hr)						10						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	13%	50%	50%	6%	0%	50%	2%	50%	0%	2%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	75	510	0	21	451	63	0	46	0	0	68	76
Turn Type	Prot	NA		Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases						8	2			6		6
Detector Phase	7	4		3	8	8	2	2		6	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.0	21.0		9.0	21.0	21.0	21.0	21.0		21.0	21.0	21.0
Total Split (s)	10.0	30.0		9.0	29.0	29.0	21.0	21.0		21.0	21.0	21.0
Total Split (%)	16.7%	50.0%		15.0%	48.3%	48.3%	35.0%	35.0%		35.0%	35.0%	35.0%
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0		5.0			5.0	5.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?												
Recall Mode	None	None		None	None	None	Min	Min		Min	Min	Min
Act Effct Green (s)	5.5	19.7		4.4	16.1	16.1		8.0			8.0	8.0
Actuated g/C Ratio	0.14	0.49		0.11	0.40	0.40		0.20			0.20	0.20
v/c Ratio	0.30	0.62		0.16	0.63	0.09		0.16			0.25	0.18
Control Delay	24.3	11.9		25.2	15.2	0.7		1.2			19.4	2.7
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Delay	24.3	11.9		25.2	15.2	0.7		1.2			19.4	2.7
LOS	C	B		C	B	A		A			B	A
Approach Delay		13.5			13.9			1.2			10.6	
Approach LOS		B			B			A			B	
Queue Length 50th (ft)	18	59		5	90	0		0			15	0
Queue Length 95th (ft)	#61	217		25	182	4		0			48	13
Internal Link Dist (ft)		420			1120			420			420	
Turn Bay Length (ft)	200			330		400						200
Base Capacity (vph)	247	1166		131	1177	1073		486			605	778

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Starvation Cap Reductn	0	0		0	0	0		0			0	0
Spillback Cap Reductn	0	0		0	0	0		0			0	0
Storage Cap Reductn	0	0		0	0	0		0			0	0
Reduced v/c Ratio	0.30	0.44		0.16	0.38	0.06		0.09			0.11	0.10

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 40
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.63
Intersection Signal Delay: 12.9 Intersection LOS: B
Intersection Capacity Utilization 49.8% ICU Level of Service A
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Kahuku Ag Rd/Marconi Rd & Kamehameha Hwy



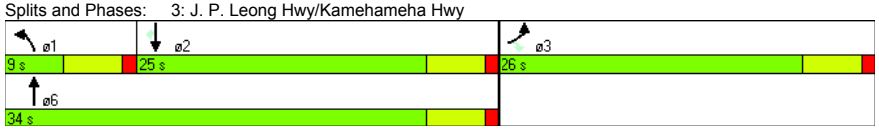
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	344	27	44	361	316	423
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	0			450
Storage Lanes	1	1	1			1
Taper Length (ft)	100		100			
Satd. Flow (prot)	1719	1615	1805	1792	1845	1568
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1719	1615	1805	1792	1845	1568
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		127				450
Link Speed (mph)	30			30	30	
Link Distance (ft)	220			382	754	
Travel Time (s)	5.0			8.7	17.1	
Peak Hour Factor	0.88	1.00	0.61	0.97	1.00	0.94
Heavy Vehicles (%)	5%	0%	0%	6%	3%	3%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	391	27	72	372	316	450
Turn Type	NA	Perm	Prot	NA	NA	Perm
Protected Phases	3		1	6	2	
Permitted Phases		3				2
Detector Phase	3	3	1	6	2	2
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.0	21.0	9.0	9.0	21.0	21.0
Total Split (s)	26.0	26.0	9.0	34.0	25.0	25.0
Total Split (%)	43.3%	43.3%	15.0%	56.7%	41.7%	41.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Max	Max
Act Effct Green (s)	16.6	16.6	4.1	25.9	21.0	21.0
Actuated g/C Ratio	0.31	0.31	0.08	0.49	0.40	0.40
v/c Ratio	0.72	0.05	0.51	0.42	0.43	0.50
Control Delay	25.0	0.1	42.7	11.2	16.4	4.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.0	0.1	42.7	11.2	16.4	4.2
LOS	C	A	D	B	B	A
Approach Delay	23.4			16.3	9.2	
Approach LOS	C			B	A	
Queue Length 50th (ft)	116	0	24	71	81	0
Queue Length 95th (ft)	194	0	41	140	157	54
Internal Link Dist (ft)	140			302	674	
Turn Bay Length (ft)						450
Base Capacity (vph)	701	734	140	1009	736	896
Starvation Cap Reductn	0	0	0	0	0	0

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.56	0.04	0.51	0.37	0.43	0.50

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 52.7
Natural Cycle: 55
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.72
Intersection Signal Delay: 14.8 — Intersection LOS: B
Intersection Capacity Utilization 51.5% — ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 3: J. P. Leong Hwy/Kamehameha Hwy



Intersection

Intersection Delay (sec/veh): 57.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Volume (vph)	42	118	451	152	552	492
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
Right Turn Channelized	Yield	Yield	Yield	Yield	None	None
Storage Length	0	0		200	0	
Median Width	12		0			0
Grade (%)	0%		0%			0%
Peak Hour Factor	0.75	0.83	0.96	0.83	0.77	1.00
Heavy Vehicles(%)	6	7	5	4	2	3
Movement Flow Rate	56	142	470	183	717	492
Number of Lanes	1	0	1	1	0	1

Major/Minor			Major 1			Major 2
Conflicting Flow Rate - All	2488	327	0	0	653	0
Stage 1	562	-	-	-	-	-
Stage 2	1926	-	-	-	-	-
Follow-up Headway	3.554	3.363	-	-	2.218	-
Pot Capacity-1 Maneuver	# 31	703	-	-	934	-
Stage 1	563	-	-	-	-	-
Stage 2	122	-	-	-	-	-
Time blocked-Platoon(%)	0	0	-	-	0	-
Mov Capacity-1 Maneuver	# 31	703	-	-	934	-
Mov Capacity-2 Maneuver	# 31	-	-	-	-	-
Stage 1	563	-	-	-	-	-
Stage 2	122	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay (s)	$ 527.9	0	12.1
HCM LOS	F	A	B

Lane	NBT	NBR	WBLn1	SBL	SBT
Capacity (vph)			102		
HCM Control Delay (s)	-	-	$ 527.9	20.323	-
HCM Lane VC Ratio	-	-	1.943	0.768	-
HCM Lane LOS	-	-	F	C	-
HCM 95th Percentile Queue (veh)	-	-	16.52	7.713	-

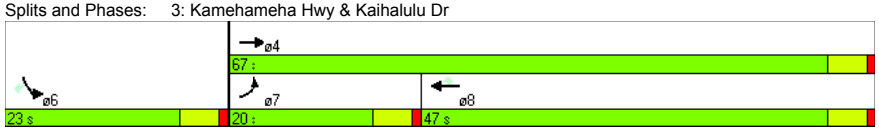
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	173	541	573	51	39	186
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300			400	0	200
Storage Lanes	1			1	1	1
Taper Length (ft)	100				100	
Satd. Flow (prot)	1770	1845	1810	1495	1736	1509
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1770	1845	1810	1495	1736	1509
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				85		202
Link Speed (mph)		45	45		30	
Link Distance (ft)		500	3000		500	
Travel Time (s)		7.6	45.5		11.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	3%	5%	8%	4%	7%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	188	588	623	55	42	202
Turn Type	Prot	NA	NA	Perm	NA	Perm
Protected Phases	7	4	8		6	
Permitted Phases				8		6
Detector Phase	7	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	20.0	67.0	47.0	47.0	23.0	23.0
Total Split (%)	22.2%	74.4%	52.2%	52.2%	25.6%	25.6%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Max	Max
Act Effct Green (s)	12.4	49.0	31.4	31.4	18.4	18.4
Actuated g/C Ratio	0.16	0.63	0.40	0.40	0.24	0.24
v/c Ratio	0.66	0.51	0.85	0.08	0.10	0.39
Control Delay	44.8	9.0	32.9	1.7	28.4	7.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.8	9.0	32.9	1.7	28.4	7.4
LOS	D	A	C	A	C	A
Approach Delay		17.7	30.4		11.0	
Approach LOS		B	C		B	
Queue Length 50th (ft)	87	132	268	0	17	0
Queue Length 95th (ft)	#174	196	414	10	48	56
Internal Link Dist (ft)		420	2920		420	
Turn Bay Length (ft)	300			400		200
Base Capacity (vph)	350	1495	1001	865	411	512
Starvation Cap Reductn	0	0	0	0	0	0

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.54	0.39	0.62	0.06	0.10	0.39

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 77.6
Natural Cycle: 65
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.85
Intersection Signal Delay: 21.8 — Intersection LOS: C
Intersection Capacity Utilization 55.6% — ICU Level of Service B
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Kamehameha Hwy & Kaihalulu Dr



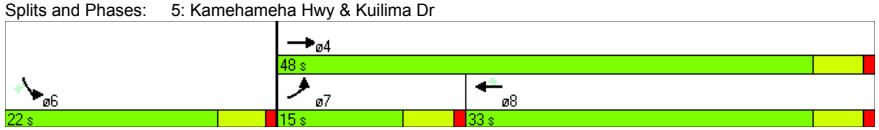
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	144	437	478	238	188	146
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200			400	0	0
Storage Lanes	1			1	1	1
Taper Length (ft)	100				100	
Satd. Flow (prot)	1741	1815	1781	1471	1715	1503
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1741	1815	1781	1444	1703	1482
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				259		159
Link Speed (mph)		45	45		25	
Link Distance (ft)		500	5500		500	
Travel Time (s)		7.6	83.3		13.6	
Confl. Peds. (#/hr)					3	1
Confl. Bikes (#/hr)				12		1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	3%	5%	8%	4%	7%
Bus Blockages (#/hr)	4	4	4	4	3	1
Shared Lane Traffic (%)						
Lane Group Flow (vph)	157	475	520	259	204	159
Turn Type	Prot	NA	NA	Perm	NA	Perm
Protected Phases	7	4	8		6	
Permitted Phases				8		6
Detector Phase	7	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	21.0	21.0	21.0	21.0	21.0
Total Split (s)	15.0	48.0	33.0	33.0	22.0	22.0
Total Split (%)	21.4%	68.6%	47.1%	47.1%	31.4%	31.4%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Min	Min
Act Effct Green (s)	9.6	32.7	22.0	22.0	12.5	12.5
Actuated g/C Ratio	0.17	0.58	0.39	0.39	0.22	0.22
v/c Ratio	0.53	0.45	0.74	0.36	0.54	0.35
Control Delay	34.0	7.9	24.1	3.7	28.0	6.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	34.0	7.9	24.1	3.7	28.0	6.9
LOS	C	A	C	A	C	A
Approach Delay		14.4	17.4		18.7	
Approach LOS		B	B		B	
Queue Length 50th (ft)	54	74	162	0	68	0
Queue Length 95th (ft)	#138	151	296	40	136	42
Internal Link Dist (ft)		420	5420		420	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Turn Bay Length (ft)	200			400		
Base Capacity (vph)	341	1370	979	910	572	600
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.46	0.35	0.53	0.28	0.36	0.27

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 56.2
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.74
Intersection Signal Delay: 16.6 Intersection LOS: B
Intersection Capacity Utilization 56.1% ICU Level of Service B
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Kamehameha Hwy & Kuilima Dr



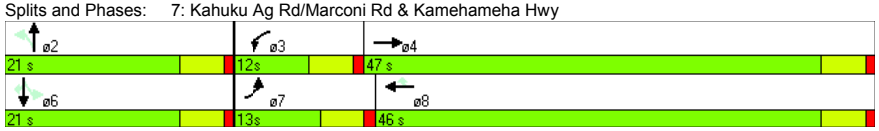
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	78	523	24	28	610	69	24	0	20	70	0	82
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	330		400	0		0	200		200
Storage Lanes	1		0	1		1	0		0	0		1
Taper Length (ft)	100			100			100			100		
Satd. Flow (prot)	1805	1796	0	1203	1810	1615	0	1157	0	0	1805	1615
Flt Permitted	0.950			0.950				0.805			0.726	
Satd. Flow (perm)	1805	1796	0	1203	1810	1571	0	956	0	0	1379	1615
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4				95		95				95
Link Speed (mph)		45			45			30			25	
Link Distance (ft)		500			1200			500			500	
Travel Time (s)		7.6			18.2			11.4			13.6	
Confl. Bikes (#/hr)						10						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	3%	50%	50%	5%	0%	50%	2%	50%	0%	2%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	85	594	0	30	663	75	0	48	0	0	76	89
Turn Type	Prot	NA		Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases						8	2			6		6
Detector Phase	7	4		3	8	8	2	2		6	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.0	21.0		9.0	21.0	21.0	21.0	21.0		21.0	21.0	21.0
Total Split (s)	13.0	47.0		12.0	46.0	46.0	21.0	21.0		21.0	21.0	21.0
Total Split (%)	16.3%	58.8%		15.0%	57.5%	57.5%	26.3%	26.3%		26.3%	26.3%	26.3%
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0		5.0			5.0	5.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?												
Recall Mode	None	None		None	None	None	Min	Min		Min	Min	Min
Act Effct Green (s)	7.9	31.3		7.1	25.8	25.8		9.3			9.3	9.3
Actuated g/C Ratio	0.14	0.56		0.13	0.46	0.46		0.17			0.17	0.17
v/c Ratio	0.33	0.59		0.20	0.79	0.10		0.20			0.33	0.26
Control Delay	31.7	11.9		32.5	21.3	1.9		3.3			29.7	8.4
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Delay	31.7	11.9		32.5	21.3	1.9		3.3			29.7	8.4
LOS	C	B		C	C	A		A			C	A
Approach Delay		14.4			19.8			3.3			18.2	
Approach LOS		B			B			A			B	
Queue Length 50th (ft)	27	78		10	187	0		0			24	0
Queue Length 95th (ft)	82	282		39	346	13		7			71	34
Internal Link Dist (ft)		420			1120			420			420	
Turn Bay Length (ft)	200			330		400						200
Base Capacity (vph)	296	1344		172	1330	1180		377			452	593

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Starvation Cap Reductn	0	0		0	0	0		0			0	0
Spillback Cap Reductn	0	0		0	0	0		0			0	0
Storage Cap Reductn	0	0		0	0	0		0			0	0
Reduced v/c Ratio	0.29	0.44		0.17	0.50	0.06		0.13			0.17	0.15

Intersection Summary

Area Type: Other
Cycle Length: 80
Actuated Cycle Length: 55.7
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.79
Intersection Signal Delay: 16.9 — Intersection LOS: B
Intersection Capacity Utilization 58.1% — ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 7: Kahuku Ag Rd/Marconi Rd & Kamehameha Hwy



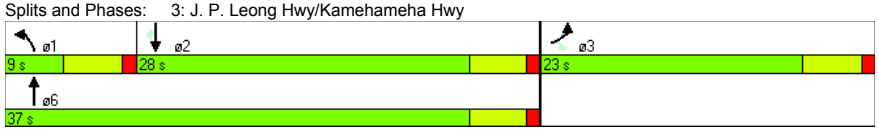
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	429	18	43	516	468	506
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	0			450
Storage Lanes	1	1	1			1
Taper Length (ft)	100		100			
Satd. Flow (prot)	1787	1615	1805	1900	1810	1583
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1787	1615	1805	1900	1810	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		127				511
Link Speed (mph)	30			30	30	
Link Distance (ft)	220			382	754	
Travel Time (s)	5.0			8.7	17.1	
Peak Hour Factor	0.98	1.00	1.00	1.00	0.87	0.99
Heavy Vehicles (%)	1%	0%	0%	0%	5%	2%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	438	18	43	516	538	511
Turn Type	NA	Perm	Prot	NA	NA	Perm
Protected Phases	3		1	6	2	
Permitted Phases		3				2
Detector Phase	3	3	1	6	2	2
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.0	21.0	9.0	9.0	21.0	21.0
Total Split (s)	23.0	23.0	9.0	37.0	28.0	28.0
Total Split (%)	38.3%	38.3%	15.0%	61.7%	46.7%	46.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Max	Max
Act Effct Green (s)	16.3	16.3	4.1	26.6	23.4	23.4
Actuated g/C Ratio	0.31	0.31	0.08	0.50	0.44	0.44
v/c Ratio	0.80	0.03	0.31	0.54	0.67	0.52
Control Delay	31.2	0.1	32.0	11.8	19.6	3.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	31.2	0.1	32.0	11.8	19.6	3.7
LOS	C	A	C	B	B	A
Approach Delay	30.0			13.4	11.8	
Approach LOS	C			B	B	
Queue Length 50th (ft)	109	0	13	108	117	0
Queue Length 95th (ft)	#286	0	42	180	#295	52
Internal Link Dist (ft)	140			302	674	
Turn Bay Length (ft)						450
Base Capacity (vph)	615	639	138	1163	798	983
Starvation Cap Reductn	0	0	0	0	0	0

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.71	0.03	0.31	0.44	0.67	0.52

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 53
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.80
Intersection Signal Delay: 16.3 — Intersection LOS: B
Intersection Capacity Utilization 64.2% — ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: J. P. Leong Hwy/Kamehameha Hwy



Intersection	
Intersection Delay (sec/veh):	49.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Volume (vph)	61	322	851	77	104	795
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
Right Turn Channelized	Yield	Yield	Yield	Yield	None	None
Storage Length	0	0		200	0	
Median Width	12		0			0
Grade (%)	0%		0%			0%
Peak Hour Factor	0.95	0.99	0.96	0.84	1.00	1.00
Heavy Vehicles(%)	6	5	3	5	3	2
Movement Flow Rate	64	325	886	92	104	795
Number of Lanes	1	0	1	1	0	1

Major/Minor			Major 1			Major 2
Conflicting Flow Rate - All	1935	489	0	0	978	0
Stage 1	932	-	-	-	-	-
Stage 2	1003	-	-	-	-	-
Follow-up Headway	3.554	3.345	-	-	2.227	-
Pot Capacity-1 Maneuver	71	573	-	-	702	-
Stage 1	377	-	-	-	-	-
Stage 2	349	-	-	-	-	-
Time blocked-Platoon(%)	0	0	-	-	0	-
Mov Capacity-1 Maneuver	# 52	573	-	-	702	-
Mov Capacity-2 Maneuver	# 52	-	-	-	-	-
Stage 1	377	-	-	-	-	-
Stage 2	257	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay (s)	284	0	1.3
HCM LOS	F	A	A

Lane	NBT	NBR	WBLn1	SBL	SBT
Capacity (vph)			258		
HCM Control Delay (s)	-	-	284	11.018	-
HCM Lane VC Ratio	-	-	1.51	0.148	-
HCM Lane LOS	-	-	F	B	-
HCM 95th Percentile Queue (veh)	-	-	22.83	0.518	-

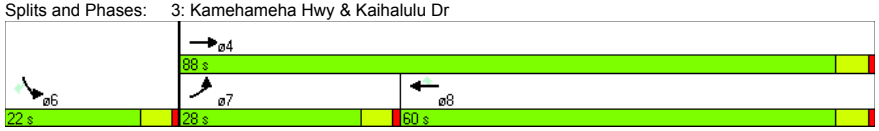
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	234	667	694	64	81	247
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300			400	0	200
Storage Lanes	1			1	1	1
Taper Length (ft)	100				100	
Satd. Flow (prot)	1752	1863	1810	1553	1752	1583
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1752	1863	1810	1553	1752	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				70		268
Link Speed (mph)		45	45		30	
Link Distance (ft)		500	3000		500	
Travel Time (s)		7.6	45.5		11.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	2%	5%	4%	3%	2%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	254	725	754	70	88	268
Turn Type	Prot	NA	NA	Perm	NA	Perm
Protected Phases	7	4	8		6	
Permitted Phases				8		6
Detector Phase	7	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	28.0	88.0	60.0	60.0	22.0	22.0
Total Split (%)	25.5%	80.0%	54.5%	54.5%	20.0%	20.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Max	Max
Act Effct Green (s)	18.3	67.9	44.5	44.5	17.5	17.5
Actuated g/C Ratio	0.19	0.71	0.47	0.47	0.18	0.18
v/c Ratio	0.76	0.55	0.90	0.09	0.28	0.53
Control Delay	53.7	7.9	38.2	3.9	41.4	9.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	53.7	7.9	38.2	3.9	41.4	9.4
LOS	D	A	D	A	D	A
Approach Delay		19.8	35.3		17.3	
Approach LOS		B	D		B	
Queue Length 50th (ft)	153	174	411	0	50	0
Queue Length 95th (ft)	259	244	#633	23	105	74
Internal Link Dist (ft)		420	2920		420	
Turn Bay Length (ft)	300			400		200
Base Capacity (vph)	433	1603	1070	946	319	508
Starvation Cap Reductn	0	0	0	0	0	0

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.59	0.45	0.70	0.07	0.28	0.53

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 95.6
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.90
Intersection Signal Delay: 25.3 Intersection LOS: C
Intersection Capacity Utilization 66.5% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Kamehameha Hwy & Kaihalulu Dr



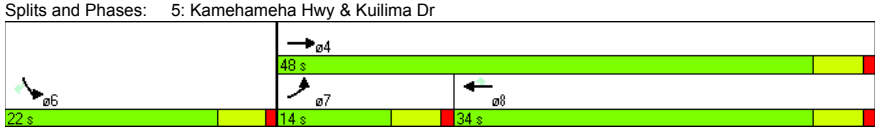
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	164	584	585	224	227	173
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200			400	0	0
Storage Lanes	1			1	1	1
Taper Length (ft)	100				100	
Satd. Flow (prot)	1738	1848	1795	1540	1738	1571
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1738	1848	1795	1512	1738	1550
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				243		188
Link Speed (mph)		45	45		25	
Link Distance (ft)		500	5500		500	
Travel Time (s)		7.6	83.3		13.6	
Confl. Bikes (#/hr)				12		1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	2%	5%	4%	3%	2%
Bus Blockages (#/hr)	2	2	2	2	2	2
Shared Lane Traffic (%)						
Lane Group Flow (vph)	178	635	636	243	247	188
Turn Type	Prot	NA	NA	Perm	NA	Perm
Protected Phases	7	4	8		6	
Permitted Phases				8		6
Detector Phase	7	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	21.0	21.0	21.0	21.0	21.0
Total Split (s)	14.0	48.0	34.0	34.0	22.0	22.0
Total Split (%)	20.0%	68.6%	48.6%	48.6%	31.4%	31.4%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Min	Min
Act Effct Green (s)	8.9	39.8	25.8	25.8	13.6	13.6
Actuated g/C Ratio	0.14	0.63	0.41	0.41	0.21	0.21
v/c Ratio	0.73	0.55	0.87	0.32	0.67	0.39
Control Delay	48.9	9.4	33.3	3.4	33.1	6.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.9	9.4	33.3	3.4	33.1	6.7
LOS	D	A	C	A	C	A
Approach Delay		18.1	25.1		21.7	
Approach LOS		B	C		C	
Queue Length 50th (ft)	72	125	223	0	94	0
Queue Length 95th (ft)	#175	225	#430	38	164	45
Internal Link Dist (ft)		420	5420		420	
Turn Bay Length (ft)	200			400		

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Base Capacity (vph)	250	1273	834	832	473	558
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.71	0.50	0.76	0.29	0.52	0.34

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 63.6
Natural Cycle: 65
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.87
Intersection Signal Delay: 21.7 Intersection LOS: C
Intersection Capacity Utilization 65.0% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Kamehameha Hwy & Kuilima Dr



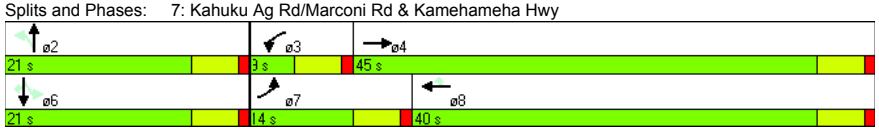
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	152	641	18	18	655	127	16	0	16	100	0	138
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	330		400	0		0	200		200
Storage Lanes	1		0	1		1	0		0	0		1
Taper Length (ft)	100			100			100			100		
Satd. Flow (prot)	1805	1817	0	1203	1812	1615	0	1152	0	0	1805	1615
Flt Permitted	0.950			0.950				0.825			0.735	
Satd. Flow (perm)	1805	1817	0	1203	1812	1570	0	974	0	0	1396	1615
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3				138		102				150
Link Speed (mph)		45			45			30			25	
Link Distance (ft)		500			1200			500			500	
Travel Time (s)		7.6			18.2			11.4			13.6	
Confl. Bikes (#/hr)						10						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	2%	50%	50%	4%	0%	50%	2%	50%	0%	2%	0%
Bus Blockages (#/hr)	0	2	0	0	2	0	0	0	0	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	165	717	0	20	712	138	0	34	0	0	109	150
Turn Type	Prot	NA		Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases						8	2			6		6
Detector Phase	7	4		3	8	8	2	2		6	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.0	21.0		9.0	21.0	21.0	21.0	21.0		21.0	21.0	21.0
Total Split (s)	14.0	45.0		9.0	40.0	40.0	21.0	21.0		21.0	21.0	21.0
Total Split (%)	18.7%	60.0%		12.0%	53.3%	53.3%	28.0%	28.0%		28.0%	28.0%	28.0%
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0		5.0			5.0	5.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?												
Recall Mode	None	None		None	None	None	Min	Min		Min	Min	Min
Act Effct Green (s)	8.9	41.6		4.1	29.1	29.1		10.5			10.5	10.5
Actuated g/C Ratio	0.14	0.65		0.06	0.46	0.46		0.16			0.16	0.16
v/c Ratio	0.66	0.61		0.26	0.87	0.17		0.14			0.48	0.38
Control Delay	44.4	10.7		41.6	29.0	2.9		1.2			33.1	8.3
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Delay	44.4	10.7		41.6	29.0	2.9		1.2			33.1	8.3
LOS	D	B		D	C	A		A			C	A
Approach Delay		17.0			25.1			1.2			18.7	
Approach LOS		B			C			A			B	
Queue Length 50th (ft)	66	121		8	234	0		0			41	0
Queue Length 95th (ft)	#169	375		31	#485	27		0			89	44
Internal Link Dist (ft)		420			1120			420			420	
Turn Bay Length (ft)	200			330		400						200

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	261	1253		77	1021	945		326			359	527
Starvation Cap Reductn	0	0		0	0	0		0			0	0
Spillback Cap Reductn	0	0		0	0	0		0			0	0
Storage Cap Reductn	0	0		0	0	0		0			0	0
Reduced v/c Ratio	0.63	0.57		0.26	0.70	0.15		0.10			0.30	0.28

Intersection Summary

Area Type: Other
Cycle Length: 75
Actuated Cycle Length: 63.9
Natural Cycle: 70
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.87
Intersection Signal Delay: 20.4 Intersection LOS: C
Intersection Capacity Utilization 65.2% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Kahuku Ag Rd/Marconi Rd & Kamehameha Hwy



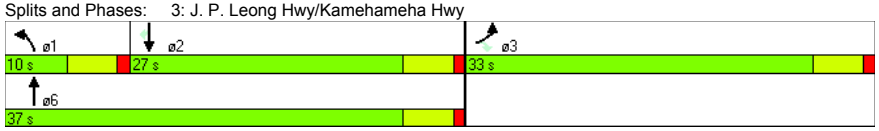
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	473	41	76	609	490	559
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	0			450
Storage Lanes	1	1	1			1
Taper Length (ft)	100		100			
Satd. Flow (prot)	1787	1615	1805	1845	1881	1583
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1787	1615	1805	1845	1881	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		109				643
Link Speed (mph)	30			30	30	
Link Distance (ft)	220			382	754	
Travel Time (s)	5.0			8.7	17.1	
Peak Hour Factor	0.83	0.68	1.00	1.00	0.95	0.87
Heavy Vehicles (%)	1%	0%	0%	3%	1%	2%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	570	60	76	609	516	643
Turn Type	NA	Perm	Prot	NA	NA	Perm
Protected Phases	3		1	6	2	
Permitted Phases		3				2
Detector Phase	3	3	1	6	2	2
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.0	21.0	9.0	9.0	21.0	21.0
Total Split (s)	33.0	33.0	10.0	37.0	27.0	27.0
Total Split (%)	47.1%	47.1%	14.3%	52.9%	38.6%	38.6%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Max	Max
Act Effct Green (s)	23.9	23.9	5.1	30.0	22.5	22.5
Actuated g/C Ratio	0.37	0.37	0.08	0.47	0.35	0.35
v/c Ratio	0.86	0.09	0.53	0.71	0.78	0.66
Control Delay	33.5	1.2	47.0	19.9	32.0	5.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.5	1.2	47.0	19.9	32.0	5.7
LOS	C	A	D	B	C	A
Approach Delay	30.4			22.9	17.4	
Approach LOS	C			C	B	
Queue Length 50th (ft)	209	0	32	199	204	0
Queue Length 95th (ft)	292	0	#89	321	#377	58
Internal Link Dist (ft)	140			302	674	
Turn Bay Length (ft)						450
Base Capacity (vph)	798	781	143	942	660	972
Starvation Cap Reductn	0	0	0	0	0	0

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.71	0.08	0.53	0.65	0.78	0.66

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 64.2
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.86
Intersection Signal Delay: 22.2 — Intersection LOS: C
Intersection Capacity Utilization 68.7% — ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: J. P. Leong Hwy/Kamehameha Hwy



Intersection

Intersection Delay (sec/veh): 95.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Volume (vph)	56	301	866	92	96	876
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
Right Turn Channelized	Yield	Yield	Yield	Yield	None	None
Storage Length	0	0		200	0	
Median Width	12		0			0
Grade (%)	0%		0%			0%
Peak Hour Factor	1.00	1.00	0.91	0.79	0.79	0.93
Heavy Vehicles(%)	7	2	2	6	4	3
Movement Flow Rate	56	301	952	116	122	942
Number of Lanes	1	0	1	1	0	1

Major/Minor			Major 1			Major 2
Conflicting Flow Rate - All	2196	534	0	0	1068	0
Stage 1	1010	-	-	-	-	-
Stage 2	1186	-	-	-	-	-
Follow-up Headway	3.563	3.318	-	-	2.236	-
Pot Capacity-1 Maneuver	# 48	546	-	-	645	-
Stage 1	344	-	-	-	-	-
Stage 2	283	-	-	-	-	-
Time blocked-Platoon(%)	0	0	-	-	0	-
Mov Capacity-1 Maneuver	# 29	546	-	-	645	-
Mov Capacity-2 Maneuver	# 29	-	-	-	-	-
Stage 1	344	-	-	-	-	-
Stage 2	171	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay (s)	$ 660.2	0	1.4
HCM LOS	F	A	A

Lane	NBT	NBR	WBLn1	SBL	SBT
Capacity (vph)			154		
HCM Control Delay (s)	-	-	$ 660.2	11.872	-
HCM Lane VC Ratio	-	-	2.318	0.188	-
HCM Lane LOS	-	-	F	B	-
HCM 95th Percentile Queue (veh)	-	-	29.859	0.689	-

HCS+: Two-Lane Highways Release 5.4

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/3/11
Analysis Time Period	AM Peak Hour W/Proposed Action
Highway	Kamehameha Highway
From/To	West of Kaihalulu Drive
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.92	
Lane width	12.0	ft	% Trucks and buses	8	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	50	%
Grade: Length		mi	Access points/mi	2	/mi
Up/down		%			

Two-way hourly volume, V 1199 veh/h
Directional split 50 / 50 %

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.992	
Two-way flow rate,(note-1) vp	1314	pc/h
Highest directional split proportion (note-2)	657	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	0.5	mi/h
Free-flow speed, FFS	44.5	mi/h

Adjustment for no-passing zones, fnp	1.2	mi/h
Average travel speed, ATS	33.1	mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	1303	pc/h
Highest directional split proportion (note-2)	652	
Base percent time-spent-following, BPTSF	68.2	%
Adj.for directional distribution and no-passing zones, fd/np	7.2	
Percent time-spent-following, PTSF	75.4	%

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.41	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS+: Two-Lane Highways Release 5.4

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/1/2011
Analysis Time Period	AM Peak Hour W/Proposed Action
Highway	Kamehameha Highway
From/To	Haleiwa to Kawailoa
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.95	
Lane width	12.0	ft	% Trucks and buses	5	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	80	%
Grade: Length		mi	Access points/mi	2	/mi
Up/down		%			

Two-way hourly volume, V	1444	veh/h
Directional split	51 / 49	%

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.995	
Two-way flow rate,(note-1) vp	1528	pc/h
Highest directional split proportion (note-2)	779	pc/h
Free-Flow Speed from Field Measurement:		
Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	0.5	mi/h
Free-flow speed, FFS	44.5	mi/h
Adjustment for no-passing zones, fnp	1.3	mi/h

Average travel speed, ATS	31.3	mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	1520	pc/h
Highest directional split proportion (note-2)	775	
Base percent time-spent-following, BPTSF	73.7	%
Adj.for directional distribution and no-passing zones, fd/np	6.7	
Percent time-spent-following, PTSF	80.4	%

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.48	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS+: Two-Lane Highways Release 5.4

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/1/2011
Analysis Time Period	AM Peak Hour W/Proposed Action
Highway	Kamehameha Highway
From/To	Hygienic Store
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.89	
Lane width	12.0	ft	% Trucks and buses	3	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	80	%
Grade: Length		mi	Access points/mi	10	/mi
Up/down		%			

Two-way hourly volume, V 1613 veh/h
Directional split 65 / 35 %

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.997	
Two-way flow rate,(note-1) vp	1818	pc/h
Highest directional split proportion (note-2)	1182	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	2.5	mi/h
Free-flow speed, FFS	42.5	mi/h
Adjustment for no-passing zones, fnp	1.1	mi/h

Average travel speed, ATS 27.3 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	1812	pc/h
Highest directional split proportion (note-2)	1178	
Base percent time-spent-following, BPTSF	79.7	%
Adj.for directional distribution and no-passing zones, fd/np	5.1	
Percent time-spent-following, PTSF	84.8	%

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.57	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS+: Two-Lane Highways Release 5.4

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/3/11
Analysis Time Period	PM Peak Hour W/Proposed Action
Highway	Kamehameha Highway
From/To	West of Kaihalulu Drive
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.92	
Lane width	12.0	ft	% Trucks and buses	4	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	50	%
Grade: Length		mi	Access points/mi	2	/mi
Up/down		%			

Two-way hourly volume, V	1473	veh/h
Directional split	52 / 48	%

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.996	
Two-way flow rate,(note-1) vp	1607	pc/h
Highest directional split proportion (note-2)	836	pc/h
Free-Flow Speed from Field Measurement:		
Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	0.5	mi/h
Free-flow speed, FFS	44.5	mi/h
Adjustment for no-passing zones, fnp	0.9	mi/h

Average travel speed, ATS	31.1	mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	1601	pc/h
Highest directional split proportion (note-2)	833	
Base percent time-spent-following, BPTSF	75.5	%
Adj.for directional distribution and no-passing zones, fd/np	5.2	
Percent time-spent-following, PTSF	80.7	%

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.50	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/1/2011
Analysis Time Period	PM Peak Hour W/Proposed Action
Highway	Kamehameha Highway
From/To	Haleiwa to Kawailoa
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.96	
Lane width	12.0	ft	% Trucks and buses	2	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	80	%
Grade: Length		mi	Access points/mi	2	/mi
Up/down		%			

Two-way hourly volume, V 1919 veh/h
Directional split 51 / 49 %

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.998	
Two-way flow rate,(note-1) vp	2003	pc/h
Highest directional split proportion (note-2)	1022	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	0.5	mi/h
Free-flow speed, FFS	44.5	mi/h
Adjustment for no-passing zones, fnp	1.0	mi/h

Average travel speed, ATS 28.0 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	1999	pc/h
Highest directional split proportion (note-2)	1019	
Base percent time-spent-following, BPTSF	82.7	%
Adj.for directional distribution and no-passing zones, fd/np	4.1	
Percent time-spent-following, PTSF	86.8	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.63	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/1/2011
Analysis Time Period	PM Peak Hour W/Proposed Action
Highway	Kamehameha Highway
From/To	Hygienic Store
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.99	
Lane width	12.0	ft	% Trucks and buses	5	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	80	%
Grade: Length		mi	Access points/mi	10	/mi
Up/down		%			

Two-way hourly volume, V 2072 veh/h
Directional split 57 / 43 %

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.995	
Two-way flow rate,(note-1) vp	2103	pc/h
Highest directional split proportion (note-2)	1199	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	2.5	mi/h
Free-flow speed, FFS	42.5	mi/h
Adjustment for no-passing zones, fnp	0.9	mi/h

Average travel speed, ATS 25.2 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	2093	pc/h
Highest directional split proportion (note-2)	1193	
Base percent time-spent-following, BPTSF	84.1	%
Adj.for directional distribution and no-passing zones, fd/np	3.7	
Percent time-spent-following, PTSF	87.9	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.66	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	11/5/11
Analysis Time Period	Sat Peak Hr W/Proposed Action
Highway	Kamehameha Highway
From/To	West of Kaihalulu Drive
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.92	
Lane width	12.0	ft	% Trucks and buses	3	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	50	%
Grade: Length		mi	Access points/mi	2	/mi
Up/down		%			

Two-way hourly volume, V	1842	veh/h
Directional split	51 / 49	%

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.997	
Two-way flow rate,(note-1) vp	2008	pc/h
Highest directional split proportion (note-2)	1024	pc/h
Free-Flow Speed from Field Measurement:		
Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	0.5	mi/h
Free-flow speed, FFS	44.5	mi/h
Adjustment for no-passing zones, fnp	0.8	mi/h

Average travel speed, ATS	28.2	mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	2002	pc/h
Highest directional split proportion (note-2)	1021	
Base percent time-spent-following, BPTSF	82.8	%
Adj.for directional distribution and no-passing zones, fd/np	3.3	
Percent time-spent-following, PTSF	86.1	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.63	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	10/29/2011
Analysis Time Period	Sat. Peak Hr W/Proposed Action
Highway	Kamehameha Highway
From/To	Haleiwa to Kawailoa
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.93	
Lane width	12.0	ft	% Trucks and buses	2	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	80	%
Grade: Length		mi	Access points/mi	2	/mi
Up/down		%			

Two-way hourly volume, V 2132 veh/h
Directional split 51 / 49 %

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.998	
Two-way flow rate,(note-1) vp	2297	pc/h
Highest directional split proportion (note-2)	1171	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	0.5	mi/h
Free-flow speed, FFS	44.5	mi/h
Adjustment for no-passing zones, fnp	0.9	mi/h

Average travel speed, ATS 25.8 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	2292	pc/h
Highest directional split proportion (note-2)	1169	
Base percent time-spent-following, BPTSF	86.7	%
Adj.for directional distribution and no-passing zones, fd/np	3.2	
Percent time-spent-following, PTSF	89.9	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.72	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS+: Two-Lane Highways Release 5.4

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Two-Way Two-Lane Highway Segment Analysis

Analyst	RSO
Agency/Co.	Traffic Management Consultant
Date Performed	10/29/2011
Analysis Time Period	Sat Peak Hr W/Proposed Action
Highway	Kamehameha Highway
From/To	Hygienic Store
Jurisdiction	
Analysis Year	2025
Description	Turtle Bay Resort Master Plan

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.94	
Lane width	12.0	ft	% Trucks and buses	3	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Level		% No-passing zones	80	%
Grade: Length		mi	Access points/mi	10	/mi
Up/down		%			

Two-way hourly volume, V 2139 veh/h
Directional split 55 / 45 %

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.997	
Two-way flow rate,(note-1) vp	2282	pc/h
Highest directional split proportion (note-2)	1255	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	45.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	2.5	mi/h
Free-flow speed, FFS	42.5	mi/h
Adjustment for no-passing zones, fnp	0.9	mi/h

Average travel speed, ATS 23.9 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate,(note-1) vp	2276	pc/h
Highest directional split proportion (note-2)	1252	
Base percent time-spent-following, BPTSF	86.5	%
Adj.for directional distribution and no-passing zones, fd/np	3.2	
Percent time-spent-following, PTSF	89.7	%

Level of Service and Other Performance Measures

Level of service, LOS	E	
Volume to capacity ratio, v/c	0.71	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

TRAFFIC IMPACT ANALYSIS REPORT

FOR THE PROPOSED

TURTLE BAY RESORT MASTER PLAN

KAHUKU, OAHU, HAWAII

APPENDIX H

TRAFFIC SIGNAL WARRANT ANALYSIS WORKSHEET

KAMEHAMEHA HIGHWAY AND KUILIMA DRIVE

10/11/2012

TRAFFIC SIGNAL WARRANTS

Project: Turtle Bay Resort Master Plan SEIS
Prepared By: The Traffic Management Consultant
Data Date: Start Date: 11/03/2011 (Thurs)
Major Street: Kamehameha Highway — Critical Approach Speed 35 mph — No. of Lanes 2
Minor Street: Kuilima Drive — Critical Approach Speed 25 mph — No. of Lanes 4

Critical speed on major street (mph)	≥	40	☐
			or
Population in built up area of isolated community	≤	10,000	☑

WARRANT 1 - Eight-Hour Vehicular Volume

Condition A - Minimum Vehicular Volume
(Ref.: MUTCD, Table 4C-1)

100% Satisfied	**YES** ☐	**NO** ☑
80% Satisfied	**YES** ☐	**NO** ☑
70% Satisfied	**YES** ☑	**NO** ☐
56% Satisfied	**YES** ☑	**NO** ☐

	Minimum Vehicular Volume				Hourly Vehicular Volumes							
STREET-APPROACH LANES	100%	80%	70%	56%	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM
Major Street-1 Lane (Each Approaches)	500	400	350	280	442	495	554	657	697	640	665	512
Minor Street-2 Lanes (Each Approaches)	200	160	140	112	132	154	143	142	161	179	148	133

Condition B - Interruption of Continuous Traffic
(Ref.: MUTCD, Table 4C-1)

100% Satisfied	**YES** ☐	**NO** ☑
80% Satisfied	**YES** ☐	**NO** ☑
70% Satisfied	**YES** ☑	**NO** ☐
56% Satisfied	**YES** ☑	**NO** ☐

	Minimum Vehicular Volume				Hourly Vehicular Volumes							
STREET-APPROACH LANES	100%	80%	70%	56%	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM
Major Street-2 Lanes (Each Approaches)	750	600	425	420	442	495	554	657	697	640	665	512
Minor Street-2 Lanes (Each Approaches)	100	80	70	56	132	154	143	142	161	179	148	133

WARRANT 2 - Four Hour Volume
(Ref.: MUTCD, Figures 4C-1 & 4C-2)

100% Satisfied	**YES** ☐	**NO** ☑
70% Satisfied	**YES** ☐	**NO** ☑

	Minimum Volume		Hourly Vehicular Volumes			
STREET - APPROACH LANES	100%	70%	1:00 PM	2:00 PM	3:00 PM	4:00 PM
Major Street - 2 Lanes (Both Approaches)	1400	1000	657	697	640	665
Minor Street - 2 Lanes	115	80	142	161	179	148

WARRANT 4 - Pedestrian Volume

Condition A - Four Hour Volumes
(Ref.: MUTCD, Figures 4C-5 & 4C-6)

100% Satisfied	**YES** ☐	**NO** ☑
70% Satisfied	**YES** ☐	**NO** ☑

	THRESHOLD VOLUME		HOURLY VOLUMES			
STREET - APPROACH LANES	100%	70%	2:15 PM	5:00 PM	6:00 PM	7:00 PM
Major Street (Both Approaches)	1100	770	836	622	536	392
Pedestrians Crossing Major Street	107	75	13	24	17	13

WARRANT 7 - Crash Experience **Satisfied** **YES** ☐ **NO** ☑

REQUIREMENT	WARRANT		Fulfilled	
One Warrant Satisfied 80%	Warrant 1-Minimum Vehicular Volume or		YES ☐	NO ☑
	Warrant 2-Interruption of Continuous Traffic or			
	Warrant 3-Minimum Pedestrian Volume			
Signal will not seriously disrupt progressive traffic flow			YES ☐	NO ☑
Adequate trial of less restrictive remedies has failed to reduce accidents frequency			YES ☐	NO ☑
Accidents within 12 month period susceptible to correction (Minimum 5 accidents*)			YES ☐	NO ☑

J

APPENDIX J:

AIR IMPACT ANALYSIS

AIR QUALITY STUDY

FOR THE PROPOSED

TURTLE BAY RESORT EXPANSION PROJECT

KAHUKU, OAHU, HAWAII

Prepared for:

Lee Sichter LLC

August 2012

B.D. NEAL & ASSOCIATES

*Applied Meteorology * Air Quality * Computer Science*

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7 Estimated Indirect Air Pollution Emissions from Turtle Bay Expansion Project Electrical Demand

8 Estimated Annual Solid Waste Disposal Demand for Turtle Bay Expansion Project

9 Estimated Indirect Air Pollution Emissions from Turtle Bay Expansion Project Solid Waste Disposal Demand

1.0 SUMMARY

Turtle Bay Resort is proposing the Turtle Bay Resort Expansion Project at Turtle Bay, Oahu. A Supplemental Environmental Impact Statement (SEIS) is required before the expansion project can be implemented. This report was prepared to support the SEIS. The SEIS recommends a Proposed Action and three alternatives. The three alternatives are referred to as: Conservation Partner Alternative, Full Build-Out Alternative and Resort Residential Alternative. As discussed in the SEIS, the Proposed Action is expected to be completed and fully occupied by 2025. This study examines the potential short- and long-term air quality impacts that could occur as a result of implementation of the Proposed Action and suggests mitigation measures to reduce any potential air quality impacts where possible and appropriate.

Both federal and state standards have been established to maintain ambient air quality. At the present time, seven parameters are regulated including: particulate matter, sulfur dioxide, hydrogen sulfide, nitrogen dioxide, carbon monoxide, ozone and lead. Hawaii air quality standards are generally comparable to the national standards although the state standards for carbon monoxide are more stringent than the national standards.

Regional and local climate together with the amount and type of human activity generally dictate the air quality of a given location. The climate of the project area is very much affected

by its windward and coastal situation. Winds are predominantly trade winds from the east-northeast except for occasional periods when kona storms may generate strong winds from the south or when the trade winds are weak and landbreeze-seabreeze circulations may develop. There are no published wind data for the area, but ventilation is good much of the time due to the exposure to the trade winds. Temperatures in the project area are generally very moderate with average daily temperatures ranging from about 68°F to 81°F. The extreme minimum temperature recorded at the nearby (former) Kahuku weather station is 48°F, while the extreme maximum temperature is 95°F. Average annual rainfall amounts to about 40 inches with summer months being the driest.

Currently, there are no Hawaii Department of Health air monitoring stations located at North Shore or Windward areas of Oahu. All Department of Health air monitoring stations on Oahu are located in leeward areas where there is more human activity and more air pollution emission sources. Data from these stations suggest that all air quality standards are currently being met. Windward areas, such as the project area, very likely have better air quality.

With implementation of the Proposed Action, it may be inevitable that some short- and/or long-term impacts on air quality will occur either directly or indirectly as a consequence of project construction and use. Short-term impacts from fugitive dust will likely occur during the project construction phase. To a lesser extent, exhaust emissions from stationary and mobile construction

equipment, from the disruption of traffic, and from workers' vehicles may also affect air quality during the period of construction. State air pollution control regulations require that there be no visible fugitive dust emissions at the property line. Hence, an effective dust control plan must be implemented to ensure compliance with state regulations. Fugitive dust emissions can be controlled to a large extent by watering of active work areas, using wind screens, keeping adjacent paved roads clean, and by covering of open-bodied trucks. Other dust control measures could include limiting the area that can be disturbed at any given time and/or mulching or chemically stabilizing inactive areas that have been worked. Paving and landscaping of project areas early in the construction schedule will also reduce dust emissions. Monitoring dust at the project boundary during the period of construction could be considered as a means to evaluate the effectiveness of the project dust control program. Exhaust emissions can be mitigated by moving construction equipment and workers to and from the project site during off-peak traffic hours.

After construction, motor vehicles coming to and from the proposed development will result in a long-term increase in air pollution emissions in the project area. To assess the impact of emissions from these vehicles, a computer modeling study was undertaken to estimate current ambient concentrations of carbon monoxide at intersections in the project vicinity and to predict future levels both with and without the Proposed Action. During worst-case conditions, model results indicated that present

1-hour and 8-hour carbon monoxide concentrations are within both the state and the national ambient air quality standards. In the year 2025 without the project, carbon monoxide concentrations were predicted to generally remain about the same in the project area, and worst-case concentrations should remain well within air quality standards. With the Proposed Action or any of the three project alternatives in the year 2025, project-related traffic would result in higher carbon monoxide concentrations compared to the without-project case at some locations, but worst-case concentrations should remain well within air quality standards. The Full Build-Out Alternative would result in the highest concentrations while the Resort Residential the least, although there is not a significant difference. Implementing mitigation measures for traffic-related air quality impacts is probably unnecessary and unwarranted.

Depending on the demand levels, long-term impacts on air quality are also possible due to indirect emissions associated with a development's electrical power and solid waste disposal requirements. Quantitative estimates of these potential impacts were not made, but based on the estimated demand levels and emission rates involved, any impacts from the Proposed Action or any of the three project alternatives will likely be negligible.

2.0 INTRODUCTION

Turtle Bay Resort is proposing the Turtle Bay Resort Expansion

Project at the existing Turtle Bay Resort on the island of Oahu. The project site is located along the North Shore of Oahu at Turtle Bay (see Figure 1 for project location). A Proposed Action, together with three alternatives, is being evaluated. The three alternatives are referred to as: Full Build-Out Alternative, Conservation Partner Alternative and Resort Residential Alternative.

The Proposed Action includes two new hotels totaling 625 units, 590 resort residential units, 160 community housing units, 73 acres of new parks, a new equestrian center, a farmers market, a low-density commercial and cultural activity center and reconfiguration of the two existing golf courses from 36 holes to 27. The Full Build-Out Alternative includes 2,500 new hotel units, 910 resort residential units, and 90 residential housing units. The Conservation Partner Alternative proposes 440 new hotel units, 252 new resort residential units, 48 community housing units and the conversion of the existing Fazio Golf Course to other uses. The Resort Residential Alternative would provide for 500 new residential units and both existing 18-hole golf courses would be retained. It is expected that the Proposed Action or one of the alternatives will be selected for development. The development is expected to be completed and fully occupied by 2025.

The purpose of this study is to describe existing air quality in the project area and to assess the potential short- and long-term direct and indirect air quality impacts that could result from

construction and use of the proposed facilities as planned. Measures to mitigate potential project impacts are suggested where possible and appropriate.

3.0 AMBIENT AIR QUALITY STANDARDS

Ambient concentrations of air pollution are regulated by both national and state ambient air quality standards (AAQS). National AAQS are specified in Section 40, Part 50 of the Code of Federal Regulations (CFR), while State of Hawaii AAQS are defined in Chapter 11-59 of the Hawaii Administrative Rules. Table 1 summarizes both the national and the state AAQS that are specified in the cited documents. As indicated in the table, national and state AAQS have been established for particulate matter, sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone and lead. The state has also set a standard for hydrogen sulfide. National AAQS are stated in terms of both primary and secondary standards for most of the regulated air pollutants. National primary standards are designed to protect the public health with an "adequate margin of safety". National secondary standards, on the other hand, define levels of air quality necessary to protect the public welfare from "any known or anticipated adverse effects of a pollutant". Secondary public welfare impacts may include such effects as decreased visibility, diminished comfort levels, or other potential injury to the natural or man-made environment, e.g., soiling of materials, damage to vegetation or other economic damage. In contrast to the national AAQS, Hawaii State AAQS are given in

terms of a single standard that is designed "to protect public health and welfare and to prevent the significant deterioration of air quality".

Each of the regulated air pollutants has the potential to create or exacerbate some form of adverse health effect or to produce environmental degradation when present in sufficiently high concentration for prolonged periods of time. The AAQS specify a maximum allowable concentration for a given air pollutant for one or more averaging times to prevent harmful effects. Averaging times vary from one hour to one year depending on the pollutant and type of exposure necessary to cause adverse effects. In the case of the short-term (i.e., 1- to 24-hour) AAQS, both national and state standards allow a specified number of exceedances each year.

The Hawaii AAQS are in some cases considerably more stringent than the comparable national AAQS. In particular, the Hawaii 1-hour AAQS for carbon monoxide is four times more stringent than the comparable national limit.

The national AAQS are reviewed periodically, and multiple revisions have occurred over the past 30 years. In general, the national AAQS have become more stringent with the passage of time and as more information and evidence become available concerning the detrimental effects of air pollution. Changes to the Hawaii AAQS over the past several years have tended to follow revisions to the national AAQS, making several of the

Hawaii AAQS the same as the national AAQS.

4.0 REGIONAL AND LOCAL CLIMATOLOGY

Regional and local climatology significantly affects the air quality of a given location. Wind, temperature, atmospheric turbulence, mixing height and rainfall all influence air quality. Although the climate of Hawaii is relatively moderate throughout most of the state, significant differences in these parameters may occur from one location to another. Most differences in regional and local climates within the state are caused by the mountainous topography.

Hawaii lies well within the belt of northeasterly trade winds generated by the semi-permanent Pacific high pressure cell to the north and east. On the island of Oahu, the Koolau and Waianae Mountain Ranges are oriented almost perpendicular to the trade winds, which accounts for much of the variation in the local climatology of the island. The site of the proposed project is located on the windward side of the Koolau Mountains at the northern tip of Oahu near Kahuku Point.

There are no published wind data for this area of Oahu. However, based on the project location and the good exposure to the tradewind flow, ventilation can be expected to be good much of the time. Wind energy resource maps for the Kahuku area [1] suggest that wind speeds are frequently in the upper range. Winds can be expected to come mostly from the east or northeast direction due

to the prevailing tradewind flow and to the local terrain effects.

Air pollution emissions from motor vehicles, the formation of photochemical smog and smoke plume rise all depend in part on air temperature. Colder temperatures tend to result in higher emissions of contaminants from automobiles but lower concentrations of photochemical smog and ground-level concentrations of air pollution from elevated plumes. In Hawaii, the annual and daily variation of temperature depend to a large degree on elevation above sea level, distance inland and exposure to the trade winds. Average temperatures at locations near sea level generally are warmer than those at higher elevations. Areas exposed to the trade winds tend to have the least temperature variation, while inland and leeward areas often have the most. The project's coastal, windward location results in relatively persistent and moderate temperatures. Based on more than 50 years of data collected at the former nearby Kahuku weather station, average annual daily minimum and maximum temperatures in the project area are 68°F and 81°F, respectively [2]. The extreme minimum temperature on record is 48°F, and the extreme maximum is 95°F.

Small scale, random motions in the atmosphere (turbulence) cause air pollutants to be dispersed as a function of distance or time from the point of emission. Turbulence is caused by both mechanical and thermal forces in the atmosphere. It is oftentimes measured and described in terms of Pasquill-Gifford stability class. Stability class 1 is the most turbulent and class 6 the

least. Thus, air pollution dissipates the best during stability class 1 conditions and the worst when stability class 6 prevails. In the Kahuku area, stability class 5 or 6 is generally the highest stability class that occurs, developing during clear, calm nighttime or early morning hours when temperature inversions form due to radiational cooling. Stability classes 1 through 4 occur during the daytime, depending mainly on the amount of cloud cover and incoming solar radiation and the onset and extent of the sea breeze.

Mixing height is defined as the height above the surface through which relatively vigorous vertical mixing occurs. Low mixing heights can result in high ground-level air pollution concentrations because contaminants emitted from or near the surface can become trapped within the mixing layer. In Hawaii, minimum mixing heights tend to be high because of mechanical mixing caused by the trade winds and because of the temperature moderating effect of the surrounding ocean. Low mixing heights may sometimes occur, however, at inland locations and even at times along coastal areas early in the morning following a clear, cool, windless night. Coastal areas also may experience low mixing levels during sea breeze conditions when cooler ocean air rushes in over warmer land. Mixing heights in Hawaii typically are above 3000 feet (1000 meters).

Rainfall can have a beneficial effect on the air quality of an area in that it helps to suppress fugitive dust emissions, and it also may "washout" gaseous contaminants that are water soluble.

Rainfall in Hawaii is highly variable depending on elevation and on location with respect to the trade wind. The Kahuku area receives moderate amounts of precipitation due to its windward and near sea level location. Average annual rainfall amounts to about 40 inches with monthly amounts of about 4 to 5 inches in winter and about 1 to 2 inches in summer [2].

5.0 PRESENT AIR QUALITY

Present air quality in the project area is mostly affected by air pollutants from motor vehicles, agricultural operations and to a lesser extent by natural sources. Table 3 presents an air pollutant emission summary for the island of Oahu for calendar year 1993. This is the most recent information available. The emission rates shown in the table pertain to manmade emissions only, i.e., emissions from natural sources are not included. As suggested in the table, much of the particulate emissions on Oahu originate from area sources, such as the mineral products industry and agriculture. Sulfur oxides are emitted almost exclusively by point sources, such as power plants and refineries. Nitrogen oxides emissions emanate predominantly from industrial point sources, although area sources (mostly motor vehicle traffic) also contribute a significant share. The majority of carbon monoxide emissions occur from area sources (motor vehicle traffic), while hydrocarbons are emitted mainly from point sources. Based on previous emission inventories that have been reported for Oahu, emissions of particulate and nitrogen oxides may have increased during the past several years, while emissions of sulfur oxides,

carbon monoxide and hydrocarbons probably have declined.

Kamehameha Highway, which passes near the project area to the south, is a major arterial roadway that presently carries moderate to heavy levels of vehicle traffic during peak traffic hours. Emissions from motor vehicles using this roadway, primarily nitrogen oxides and carbon monoxide, will tend to be carried away from the project site by the prevailing winds.

Natural sources of air pollution emissions that also could affect the project area but cannot be quantified very accurately include the ocean (sea spray), plants (aero-allergens), wind-blown dust, and perhaps distant volcanoes on the island of Hawaii.

The State Department of Health operates a network of air quality monitoring stations at various locations on Oahu. Each station, however, typically does not monitor the full complement of air quality parameters, and no stations are located on the windward side of the island or anywhere near to the project site. Thus, air quality data from stations at leeward locations will be discussed, but this data is probably only marginally representative of the project area. Table 3 shows annual summaries of air quality measurements that were made at leeward Oahu locations for several of the regulated air pollutants for the period 2006 through 2010. These are the most recent data that are currently available.

During the 2006-2010 period, sulfur dioxide was monitored by the State Department of Health at an air quality station located at Kapolei. Concentrations monitored were consistently low compared to the standards. Annual second-highest 3-hour concentrations (which are most relevant to the air quality standards) ranged from 0.004 to 0.011 parts per million (ppm), while the annual second-highest 24-hour concentrations ranged from 0.003 to 0.004 ppm. Annual average concentrations were only about 0.001 to 0.002 ppm. There were no exceedances of the state/national 3-hour or 24-hour AAQS for sulfur dioxide during the 5-year period. Data pertaining to the new 1-hour standard have not yet been reported.

Particulate matter less than 10 microns in diameter (PM-10) is also measured at the Kapolei monitoring station. Annual second-highest 24-hour PM-10 concentrations ranged from 36 to 58 $\mu g/m^3$ between 2006 and 2010. Average annual concentrations ranged from 16 to 18 $\mu g/m^3$. All values reported were within the state and national AAQS.

Particulate matter less than 2.5 microns in diameter (PM-2.5) measured at the Kapolei monitoring station had annual 98th percentile 24-hour concentrations ranging from 7 to 21 $\mu g/m^3$ between 2006 and 2010. Average annual concentrations ranged from 4 to 6 $\mu g/m^3$. All values reported were within the state and national AAQS.

Carbon monoxide measurements were also made at the Kapolei monitoring station. The annual second-highest 1-hour concentrations ranged from 0.9 to 2.6 ppm. The annual second-highest 8-hour concentrations ranged from 0.7 to 1.2 ppm. These values are well within the standards, and no exceedances of the state or national 1-hour or 8-hour AAQS were reported.

Nitrogen dioxide is also monitored by the Department of Health at the Kapolei monitoring station. Annual average concentrations of this pollutant ranged from 0.003 to 0.005 ppm, safely inside the state and national AAQS.

The nearest available ozone measurements were obtained at Sand Island. The fourth-highest 8-hour concentrations (which are most relevant to the standard) for the period 2006 through 2010 ranged between 0.033 and 0.048 ppm, well inside the state and federal standards. The 8-hour standard for ozone did not exist prior to 2002. Prior to 2002, the now obsolete state 1-hour standard was typically exceeded several times each year.

Although not shown in the table, the nearest and most recent measurements of ambient lead concentrations that have been reported were made at the downtown Honolulu monitoring station between 1996 and 1997. Average quarterly concentrations were near or below the detection limit, and no exceedances of the state AAQS were recorded. Monitoring for this parameter was discontinued during 1997.

It is probable that air pollution concentrations measured at leeward locations are higher than those present on the windward coast where the project is located. Based on the data and discussion presented above, it appears likely that the State of Hawaii AAQS for sulfur dioxide, nitrogen dioxide, particulate matter, ozone and lead are currently being met in the project area. While carbon monoxide measurements at the Kapolei monitoring station suggest that concentrations are within the state and national standards, local “hot spots” may exist near traffic-congested intersections. The potential for this within the specific project area is examined later in this report.

6.0 SHORT-TERM IMPACTS OF PROJECT

Short-term direct and indirect impacts on air quality could potentially occur due to project construction. For a project of this nature, there are two potential types of air pollution emissions that could directly result in short-term air quality impacts during project construction: (1) fugitive dust from vehicle movement and soil excavation; and (2) exhaust emissions from on-site construction equipment. Indirectly, there also could be short-term impacts from slow-moving construction equipment traveling to and from the project site, from a temporary increase in local traffic caused by commuting construction workers, and from the disruption of normal traffic flow caused by lane closures of adjacent roadways.

Fugitive dust emissions may arise from the grading and dirt-moving activities associated with site clearing and preparation work. The emission rate for fugitive dust emissions from construction activities is difficult to estimate accurately. This is because of its elusive nature of emission and because the potential for its generation varies greatly depending upon the type of soil at the construction site, the amount and type of dirt-disturbing activity taking place, the moisture content of exposed soil in work areas, and the wind speed. The EPA [3] has provided a rough estimate for uncontrolled fugitive dust emissions from construction activity of 1.2 tons per acre per month under conditions of "medium" activity, moderate soil silt content (30%), and precipitation/evaporation (P/E) index of 50. Uncontrolled fugitive dust emissions at the project site would likely be somewhere near that level, depending on the amount of rainfall that occurs. In any case, State of Hawaii Air Pollution Control Regulations [4] prohibit visible emissions of fugitive dust from construction activities at the property line. Thus, an effective dust control plan for the project construction phase is essential.

Adequate fugitive dust control can usually be accomplished by the establishment of a frequent watering program to keep bare-dirt surfaces in construction areas from becoming significant sources of dust. In dust-prone or dust-sensitive areas, other control measures such as limiting the area that can be disturbed at any given time, applying chemical soil stabilizers, mulching and/or using wind screens may be necessary. Control regulations further stipulate that open-bodied trucks be covered at all times when in

motion if they are transporting materials that could be blown away. Haul trucks tracking dirt onto paved streets from unpaved areas is often a significant source of dust in construction areas. Some means to alleviate this problem, such as road cleaning or tire washing, may be appropriate. Paving of parking areas and/or establishment of landscaping as early in the construction schedule as possible can also lower the potential for fugitive dust emissions. Monitoring dust at the project property line could be considered to quantify and document the effectiveness of dust control measures.

On-site mobile and stationary construction equipment also will emit air pollutants from engine exhausts. The largest of this equipment is usually diesel-powered. Nitrogen oxides emissions from diesel engines can be relatively high compared to gasoline-powered equipment, but the annual standard for nitrogen dioxide is not likely to be violated by short-term construction equipment emissions. Also, the new short-term (1-hour) standard for nitrogen dioxide is based on a three-year average; thus it is unlikely that relatively short-term construction emissions would exceed the standard. Carbon monoxide emissions from diesel engines are low and should be relatively insignificant compared to vehicular emissions on nearby roadways.

Project construction activities could occasionally obstruct the normal flow of traffic at times to such an extent that overall vehicular emissions in the project area will temporarily increase. The only means to alleviate this problem will be to

attempt to keep roadways open during peak traffic hours and to move heavy construction equipment and workers to and from construction areas during periods of low traffic volume. Thus, most potential short-term air quality impacts from project construction can be mitigated.

7.0 LONG-TERM IMPACTS OF PROJECT

7.1 Roadway Traffic

After construction is completed, use of the proposed facilities will result in increased motor vehicle traffic in the project area, potentially causing long-term impacts on ambient air quality. Motor vehicles with gasoline-powered engines are significant sources of carbon monoxide. They also emit nitrogen oxides and other contaminates.

Federal air pollution control regulations require that new motor vehicles be equipped with emission control devices that reduce emissions significantly compared to a few years ago. In 1990, the President signed into law the Clean Air Act Amendments. This legislation required further emission reductions, which have been phased in since 1994. Additional restrictions were signed into law during the Clinton administration, and these began to take effect during the past decade. The added restrictions on emissions from new motor vehicles will lower average emissions each year as more and more older vehicles leave the state's roadways. It is estimated that carbon monoxide emissions, for

example, will go down by an average of about 20 percent per vehicle during the next 10 years due to the replacement of older vehicles with newer models.

To evaluate the potential long-term indirect ambient air quality impact of increased roadway traffic associated with a project such as this, computerized emission and atmospheric dispersion models can be used to estimate ambient carbon monoxide concentrations along roadways leading to and from the project. Carbon monoxide is selected for modeling because it is both the most stable and the most abundant of the pollutants generated by motor vehicles. Furthermore, carbon monoxide air pollution is generally considered to be a microscale problem that can be addressed locally to some extent, whereas nitrogen oxides air pollution most often is a regional issue that cannot be addressed by a single new development.

For this project, six scenarios were selected for the carbon monoxide modeling study: (1) year 2012 with present conditions, (2) year 2025 without the project, (3) year 2025 with the project Conservation Partner Alternative, (4) year 2025 with the project Full Build-Out Alternative, (5) year 2025 with the Proposed Action, and (6) year 2025 with the project Resort Residential Alternative. To begin the modeling study of the six scenarios, critical receptor areas in the vicinity of the project were identified for analysis. Generally speaking, roadway intersections are the primary concern because of traffic congestion and because of the increase in vehicular emissions

associated with traffic queuing. For this study, the key intersections identified in the traffic study were also selected for air quality analysis. These included the following intersections:

- Kamehameha Highway at Kuilima Drive
- Kamehameha Highway at Marconi Road
- Kamehameha Highway at Kaihalulu Drive (the project's new lateral roadway)

The traffic impact report for the project [5] describes the existing and the projected future traffic conditions and laneage configurations of these intersections in detail. In performing the air quality impact analysis, it was assumed that all recommended traffic mitigation measures would be implemented.

The main objective of the modeling study was to estimate maximum 1-hour average carbon monoxide concentrations for each of the four scenarios studied. To evaluate the significance of the estimated concentrations, a comparison of the predicted values for each scenario can be made. Comparison of the estimated values to the national and state AAQS was also used to provide another measure of significance.

Maximum carbon monoxide concentrations typically coincide with peak traffic periods. The traffic impact assessment report evaluated weekday morning, weekday afternoon and Saturday peak traffic periods. These same periods were evaluated in the air

quality impact assessment.

The EPA computer model MOBILE6.2 [6] was used to calculate vehicular carbon monoxide emissions for each year studied. One of the key inputs to MOBILE6.2 is vehicle mix. Unless very detailed information is available, national average values are typically assumed, which is what was used for the present study. Based on national average vehicle mix figures, the present vehicle mix in the project area was estimated to be 33.2% light-duty gasoline-powered automobiles, 53.9% light-duty gasoline-powered trucks and vans, 3.6% heavy-duty gasoline-powered vehicles, 0.2% light-duty diesel-powered vehicles, 8.6% heavy-duty diesel-powered trucks and buses, and 0.5% motorcycles. For the future scenarios studied, the vehicle mix was estimated to change slightly with fewer light-duty gasoline-powered automobiles and more light-duty gasoline-powered trucks and vans. This reflects the nationwide trend of driver preferences in motor vehicles.

Ambient temperatures of 59 and 68 degrees F were used for morning and afternoon peak-hour emission computations, respectively. These are conservative assumptions since morning/afternoon ambient temperatures will generally be warmer than this, and emission estimates given by MOBILE6.2 generally have an inverse relationship to the ambient temperature.

After computing vehicular carbon monoxide emissions through the use of MOBILE6.2, these data were then input to an atmospheric dispersion model. EPA air quality modeling guidelines [7]

currently recommend that the computer model CAL3QHC [8] be used to assess carbon monoxide concentrations at roadway intersections, or in areas where its use has previously been established, CALINE4 [9] may be used. CALINE4 was used extensively in Hawaii in the 1990's to assess air quality impacts at roadway intersections, but in December 1997, the California Department of Transportation recommended that the intersection mode of CALINE4 no longer be used because it was thought the model had become outdated. Studies have shown that CALINE4 may tend to over-predict maximum concentrations in some situations. For the past several years, CAL3QHC has been used in Hawaii to assess air quality impacts near roadway intersections, and therefore, CAL3QHC was used for the subject analysis.

CAL3QHC was developed for the U.S. EPA to simulate vehicular movement, vehicle queuing and atmospheric dispersion of vehicular emissions near roadway intersections. It is designed to predict 1-hour average pollutant concentrations near roadway intersections based on input traffic and emission data, roadway/receptor geometry and meteorological conditions.

Although CAL3QHC is intended primarily for use in assessing atmospheric dispersion near signalized roadway intersections, it can also be used to evaluate unsignalized intersections. This is accomplished by manually estimating queue lengths and then applying the same techniques used by the model for signalized intersections. Currently, the two existing study intersection

(Kamehameha Highway at Kuilima Drive and Kamehameha Highway at Marconi Road) are unsignalized. For the future without project scenario, in accordance with the traffic report, these intersections were assumed to remain unsignalized. For the future scenarios with the project, in accordance with the traffic report, these intersections, as well as a new intersection at Kamehameha Highway and Kaihalulu Drive, were assumed to become signalized.

Input peak-hour traffic data were obtained from the traffic study cited previously. This included vehicle approach volumes, saturation capacity estimates, intersection laneage and signal timings (where applicable). All emission factors that were input to CAL3QHC for free-flow traffic on roadways were obtained from MOBILE6.2 based on assumed free-flow vehicle speeds corresponding to the posted speed limits.

Model roadways were set up to reflect roadway geometry, physical dimensions and operating characteristics. Concentrations predicted by air quality models generally are not considered valid within the roadway-mixing zone. The roadway-mixing zone is usually taken to include 3 meters on either side of the traveled portion of the roadway and the turbulent area within 10 meters of a cross street. Model receptor sites were thus located at the edges of the mixing zones near all intersections that were studied for all scenarios. All receptor heights were placed at 1.8 meters above ground to simulate levels within the normal human breathing zone.

Input meteorological conditions for this study were defined to provide "worst-case" results. One of the key meteorological inputs is atmospheric stability category. For these analyses, atmospheric stability category 6 was assumed for the weekday morning cases, while atmospheric stability category 4 was assumed for the weekday and Saturday afternoon cases. These are the most conservative stability categories that are generally used for estimating worst-case pollutant dispersion within suburban areas for these periods. A surface roughness length of 100 cm and a mixing height of 1000 meters were used in all cases. Worst-case wind conditions were defined as a wind speed of 1 meter per second with a wind direction resulting in the highest predicted concentration. Concentration estimates were calculated at wind directions of every 5 degrees.

Existing background concentrations of carbon monoxide in the project vicinity are believed to be at low levels. Thus, background contributions of carbon monoxide from sources or roadways not directly considered in the analysis were accounted for by adding a background concentration of 0.5 ppm to all predicted concentrations for 2012. Although increased traffic is expected to occur within the project area during the next several years with or without the project, background carbon monoxide concentrations may not change significantly since individual emissions from motor vehicles are forecast to decrease with time. Hence, a background value of 0.5 ppm was assumed to persist for the future scenarios studied.

Predicted Worst-Case 1-Hour Concentrations

Table 4 summarizes the final results of the modeling study in the form of the estimated worst-case 1-hour morning and afternoon ambient carbon monoxide concentrations. These results can be compared directly to the state and the national AAQS. Estimated worst-case carbon monoxide concentrations are presented in the table for six scenarios: year 2012 with existing traffic, year 2025 without the project, year 2025 with the Proposed Action, year 2025 with the project Full Build-Out Alternative, year 2025 with the project Conservation Partner Alternative and year 2025 with the project Resort Residential Alternative. The locations of these estimated worst-case 1-hour concentrations all occurred at or very near the indicated intersections.

As indicated in the table, the highest estimated 1-hour concentration within the project vicinity for the present (2012) case was 1.7 ppm. This was projected to occur during both the weekday morning peak traffic hour and the Saturday peak traffic period near the intersection of Kamehameha Highway and Kuilima Drive. Concentrations at other locations and times studied were 1.3 ppm or lower. All predicted worst-case 1-hour concentrations for the 2012 scenario were within both the national AAQS of 35 ppm and the state standard of 9 ppm.

In the year 2025 without the proposed project, the highest worst-case 1-hour concentration was predicted to occur during the Saturday peak traffic hour at the intersection of Kamehameha

Highway and Kuilima Drive. A value of 1.8 ppm was predicted to occur at this location and time. Peak-hour worst-case values at the other locations and times studied for the 2025 without project scenario ranged between 1.0 and 1.6 ppm. Compared to the existing case, concentrations generally remained about the same, and all projected worst-case concentrations for this scenario remained well within the state and national standards.

In the year 2025, the full build-out alternative was predicted to result in the highest worst-case 1-hour concentration. This was predicted to occur during the weekday morning at the intersection of Kamehameha Highway and Kuilima Drive with a value of 3.1 ppm. Other concentrations for this alternative ranged between 2.0 and 2.9 ppm. The Proposed Action and other project alternatives generally resulted in slightly lower concentrations, but the difference amongst them was relatively small. Although the predicted concentrations with any development increased compared to the without project scenario, the values remained well within the state and federal standards.

Predicted Worst-Case 8-Hour Concentrations

Worst-case 8-hour carbon monoxide concentrations were estimated by multiplying the worst-case 1-hour values by a persistence factor of 0.5. This accounts for two factors: (1) traffic volumes averaged over eight hours are lower than peak 1-hour values, and (2) meteorological conditions are more variable (and hence more favorable for dispersion) over an 8-hour period than they are for

a single hour. Based on monitoring data, 1-hour to 8-hour persistence factors for most locations generally vary from 0.4 to 0.8 with 0.6 being the most typical. One study based on modeling [10] concluded that 1-hour to 8-hour persistence factors could typically be expected to range from 0.4 to 0.5. EPA guidelines [11] recommend using a value of 0.7 unless a locally derived persistence factor is available. Recent monitoring data for locations on Oahu reported by the Department of Health [12] suggest that this factor may range between about 0.2 and 0.6 depending on location and traffic variability. Considering the location of the project and the traffic pattern for the area, a 1-hour to 8-hour persistence factor of 0.5 will likely yield reasonable estimates of worst-case 8-hour concentrations.

The resulting estimated worst-case 8-hour concentrations are indicated in Table 5. For the 2012 scenario, the estimated worst-case 8-hour carbon monoxide concentrations for the two locations studied were 0.6 ppm at the Kamehameha Highway/Marconi Road intersection and 0.8 ppm at the Kamehameha Highway/Kuilima Drive intersection. The estimated worst-case concentrations for the existing case were within both the state standard of 4.4 ppm and the national limit of 9 ppm.

For the year 2025 without project scenario, worst-case concentrations ranged between 0.6 and 0.9 ppm, with the highest concentration occurring at Kamehameha Highway and Kuilima Drive. All predicted concentrations were within the standards.

For the 2025 with Proposed Action or alternatives, worst-case concentrations were predicted to increase somewhat compared to the without project case. At the three intersections studied, predicted worst-case concentrations ranged from 1.0 to 1.6 ppm with the highest concentration occurring at the intersection of Kamehameha Highway and Kaihalulu Drive in the Full Build-Out Alternative. All predicted 8-hour concentrations for the Proposed Action and alternatives were within both the national and the state AAQS.

Conservativeness of Estimates

The results of this study reflect several assumptions that were made concerning both traffic movement and worst-case meteorological conditions. One such assumption concerning worst-case meteorological conditions is that a wind speed of 1 meter per second with a steady direction for 1 hour will occur. A steady wind of 1 meter per second blowing from a single direction for an hour is extremely unlikely and may occur only once a year or less. With wind speeds of 2 meters per second, for example, computed carbon monoxide concentrations would be only about half the values given above. The 8-hour estimates are also conservative in that it is unlikely that anyone would occupy the assumed receptor sites (within 3 m of the roadways) for a period of 8 hours.

7.2 Electrical Demand

The Proposed Action also will cause indirect air pollution emissions from power generating facilities as a consequence of electrical power usage. The estimated annual electrical demands of the Proposed Action and alternatives are shown in Table 6. The highest electrical demand, 107 million kilowatt-hours per year, would occur with the Full Build-Out Alternative, while the Resort Residential Alternative would have the least at 31 million kilowatt-hours per year. Electrical power for the development will most probably be provided mainly by oil-fired generating facilities located on Oahu, but some of the power could also come from sources burning other fuels, such as H-Power and the AES coal-fired power plant at Campbell Industrial Park, or from renewable energy resources that are currently being developed. In order to meet the electrical power needs of the Proposed Action, power generating facilities may be required to burn more fuel and hence more air pollution may be emitted at these facilities. Table 7 presents estimates of the indirect air pollution emissions that would result from the Proposed Action’s electrical demand assuming all power is provided by burning more fuel oil at Oahu's power plants. These values can be compared to the island-wide emission estimates for 1993 given in Table 3. The Full Build-Out Alternative would have the highest emissions, while the Resort Residential Alternative would have the least. The Proposed Action or alternatives would result in relatively small emissions from project electrical demand. The estimated indirect emissions from the electrical

demand amounts to less than 0.1 percent of the present air pollution emissions occurring on Oahu.

7.3 Solid Waste Disposal

Solid waste generated by the Proposed Action or alternatives is not expected to exceed the amounts indicated in Table 8. As indicated in the table, the estimated amounts assume 70 percent recycling/reuse diversion. Most project refuse will likely be hauled away and burned at the H-Power facility at Campbell Industrial Park to generate electricity. Burning of the waste to generate electricity will result in emissions of particulate, carbon monoxide and other contaminants, but these will be offset to some extent by reducing the amount of fuel oil that may be required to generate electricity for the project. Table 9 gives emission estimates assuming all project solid waste is burned at H-Power. These values can be compared to the island-wide emission estimates for 1993 given in Table 2. The estimated potential indirect emissions from project solid waste disposal demand amount to less than 0.1 percent of the present air pollution emissions occurring on Oahu. The emissions from the Proposed Action or alternatives are relatively small. The Full Build-Out Alternative would result in the most emissions and the Resort Residential Alternative the least.

8.0 CONCLUSIONS AND RECOMMENDATIONS

The major potential short-term air quality impact of the project

will occur from the emission of fugitive dust during construction. Uncontrolled fugitive dust emissions from construction activities are estimated to amount to about 1.2 tons per acre per month, depending on rainfall. To control dust, active work areas and any temporary unpaved work roads should be watered at least twice daily on days without rainfall. Use of wind screens and/or limiting the area that is disturbed at any given time will also help to contain fugitive dust emissions. Wind erosion of inactive areas of the site that have been disturbed could be controlled by mulching or by the use of chemical soil stabilizers. Dirt-hauling trucks should be covered when traveling on roadways to prevent windage. A routine road cleaning and/or tire washing program will also help to reduce fugitive dust emissions that may occur as a result of trucks tracking dirt onto paved roadways in the project area. Paving of parking areas and establishment of landscaping early in the construction schedule will also help to control dust. Monitoring dust at the project boundary during the period of construction could be considered as a means to evaluate the effectiveness of the project dust control program and to adjust the program if necessary.

During construction phases, emissions from engine exhausts (primarily consisting of carbon monoxide and nitrogen oxides) will also occur both from on-site construction equipment and from vehicles used by construction workers and from trucks traveling to and from the project. Increased vehicular emissions due to disruption of traffic by construction equipment and/or commuting construction workers can be alleviated by moving equipment and

personnel to the site during off-peak traffic hours.

After construction of the Proposed Action or alternative is completed and fully occupied, carbon monoxide concentrations in the project area will likely increase due to emissions from project-related motor vehicle traffic. The Full Build-Out Alternative would likely have the most impact, while the Resort Residential Alternative the least, but worst-case concentrations should remain within both the state and the national ambient air quality standards with the Proposed Action or any of the three project alternatives studied. Implementing any air quality mitigation measures for long-term traffic-related impacts is probably unnecessary and unwarranted.

Any long-term impacts on air quality due to indirect emissions from supplying the project with electricity and from the disposal of waste materials generated by the project will likely be negligible based on the magnitudes of the estimated emissions compared to the current island-wide emissions.

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Figure 1 - Project Location

Table 1

SUMMARY OF STATE OF HAWAII AND NATIONAL AMBIENT AIR QUALITY STANDARDS

Pollutant	Units	Averaging Time	Maximum Allowable Concentration		
			National Primary	National Secondary	State of Hawaii
Particulate Matter (<10 microns)	µg/m³	Annual	-	-	50
		24 Hours	150[a]	150[a]	150[b]
Particulate Matter (<2.5 microns)	µg/m³	Annual	15[c]	15[c]	-
		24 Hours	35[d]	35[d]	-
Sulfur Dioxide	ppm	Annual	-	-	0.03
		24 Hours	-	-	0.14[b]
		3 Hours	-	0.5[b]	0.5[b]
		1 Hour	0.075[e]	-	-
Nitrogen Dioxide	ppm	Annual	0.053	0.053	0.04
		1 Hour	0.100[f]	-	-
Carbon Monoxide	ppm	8 Hours	9[b]	-	4.4[b]
		1 Hour	35[b]	-	9[b]
Ozone	ppm	8 Hours	0.075[g]	0.075[g]	0.08[g]
Lead	µg/m³	3 Months	0.15[h]	0.15[h]	-
		Quarter	1.5[i]	1.5[i]	1.5[i]
Hydrogen Sulfide	ppm	1 Hour	-	-	0.035[b]

[a] Not to be exceeded more than once per year on average over three years.
[b] Not to be exceeded more than once per year.
[c] Three-year average of the weighted annual arithmetic mean.
[d] 98th percentile value of the 24-hour concentrations averaged over three years.
[e] Three-year average of annual fourth-highest daily 1-hour maximum.
[f] 98th percentile value of the daily 1-hour maximum averaged over three years.
[g] Three-year average of annual fourth-highest daily 8-hour maximum.
[h] Rolling 3-month average.
[i] Quarterly average.

Table 2

AIR POLLUTION EMISSIONS INVENTORY FOR ISLAND OF OAHU, 1993

Air Pollutant	Point Sources (tons/year)	Area Sources (tons/year)	Total (tons/year)
Particulate	25,891	49,374	75,265
Sulfur Oxides	39,230	nil	39,230
Nitrogen Oxides	92,436	31,141	123,577
Carbon Monoxide	28,757	121,802	150,559
Hydrocarbons	4,160	421	4,581

Source: Final Report, "Review, Revise and Update of the Hawaii Emissions Inventory Systems for the State of Hawaii", prepared for Hawaii Department of Health by J.L. Shoemaker & Associates, Inc., 1996

Table 3

ANNUAL SUMMARIES OF AIR QUALITY MEASUREMENTS FOR MONITORING STATIONS NEAREST TURTLE BAY EXPANSION PROJECT

Parameter / Location	2006	2007	2008	2009	2010
Sulfur Dioxide / Kapolei					
3-Hour Averaging Period:					
Highest Concentration (ppm)	0.005	0.010	0.009	0.010	0.012
2nd Highest Concentration (ppm)	0.004	0.008	0.009	0.007	0.011
No. of State AAQS Exceedances	0	0	0	0	0
24-Hour Averaging Period:					
Highest Concentration (ppm)	0.003	0.003	0.005	0.003	0.004
2nd Highest Concentration (ppm)	0.003	0.003	0.003	0.003	0.004
No. of State AAQS Exceedances	0	0	0	0	0
Annual Average Concentration (ppm)	0.002	0.002	0.001	0.001	0.001
Particulate (PM-10) / Kapolei					
24-Hour Averaging Period:					
Highest Concentration ($\mu g/m^3$)	59	75(a)	61	37	59
2nd Highest Concentration ($\mu g/m^3$)	58	57	44	36	58
No. of State AAQS Exceedances	0	0	0	0	0
Annual Average Concentration ($\mu g/m^3$)	16	17	18	16	16
Particulate (PM-2.5) / Kapolei					
24-Hour Averaging Period:					
Highest Concentration ($\mu g/m^3$)	34(a)	20	35	25	61(a)
98th percentile Concentration ($\mu g/m^3$)	7	8	21	13	12
No. of State AAQS Exceedances	0	0	0	0	1(a)
Annual Average Concentration ($\mu g/m^3$)	4	4	5	6	4
Carbon Monoxide / Kapolei					
1-Hour Averaging Period:					
Highest Concentration (ppm)	1.4	3.8	2.2	3.7	1.6
2nd Highest Concentration (ppm)	1.4	0.9	1.7	2.6	1.5
No. of State AAQS Exceedances	0	0	0	0	0
8-Hour Averaging Period:					
Highest Concentration (ppm)	1.0	0.8	0.7	1.2	1.0
2nd Highest Concentration (ppm)	1.0	0.7	0.7	1.2	0.8
No. of State AAQS Exceedances	0	0	0	0	0
Nitrogen Dioxide / Kapolei					
Annual Average Concentration (ppm)	0.005	0.005	0.004	0.004	0.003
Ozone / Sand Island					
8-Hour Averaging Period:					
Highest Concentration (ppm)	0.042	0.035	0.048	0.049	0.052
4th Highest Concentration (ppm)	0.042	0.033	0.043	0.048	0.047
No. of State AAQS Exceedances	0	0	0	0	0

(a) Data flagged due to fireworks. SOURCE: STATE OF HAWAII DEPARTMENT OF HEALTH, "ANNUAL SUMMARIES" HAWAII AIR QUALITY DATA, 2006 - 2010"

Table 4

ESTIMATED WORST-CASE 1-HOUR CARBON MONOXIDE CONCENTRATIONS ALONG ROADWAYS NEAR TURTLE BAY EXPANSION PROJECT (parts per million)

Roadway Intersection	Year/Scenario								
	2012/Present			2025/Without Project			2025/Proposed Action		
	AM	PM	Sat.	AM	PM	Sat.	AM	PM	Sat.
Kamehameha Highway at Kuilima Drive	1.7	1.3	1.7	1.6	1.4	1.8	2.4	1.9	2.1
Kamehameha Highway at Marconi Road	1.3	1.0	1.0	1.3	1.0	1.1	2.1	1.6	2.2
Kamehameha Highway at Kaihalulu Drive	-	-	-	-	-	-	2.6	1.6	2.0

Hawaii State AAQS: 9
National AAQS: 35

(Continued)

Table 4 (cont.)

ESTIMATED WORST-CASE 1-HOUR CARBON MONOXIDE CONCENTRATIONS ALONG ROADWAYS NEAR TURTLE BAY EXPANSION PROJECT (parts per million)

Roadway Intersection	Year/Scenario								
	2025/Full Build-Out			2025/Conservation Partner			2025/Resort Residential		
	AM	PM	Sat.	AM	PM	Sat.	AM	PM	Sat.
Kamehameha Highway at Kuilima Drive	2.9	2.1	2.2	2.2	1.7	2.0	2.2	1.6	2.0
Kamehameha Highway at Marconi Road	2.7	2.0	2.2	1.9	1.3	1.7	1.9	1.3	1.7
Kamehameha Highway at Kaihalulu Drive	3.1	2.6	2.4	2.4	1.5	2.0	2.0	1.4	1.8

Hawaii State AAQS: 9
National AAQS: 35

Table 5

ESTIMATED WORST-CASE 8-HOUR CARBON MONOXIDE CONCENTRATIONS ALONG ROADWAYS NEAR TURTLE BAY EXPANSION PROJECT (parts per million)

Roadway Intersection	Year/Scenario		
	2012/Present	2025/Without Project	2025/Proposed Action
Kamehameha Highway at Kuilima Drive	0.8	0.9	1.2
Kamehameha Highway at Marconi Road	0.6	0.6	1.1
Kamehameha Highway at Kaihalulu Drive	-	-	1.3

Hawaii State AAQS: 4.4
National AAQS: 9

(Continued)

Table 5 (cont.)

ESTIMATED WORST-CASE 8-HOUR CARBON MONOXIDE CONCENTRATIONS ALONG ROADWAYS NEAR TURTLE BAY EXPANSION PROJECT (parts per million)

Roadway Intersection	Year/Scenario		
	2025/Full Build-Out	2025/Conservation Partner	2025/Resort Residential
Kamehameha Highway at Kuilima Drive	1.4	1.1	1.1
Kamehameha Highway at Marconi Road	1.4	1.0	1.0
Kamehameha Highway at Kaihalulu Drive	1.6	1.2	1.0

Hawaii State AAQS: 4.4
National AAQS: 9

Table 6

ESTIMATED ANNUAL ELECTRICAL DEMAND FOR TURTLE BAY EXPANSION PROJECT

Project	Estimated Annual Electrical Demand (million kilowatt-hours
Proposed Action	70
Full Build-Out Alternative	107
Conservation Partner Alternative	46
Resort Residential Alternative	31

Source: Personal communication via email from Cheryl Palesh, Belt Collins Hawaii LLC, to Barry D. Neal, B.D. Neal & Associates, Turtle Bay Resort Monthly Electrical Demand Estimates, August 22, 2012.

Table 7

ESTIMATED INDIRECT AIR POLLUTION EMISSIONS FROM TURTLE BAY EXPANSION PROJECT ELECTRICAL DEMAND[a]

Air Pollutant	Emission Rate (tons/year)			
	Proposed Action	Full Build-Out	Conservation Partner	Resort Residential
Particulate	2	3	1	1
Sulfur Dioxide	24	36	16	11
Carbon Monoxide	2	3	1	1
Volatile Organics	1	1	<1	<1
Nitrogen Oxides	10	16	7	4

[a]Based on U.S. EPA emission factors for utility boilers [3]. Assumes electrical demand indicated in Table 6 and low-sulfur oil used to generate power.

Table 8

ESTIMATED ANNUAL SOLID WASTE DISPOSAL DEMAND FOR TURTLE BAY EXPANSION PROJECT

Project	Estimated Annual Solid Waste Disposal Demand (tons)[a]
Proposed Action	2,626
Full Build-Out Alternative	3,686
Conservation Partner Alternative	1,173
Resort Residential Alternative	1,106

[a]Assumes 70 percent recycling/reuse diversion.

Source: Personal communication via email from Lee Sichter, Lee Sichter LLC, to Barry D. Neal, B.D. Neal & Associates, Turtle Bay Resort Annual Solid Waste Disposal Demand Estimates, August 14, 2012.

Table 9

ESTIMATED INDIRECT AIR POLLUTION EMISSIONS FROM TURTLE BAY EXPANSION PROJECT SOLID WASTE DISPOSAL DEMAND[a]

Air Pollutant	Emission Rate (tons/year)			
	Proposed Action	Full Build-Out	Conservation Partner	Resort Residential
Particulate	0.2	0.2	0.1	0.1
Sulfur Dioxide	0.6	0.8	0.2	0.2
Carbon Monoxide	2.5	3.5	1.1	1.1
Nitrogen Oxides	6.6	9.2	2.9	2.8
Lead	0.3	0.4	0.1	0.1

[a]Assumes solid waste disposal demands indicated in Table 8 and that solid waste is burned in a refuse-derived fuel-fired power plant equipped with spray dryer and fabric filter. Emission rates based on U.S. EPA emission factors for refuse-derived fuel-fired combustors [3].

APPENDIX K:

NOISE IMPACT ANALYSIS

K

ACOUSTIC STUDY FOR THE TURTLE BAY RESORT MASTER PLAN KAHUKU, OAHU, HAWAII

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CHAPTER I. SUMMARY

The existing and future traffic noise levels in the vicinity of the proposed Master Plan for the Turtle Bay Resort at Kawela Bay, Oahu were evaluated for their potential impact on present and future noise sensitive areas. Figure 1 depicts the location of the project site. The future traffic noise levels along the primary access roadways to the project were calculated for the year 2025.

Along the existing Kamehameha Highway, traffic noise levels were expected to increase by 1.2 to 4.3 DNL (Day-Night Average Sound Level) between CY 2011 and CY 2025 as a result of both project and non-project traffic. Traffic noise increases due to project traffic were predicted to range from 0.2 to 3.3 DNL which were greater than the range of the noise increases caused by non-project traffic (1.0 to 1.2 DNL) on Kamehameha Highway. These increases in traffic noise levels associated with project traffic were considered to be moderate to high.

Future traffic noise levels at existing and planned noise sensitive locations along Kamehameha Highway in the project environs were expected to exceed 65 DNL without noise mitigation measures. Existing residences west of Kawela Bay and two existing residences located approximately 0.7 miles east of Kuilima Drive were predicted to experience future traffic noise levels greater than 65 DNL. Future project residents located along Kamehameha Highway may be impacted by traffic noise if adequate setback distances are not provided from the highway or if sound attenuation walls or berms are not included in the project. Due to the relatively short setback distances of existing residences west of Kawela Bay, approximately thirteen of these residences currently experience traffic noise levels greater than 65 DNL. By 2025, an additional five residences were predicted to experience traffic noise levels greater than 65 DNL.

Unavoidable, but temporary, noise impacts may occur during the construction of the proposed project. Because construction activities may be audible at the developed properties of Kuilima Estates and Ocean Villas, the resort's hotel and spa buildings, and at single family residences along Kamehameha Highway, the acoustic environment from construction of the project may be degraded during periods of construction. Mitigation measures to reduce construction noise to inaudible levels will not be practical in all cases. For this reason, the use of quiet equipment and construction curfew periods as required under the State Department of Health noise regulations are recommended to minimize construction noise impacts.

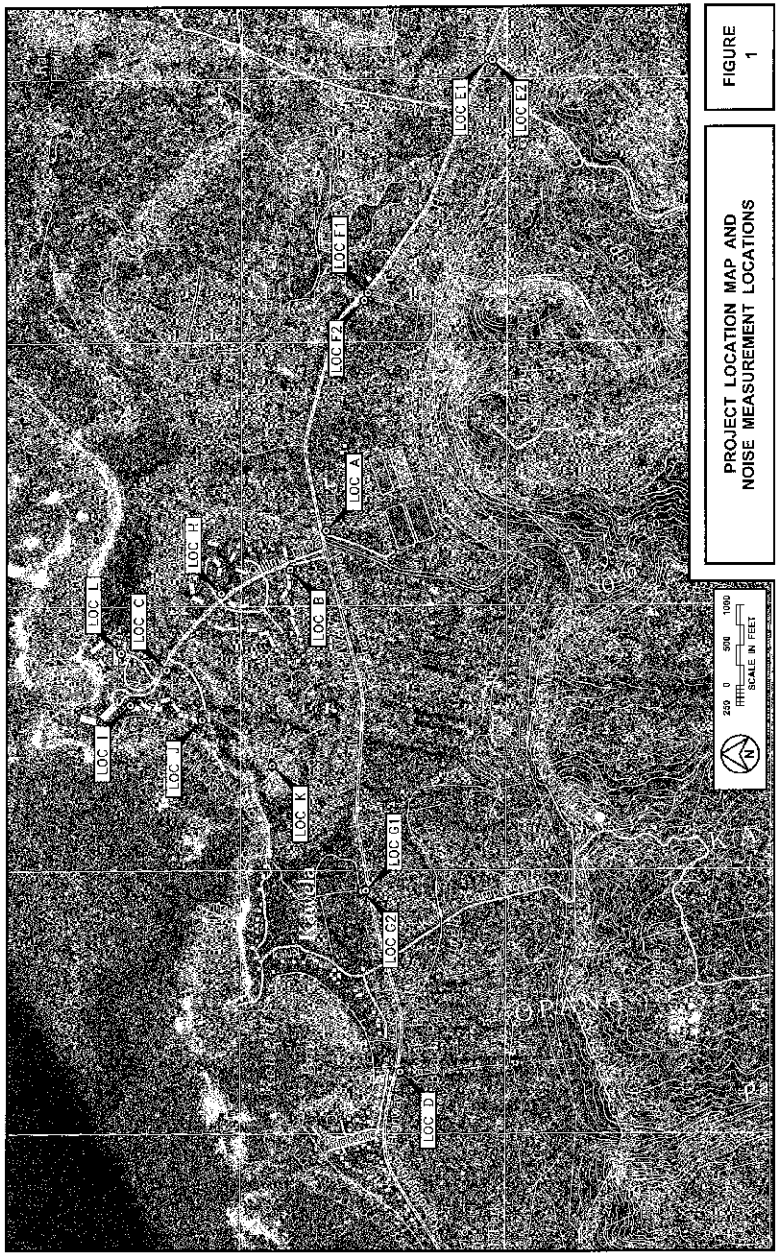


FIGURE 1

PROJECT LOCATION MAP AND NOISE MEASUREMENT LOCATIONS

CHAPTER II. PURPOSE

The objectives of this study were to describe the existing and future noise environment in the environs of the proposed Master Plan for the Turtle Bay Resort Project at Kawela Bay on the island of Oahu. Traffic noise level increases and impacts associated with the proposed Master Plan were to be determined within the project site as well as along the public roadways expected to service the project traffic. A specific objective was to determine the future traffic noise level increases associated with both project and non-project traffic, and the potential noise impacts associated with these increases. Assessments of possible impacts from short term construction noise at the project site were also included in the noise study objectives. Recommendations for minimizing these noise impacts were also to be provided as required.

CHAPTER III. NOISE DESCRIPTORS AND THEIR RELATIONSHIP TO LAND USE COMPATIBILITY

The noise descriptor currently used by federal agencies to assess environmental noise is the Day-Night Average Sound Level (DNL or Ldn). This descriptor incorporates a 24-hour average of instantaneous A-Weighted sound levels as read on a standard Sound Level Meter. The maximum A-Weighted sound level occurring while a noise source such as a heavy truck or aircraft is moving past a listener (i.e., the maximum sound level from a "single event") is referred to as the "Lmax value". The mathematical product (or integral) of the instantaneous sound level times the duration of the event is known as the "Sound Exposure Level", or Lse, which is analogous to the energy of the time-varying sound levels associated with a single event.

The DNL values represent the average noise during a typical day of the year. DNL exposure levels of 55 or less are typical of quiet rural or suburban areas. DNL exposure levels of 55 to 65 are typical of urbanized areas with medium to high levels of activity and street traffic. DNL exposure levels above 65 are representative of densely developed urban areas and areas fronting high volume roadways.

By definition, the minimum averaging period for the DNL descriptor is 24 hours. Additionally, sound levels which occur during the nighttime hours of 10:00 PM to 7:00 AM are increased by 10 decibels (dB) prior to computing the 24-hour average by the DNL descriptor. Because of the averaging used, DNL values in urbanized areas typically range between 50 and 75 DNL. In comparison, the typical range of intermittent noise events may have maximum Sound Level Meter readings between 75 and 105 dBA. A more complete list of noise descriptors is provided in Appendix B to this report. In Appendix B, the Ldn descriptor symbol is used in place of the DNL descriptor symbol.

Table 1, extracted from Reference 1, categorizes the various DNL levels of outdoor noise exposure with severity classifications. Figure 2, extracted from Reference 2, presents suggested land use compatibility guidelines for residential and nonresidential land uses. A general consensus among federal agencies has developed whereby residential housing development is considered acceptable in areas where exterior noise does not exceed 65 DNL. This value of 65 DNL is used as a federal regulatory threshold for determining the necessity for special noise abatement measures when applications for federal funding assistance are made.

As a general rule, noise levels of 55 DNL or less occur in rural areas, or in areas which are removed from high volume roadways. In urbanized areas which are shielded from high volume streets, DNL levels generally range from 55 to 65 DNL, and are usually controlled by motor vehicle traffic noise. Residences which front major roadways are generally exposed to levels of 65 DNL, and as high as 75 DNL when the roadway is a high speed freeway. Due to noise shielding effects from intervening

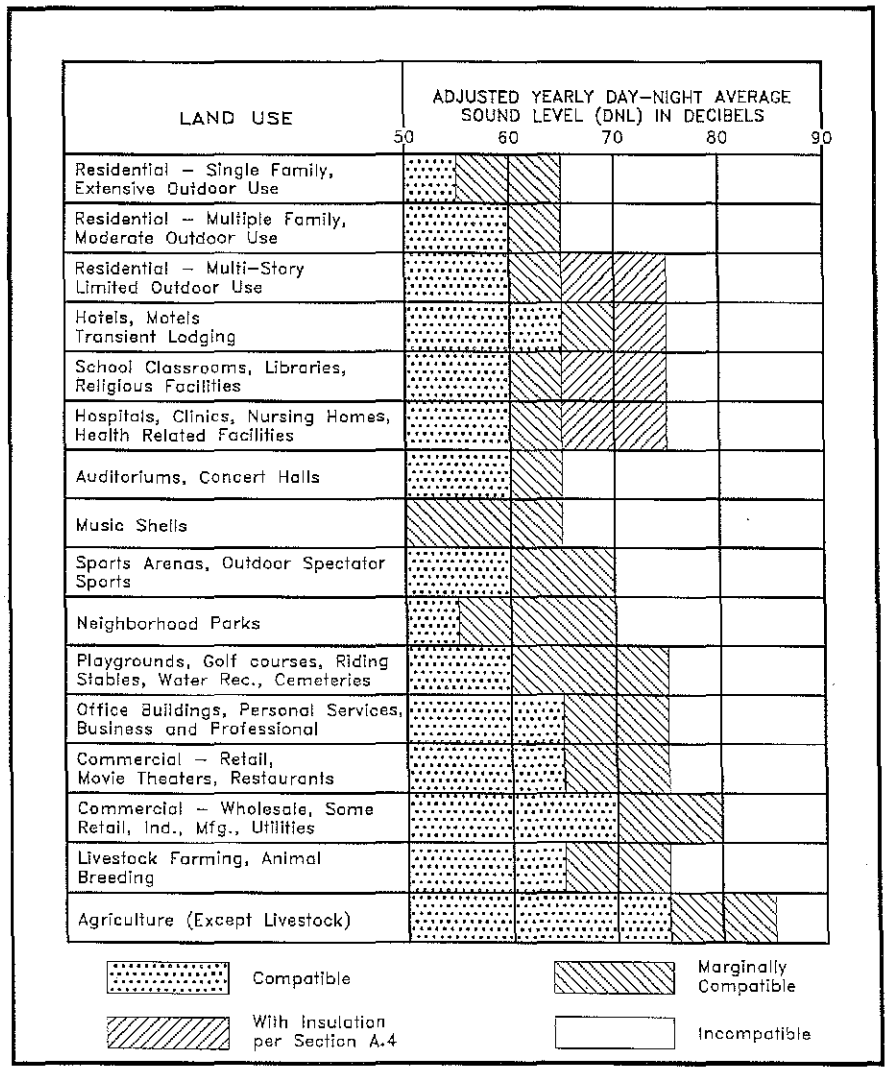
TABLE 1

EXTERIOR NOISE EXPOSURE CLASSIFICATION (RESIDENTIAL LAND USE)

NOISE EXPOSURE CLASS	DAY–NIGHT SOUND LEVEL	EQUIVALENT SOUND LEVEL	FEDERAL (1) STANDARD
Minimal Exposure	Not Exceeding 55 DNL	Not Exceeding 55 Leq	Unconditionally Acceptable
Moderate Exposure	Above 55 DNL But Not Above 65 DNL	Above 55 Leq But Not Above 65 Leq	Acceptable(2)
Significant Exposure	Above 65 DNL But Not Above 75 DNL	Above 65 Leq But Not Above 75 Leq	Normally Unacceptable
Severe Exposure	Above 75 DNL	Above 75 Leq	Unacceptable

Notes: (1) Federal Housing Administration, Veterans Administration, Department of Defense, and Department of Transportation.

(2) FHWA uses the Leq instead of the Ldn descriptor. For planning purposes, both are equivalent if: (a) heavy trucks do not exceed 10 percent of total traffic flow in vehicles per 24 hours, and (b) traffic between 10:00 PM and 7:00 AM does not exceed 15 percent of average daily traffic flow in vehicles per 24 hours. The noise mitigation threshold used by FHWA for residences is 67 Leq.



LAND USE COMPATIBILITY WITH YEARLY AVERAGE DAY–NIGHT AVERAGE SOUND LEVEL (DNL) AT A SITE FOR BUILDINGS AS COMMONLY CONSTRUCTED.
(Source: American National Standards Institute S12.9–1998/Part 5)

FIGURE 2

structures, interior lots are usually exposed to 3 to 10 DNL lower noise levels than the front lots which are not shielded from the traffic noise.

For the purposes of determining noise acceptability for funding assistance from federal agencies, an exterior noise level of 65 DNL or lower is considered acceptable. These federal agencies include the Federal Aviation Administration (FAA), Department of Defense (DOD); Federal Housing Administration, Housing and Urban Development (FHA/HUD), and Veterans Administration (VA). This standard is applied nationally (see Reference 3), including Hawaii.

Because of our open-living conditions, the predominant use of naturally ventilated dwellings, and the relatively low exterior-to-interior sound attenuation afforded by these naturally ventilated structures, an exterior noise level of 65 DNL does not eliminate all risks of noise impacts. Because of these factors, a lower level of 55 DNL is considered as the "Unconditionally Acceptable" (or "Near-Zero Risk") level of exterior noise (see Reference 4). For typical, naturally ventilated structures in Hawaii, an exterior noise level of 55 DNL results in an interior level of approximately 45 DNL, which is considered to be the "Unconditionally Acceptable" (or "Near-Zero Risk") level of interior noise. However, after considering the cost and feasibility of applying the lower level of 55 DNL, government agencies such as FHA/HUD and VA have selected 65 DNL as a more appropriate regulatory standard.

For commercial, industrial, and other non-noise sensitive land uses, exterior noise levels as high as 75 DNL are generally considered acceptable. Exceptions to this occur when naturally ventilated office and other commercial establishments are exposed to exterior levels which exceed 65 DNL.

In the State of Hawaii, the State Department of Health (DOH) regulates noise from on-site activities. State DOH noise regulations are expressed in maximum allowable property line noise limits rather than DNL (see Reference 5). The noise limits apply on all islands of the State, including Oahu. Although they are not directly comparable to noise criteria expressed in DNL, State DOH noise limits for preservation/residential, apartment/commercial, and agricultural/industrial lands equate to approximately 55, 60, and 76 DNL, respectively.

Because the proposed project site is located on lands designated for single family and multifamily residential, commercial, and agricultural uses, various DOH noise limits would be applicable along the lot boundary lines or receptor locations for any stationary machinery, or equipment related to commercial or construction activities. These property line limits are 60 dBA and 50 dBA during the daytime and nighttime periods, respectively, for commercial lots or receptors. For multifamily or apartment use, the State DOH limits are also 60 dBA and 50 dBA during the daytime and nighttime periods, respectively. For single family residential and public facility uses, the State DOH limits are 55 dBA and 45 dBA during the daytime and nighttime periods, respectively. For agricultural uses, the State DOH limit is 70 dBA during both the daytime and nighttime periods. These noise limits cannot be exceeded for more than 2

minutes in any 20-minute time period under the State DOH noise regulations. The State DOH noise regulations do not apply to aircraft or motor vehicles.

CHAPTER IV. GENERAL STUDY METHODOLOGY

Existing traffic and background ambient noise levels were measured at fifteen locations in the project environs to provide a basis for developing the traffic noise contours along Kamehameha Highway; and for determining the existing background ambient noise levels in the project area. The locations of the measurement sites are shown in Figure 1. Noise measurements were performed during February 2012. The traffic noise measurement results, and their comparisons with computer model predictions of existing traffic noise levels are summarized in Table 2. The results of the traffic noise measurements were compared with calculations of existing traffic noise levels to validate the computer model used.

Traffic noise calculations for the existing conditions as well as noise predictions for the future conditions with and without the project were performed using the Federal Highway Administration (FHWA) Noise Prediction Model (Reference 6). Traffic data entered into the noise prediction model were: hourly traffic volumes, average vehicle speeds, estimates of traffic mix, and loose soil propagation loss factor. The traffic assignments for the project (Reference 7) and Hawaii State Department of Transportation counts on Kamehameha Highway (Reference 8) were the primary sources of data inputs to the model.

For existing and future traffic, it was assumed that the average noise levels, or Leq(h), during the weekday PM peak hour were 0.3 dB greater than the weekday 24-hour DNL along any roadway segment in the project environs. This assumption was based on computations of both the weekday and weekend day hourly Leq's and the 24-hour DNL's of traffic noise on Kamehameha Highway and Kuilima Drive (see Figures 3 through 5). Because the weekend peak hour Leq(h) was slightly higher than the weekday PM peak hour Leq(h), the weekly, 7-day average DNL value was determined to be 0.1 to 0.3 dB higher than the 5-day, weekday DNL value. Therefore, the weekly, 7-day average DNL values were assumed be equal to the weekday PM peak hour Leq's in all calculations and modeling.

Traffic noise calculations for both the existing and future conditions in the project environs were developed for ground level receptors without the benefit of shielding effects. Traffic assignments with and without the project were obtained from the project's traffic turning movements (Reference 7). The forecasted increases in traffic noise levels over existing levels were calculated for both scenarios, and noise impact risks evaluated. The relative contributions of non-project and project related traffic to the total noise levels were also calculated, and an evaluation was made of possible traffic noise impacts resulting from the project.

Evaluations of the potential noise impacts associated with the four Master Plan alternatives (see Figures 6 through 9) for Turtle Bay Resort were provided, with all evaluations referenced to the Proposed Action shown in Figure 6. These evaluations

TABLE 2

TRAFFIC AND BACKGROUND NOISE MEASUREMENT RESULTS

LOCATION	Time of Day (HRS)	Ave. Speed (MPH)	Hourly Traffic Volume AUTO	M.TRUCK	H.TRUCK	Measured Leq (dB)	Predicted Leq (dB)
A. 50 FT from the center-line of Kamehameha Hwy. (2/09/12)	1050 TO 1150	45	478	25	14	66.5	66.5
B. 57 FT from the center-line of Kuilima Drive (2/09/12)	1059 TO 1159	25	272	7	7	56.9	57.3
C. 50 FT from the center-line of Kuilima Drive (2/09/12)	1252 TO 1352	25	209	2	8	56.6	56.6
D 50 FT from the center-line of Kamehameha Hwy. (2/09/12)	1500 TO 1600	55	709	5	5	70.5 (w siren) 68.6 (wo siren)	68.0
D 50 FT from the center-line of Kamehameha Hwy. (2/10/12)	0700 TO 0800	55	427	10	7	68.1	66.6
E1. 50 FT from the center-line of Kamehameha Hwy. (2/10/12)	0940 TO 1040	55	364	5	3	69.1	69.3

TABLE 2 (CONTINUED)

TRAFFIC AND BACKGROUND NOISE MEASUREMENT RESULTS

LOCATION	Time of Day (HRS)	Ave. Speed (MPH)	Hourly Traffic Volume AUTO	M.TRUCK	H.TRUCK	Measured Leq (dB)	Predicted Leq (dB)
E2. 100 FT from the center-line of Kamehameha Hwy. (2/10/12)	0940 TO 1040	55	364	5	3	62.8	62.6
F1. 50 FT from the center-line of Kamehameha Hwy. (2/10/12)	1056 TO 1156	55	505	13	7	67.5	67.2
F2. 95 FT from the center-line of Kamehameha Hwy. (2/10/12)	1056 TO 1156	55	505	13	7	60.2	62.0
F1. 50 FT from the center-line of Kamehameha Hwy. (2/10/12)	1454 TO 1554	55	814	6	8	69.9	68.7
F2. 95 FT from the center-line of Kamehameha Hwy. (2/10/12)	1454 TO 1554	55	814	6	8	63.3	63.7
G1. 50 FT from the center-line of Kamehameha Hwy. (2/10/12)	1613 TO 1713	55	753	6	6	68.0	68.3

TABLE 2 (CONTINUED)

TRAFFIC AND BACKGROUND NOISE MEASUREMENT RESULTS

LOCATION	Time of Day (HRS)	Ave. Speed (MPH)	Hourly Traffic Volume AUTO	M.TRUCK	H.TRUCK	Measured Leq (dB)	Predicted Leq (dB)
G2. 100 FT from the center-line of Kamehameha Hwy. (2/10/12)	1613 TO 1713	55	753	6	6	60.9	61.6
H. On Kuilima Dr. at Eleku Kuilima Place (2/11/12)	0414 TO 0430	N/A	N/A	N/A	N/A	45.3	N/A
I. At Hotel Beach Cottage; east end. (2/11/12)	0807 TO 0837	N/A	N/A	N/A	N/A	54.1	N/A
J. At Hotel Beach Cottage west end with helo noise. (2/11/12)	0845 TO 0857	N/A	N/A	N/A	N/A	61.2	N/A
K. At Horse Stables (2/11/12)	0912 TO 0922	N/A	N/A	N/A	N/A	52.3	N/A
L. At Ocean Villas. (2/11/12)	0945 TO 1000	N/A	N/A	N/A	N/A	52.4	N/A

FIGURE 3

HOURLY VARIATIONS OF TRAFFIC NOISE AT 50 FT SETBACK DISTANCE FROM THE CENTERLINE OF KAMEHAMEHA HIGHWAY WEST OF KUILIMA DRIVE (STA. B72008300907; JANUARY 19, 2011)

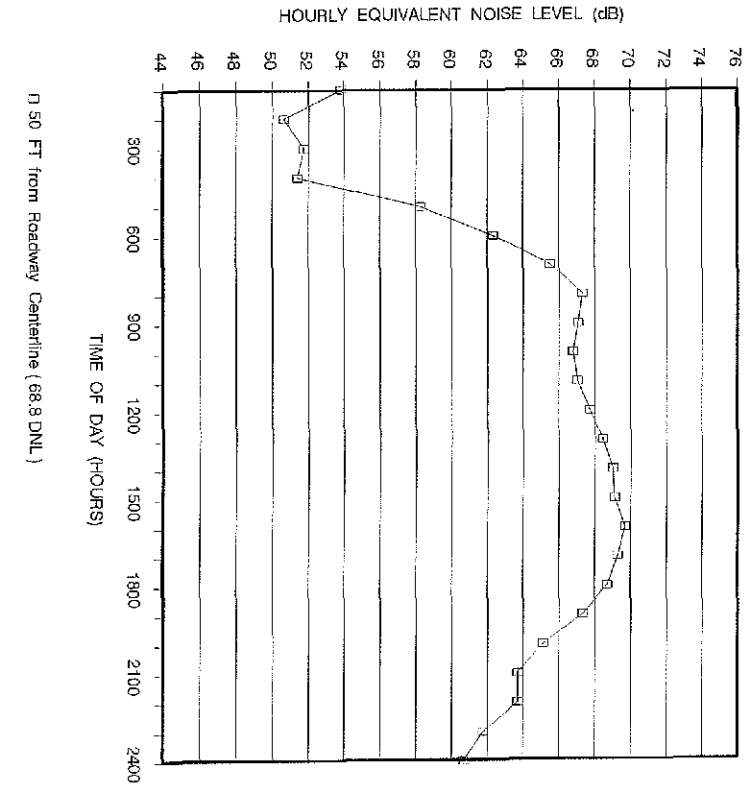
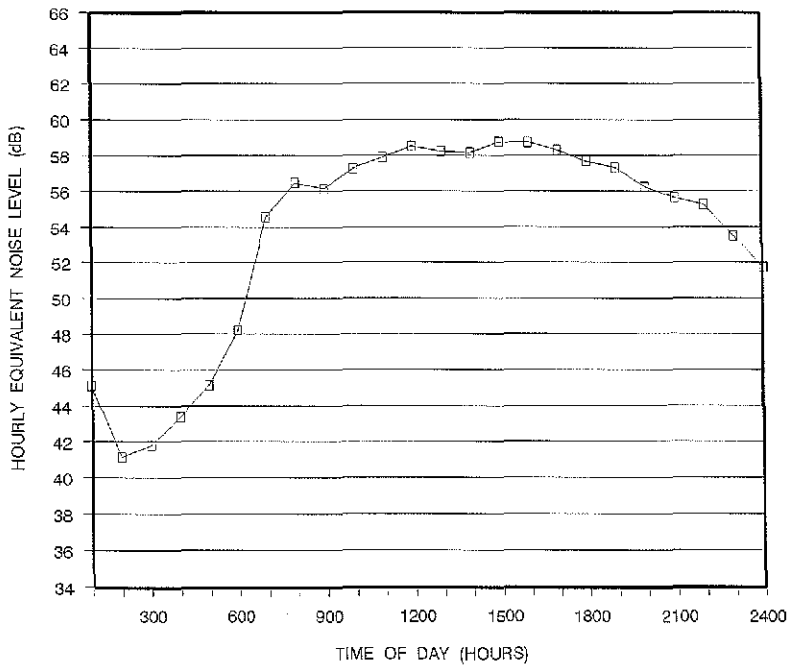


FIGURE 4

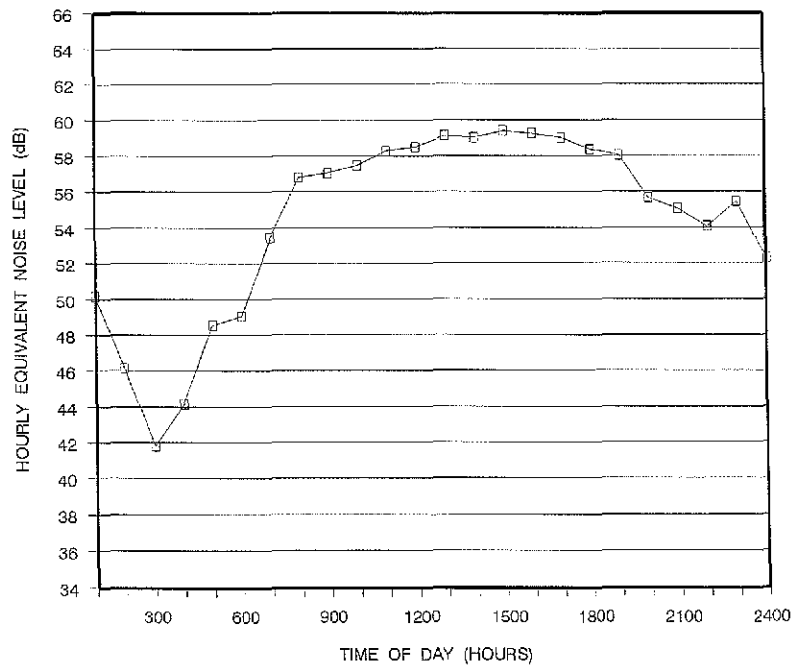
HOURLY VARIATIONS OF TRAFFIC NOISE AT 50 FT SETBACK DISTANCE FROM THE CENTERLINE OF KUILIMA DRIVE AT KAMEHAMEHA HIGHWAY (WEEKDAY; NOVEMBER 3, 2011)



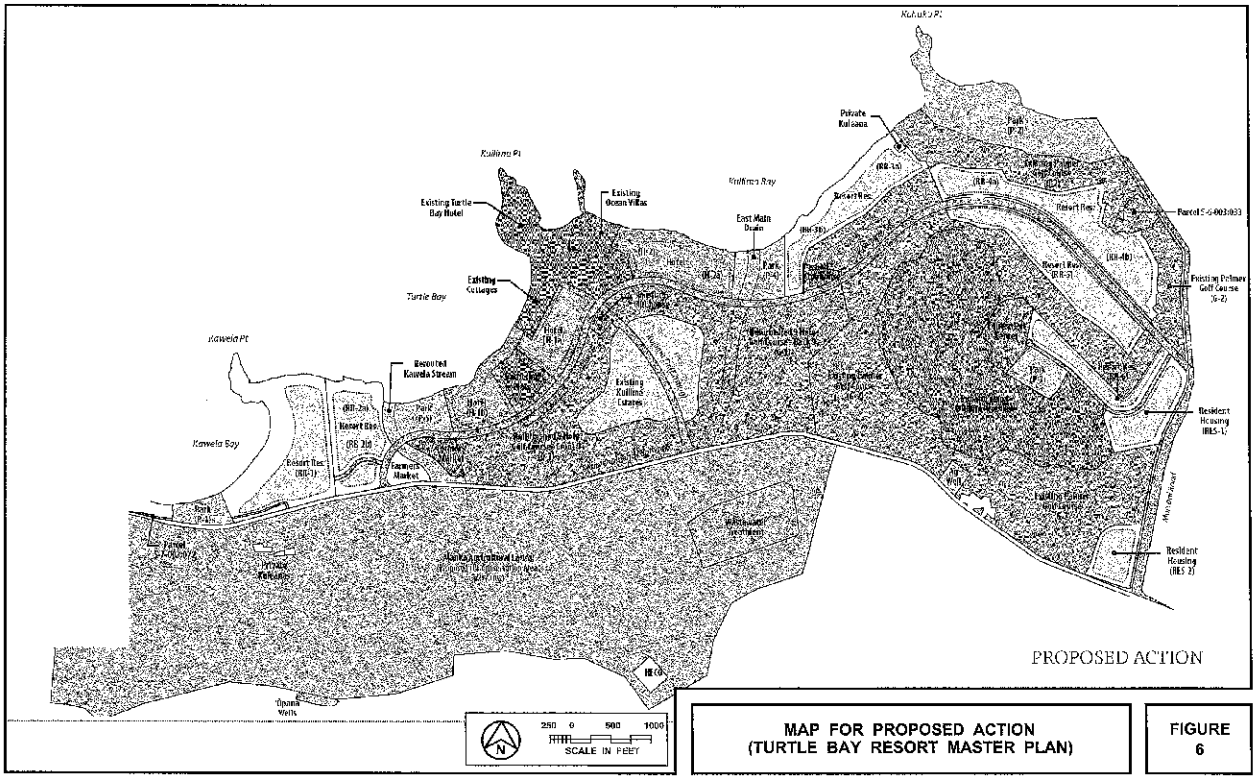
□ 50 FT from Roadway Centerline (58.5 DNL)

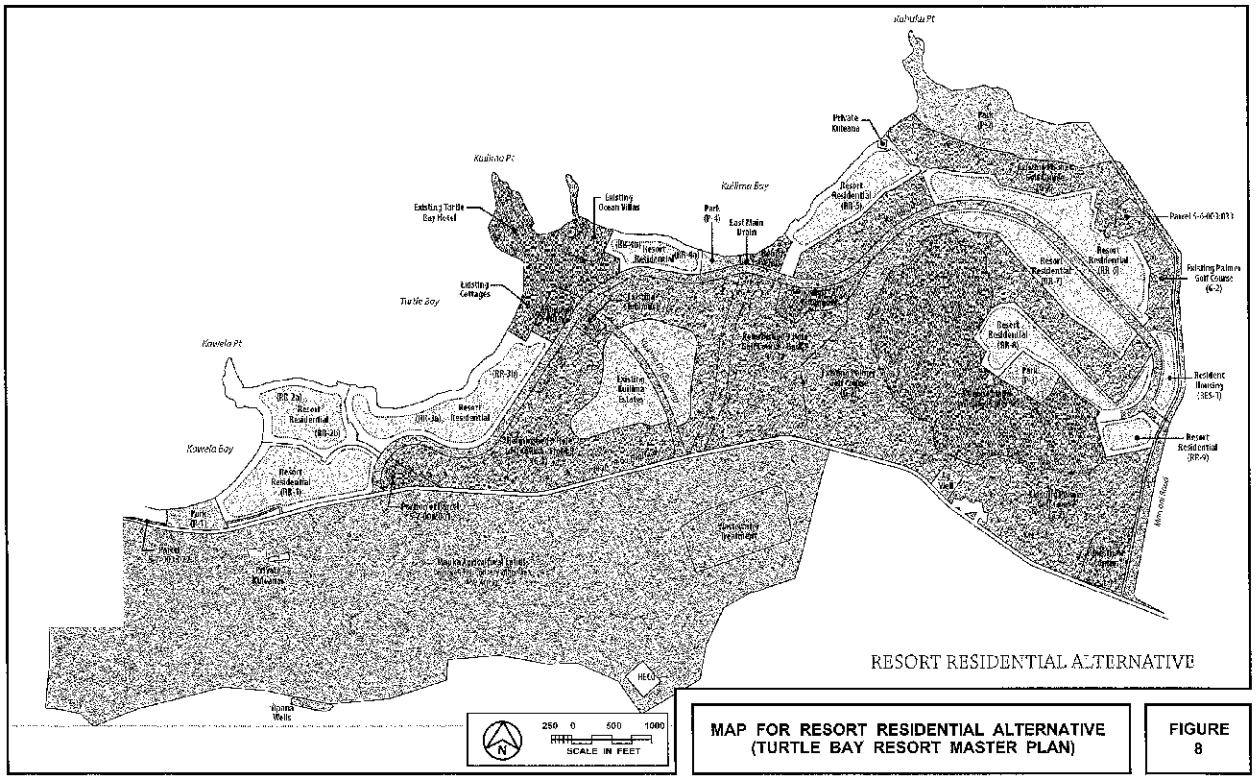
FIGURE 5

HOURLY VARIATIONS OF TRAFFIC NOISE AT 50 FT SETBACK DISTANCE FROM THE CENTERLINE OF KUILIMA DRIVE AT KAMEHAMEHA HIGHWAY (WEEKEND DAY; NOVEMBER 5, 2011)



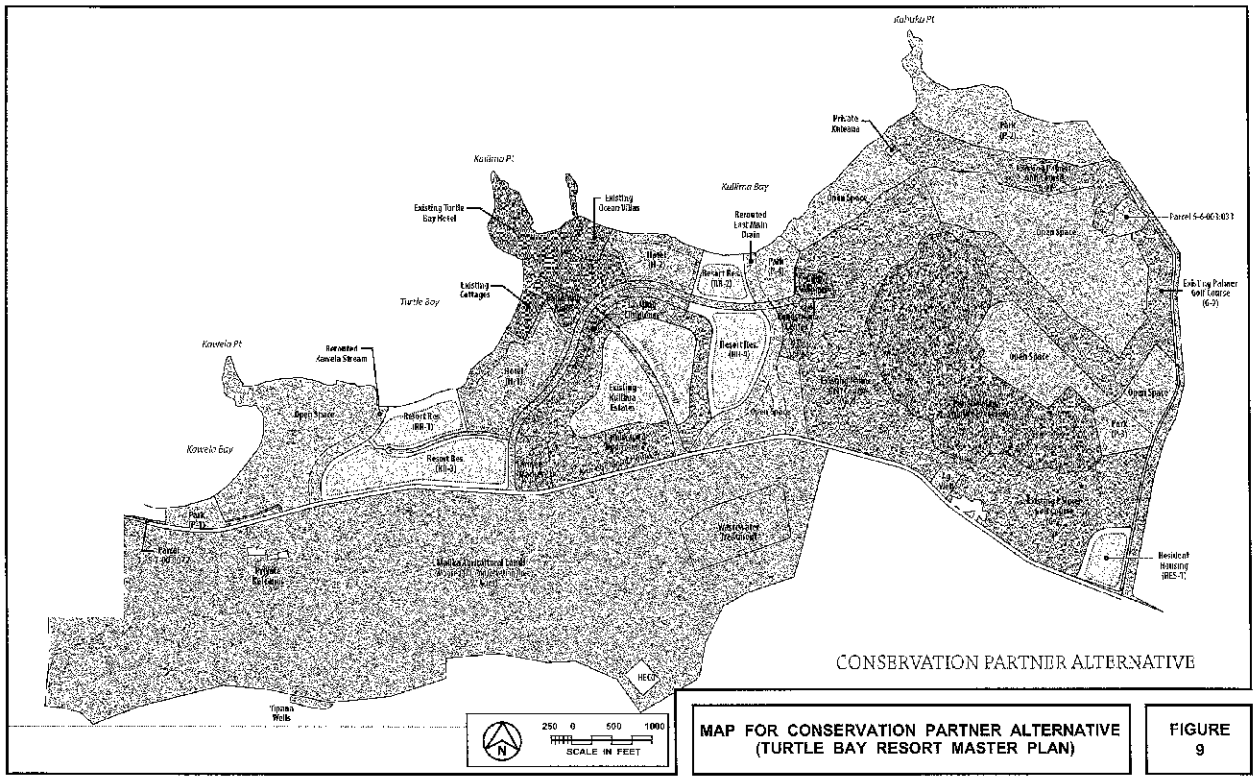
□ 50 FT from Roadway Centerline (59.2 DNL)


Kuilima Pt
Kuilima Bay
Existing Turtle Bay Hotel
Existing Ocean Villas
Existing Cottages
Turtle Bay
East Main Drain
Kawela Pt
Kawela Stream
Kawela Bay
Existing Kuilima Estates
Resort Res
Resort Res (RR-1)
Resort Res (RR-2)
Resort Res (RR-3)
Resort Res (RR-4)
Existing Palmer Golf Course (G-2)
Resident Housing (RES-1)
Resident Housing (RES-2)
Parcel 5-6-003:033
Private Kuilima
Park (P-2)
Park (P-3)
Park (P-4)
Park (P-5)
Park (P-6)
Park (P-7)
Hotel (H-1)
Hotel (H-2)
Hotel (H-3)
Hotel (H-4)
Hotel (H-5)
Hotel (H-6)
Hotel (H-7)
Hotel (H-8)
Hotel (H-9)
Hotel (H-10)
Hotel (H-11)
Hotel (H-12)
Hotel (H-13)
Hotel (H-14)
Hotel (H-15)
Hotel (H-16)
Hotel (H-17)
Hotel (H-18)
Hotel (H-19)
Hotel (H-20)
Hotel



MAP FOR RESORT RESIDENTIAL ALTERNATIVE (TURTLE BAY RESORT MASTER PLAN)

FIGURE 8



MAP FOR CONSERVATION PARTNER ALTERNATIVE (TURTLE BAY RESORT MASTER PLAN)

FIGURE 9

were qualitative in nature. Quantitative evaluations were performed for the Proposed Action and the Do Nothing Alternative. Discussions of potential traffic and construction noise impacts, and mitigation measures were included in these evaluations.

CHAPTER V. EXISTING NOISE ENVIRONMENT

The existing traffic noise levels in the project environs are controlled by traffic along Kamehameha Highway. Within the Turtle Bay Resort lands, existing background noise levels along the mauka boundaries are controlled by traffic along Kamehameha Highway. Traffic along Kuilima Drive controls background ambient noise levels in the middle section of the resort at the Kuilima Estates. Along the makai boundaries of the resort, surf and resort activities control the background ambient noise levels.

Calculations of existing traffic noise levels during the weekday and weekend PM peak traffic hours are presented in Table 3. The hourly Leq (or Equivalent Sound Level) contribution from each roadway section in the project environs was calculated for comparison with forecasted traffic noise levels with and without the project. The PM peak hour Leq's for a weekday and weekend day were calculated using traffic data from Reference 7. The existing setback distances from the roadways' centerlines to their associated 65, 70, and 75 DNL contours were also calculated as shown in Table 4. The contour line setback distances do not take into account noise shielding effects or the additive contributions of traffic noise from intersecting street sections. Based on the results of Table 4, it was concluded that the existing 65 DNL traffic noise contour is located approximately 59 to 75 FT from the centerline of Kamehameha Highway west of Kuilima Drive, and approximately 57 to 100 FT from the centerline of Kamehameha Highway east of Kuilima Drive.

One existing residence located makai of Kamehameha Highway and approximately 0.70 miles east of Kuilima Drive is located within the existing 65 DNL traffic noise contour, with approximately 68 DNL noise exposure level. The existing traffic noise level at this residence is in the "Significant Exposure, Normally Unacceptable" category (see Table 1).

Approximately thirteen existing residences located makai of Kamehameha Highway and between Pahipahialua Street and Pahipahialua Beach Park are located within the existing 65 DNL traffic noise contour, with traffic noise levels ranging from 66 to 70 DNL. Existing traffic noise levels at these thirteen residences are in the "Significant Exposure, Normally Unacceptable" category (see Table 1).

Existing traffic noise levels along Kuilima Drive at Kuilima Estates are less than 65 DNL along the Rights-of-Way, and the traffic noise contributions from Kuilima Drive range from approximately 54 to 59 DNL at the six multifamily dwelling units closest to Kuilima Drive. Traffic noise contributions from Kamehameha Highway are relatively low, and less than 48 DNL at Kuilima Estates.

Existing background noise levels at the interior portions of the project site beyond 500 feet from Kamehameha Highway are low (between 45 and 55 DNL) due to their large setback distances from Kamehameha Highway. At these interior locations

TABLE 3

EXISTING (CY 2011) TRAFFIC VOLUMES AND NOISE LEVELS ALONG ROADWAYS IN PROJECT AREA (PM PEAK HOUR)

LOCATION	SPEED (MPH)	TOTAL VPH	****** VOLUMES (VPH) ******** AUTOS	M TRUCKS	H TRUCKS	50' Leq	75' Leq	100' Leq
Weekday:								
Kamehameha Hwy. West of Kuilima Dr. (Posted 35 mph)	45	712	701	5	6	66.7	62.7	60.1
Kamehameha Hwy. West of Kuilima Dr. (Posted 45 mph)	55	712	701	5	6	69.1	65.0	62.3
Kamehameha Hwy. East of Kuilima Dr. (Posted 35 mph)	45	663	652	5	6	66.4	62.5	59.8
Kamehameha Hwy. East of Kuilima Dr. (Posted 45 mph)	55	663	652	5	6	68.8	64.8	62.0
Kuilima Dr. At Kamehameha Hwy.	25	341	325	6	10	58.9	55.7	53.5
Kamehameha Hwy. West of Marconi Dr. (Posted 35 mph)	45	654	643	5	6	66.3	62.4	59.8
Kamehameha Hwy. West of Marconi Dr. (Posted 45 mph)	55	654	643	5	6	68.7	64.7	62.0
Kamehameha Hwy. East of Marconi Dr. (Posted 35 mph)	45	663	652	5	6	66.4	62.5	59.8
Kamehameha Hwy. East of Marconi Dr. (Posted 45 mph)	55	663	652	5	6	71.8	67.8	65.0
Marconi Rd. At Kamehameha Hwy.	25	19	19	0	0	46.7	44.0	41.7
Saturday:								
Kamehameha Hwy. West of Kuilima Dr. (Posted 35 mph)	45	871	856	7	8	67.6	63.7	61.0
Kamehameha Hwy. West of Kuilima Dr. (Posted 45 mph)	55	871	856	7	8	70.0	66.0	63.2
Kamehameha Hwy. East of Kuilima Dr. (Posted 35 mph)	45	819	806	6	7	67.3	63.4	60.7
Kamehameha Hwy. East of Kuilima Dr. (Posted 45 mph)	55	819	806	6	7	69.7	65.7	62.9
Kuilima Dr. At Kamehameha Hwy.	25	390	371	7	12	59.5	56.4	54.2
Kamehameha Hwy. West of Marconi Dr. (Posted 35 mph)	45	809	796	6	7	67.2	63.3	60.7
Kamehameha Hwy. West of Marconi Dr. (Posted 45 mph)	55	809	796	6	7	69.6	65.6	62.9
Kamehameha Hwy. East of Marconi Dr. (Posted 35 mph)	45	809	796	6	7	67.2	63.3	60.7
Kamehameha Hwy. East of Marconi Dr. (Posted 45 mph)	55	809	796	6	7	72.6	68.6	65.9
Marconi Rd. At Kamehameha Hwy.	25	16	16	0	0	41.1	38.2	35.4

TABLE 4

EXISTING AND CY 2025 DISTANCES TO 65, 70, AND 75 DNL CONTOURS

STREET SECTION	65 DNL SETBACK (FT) EXISTING	CY 2025	70 DNL SETBACK (FT) EXISTING	CY 2025	75 DNL SETBACK (FT) EXISTING	CY 2025
Kamehameha Hwy. West of Kaihalulu Dr. (Posted 35 mph)	59	87	36	50	22	28
Kamehameha Hwy. West of Kaihalulu Dr. (Posted 45 mph)	75	122	46	66	28	37
Kamehameha Hwy. from Kaihalulu to Kuilima (With Median)	75	81	46	46	28	26
Kamehameha Hwy. from Kaihalulu to Kuilima (W/O Median)	75	82	46	45	28	25
Kamehameha Hwy. East of Kuilima Dr. (Posted 35 mph)	58	84	34	48	20	27
Kamehameha Hwy. East of Kuilima Dr. (Posted 45 mph)	73	116	44	63	27	35
Kamehameha Hwy. West of Marconi Dr. (Posted 35 mph)	57	84	34	48	20	27
Kamehameha Hwy. West of Marconi Dr. (Posted 45 mph)	73	116	44	63	26	35
Kamehameha Hwy. East of Marconi Dr. (Posted 35 mph)	58	84	34	48	20	27
Kamehameha Hwy. East of Marconi Dr. (Posted 45 mph)	100	173	60	90	36	49
Kaihalulu Dr. At Kamehameha Hwy.	N/A	29	N/A	15	N/A	7
Kuilima Dr. At Kamehameha Hwy.	23	33	12	17	7	9
Marconi Rd. At Kamehameha Hwy.	3	15	2	8	1	4

Notes:

(1) All setback distances are from the roadways' centerlines.
(2) See TABLES 3 and 5 for traffic volume, speed, and mix assumptions.
(3) Setback distances are for ground level receptors.
(4) "Loose Soil" conditions assumed along all roadways.
(5) DNL values represent 7-day, weekly averages.
(6) With medians and 35 mph posted within 600' of intersections on Kamehameha Highway.
(7) Without medians and 45 mph posted beyond 600' of intersections on Kamehameha Highway, except 35 mph posted between Kuilima Dr and Kaihalulu Dr.

on the project site, distant traffic, helicopter noise, and the natural sounds of surf, birds, and winds in foliage are the dominant noise sources. Between traffic, helicopter, surf, bird, or wind noise events, background ambient noise levels drop to a range of 40 to 45 dBA. During calm wind periods, background ambient noise levels decrease to levels less than 45 dBA at the interior locations removed from Kamehameha Highway, Kuilima Drive, and the shoreline. The minimum background ambient noise levels at these interior locations are controlled by distant traffic, surf, and wind noise.

CHAPTER VI. FUTURE NOISE ENVIRONMENT

Figure 6 depicts the Proposed Action for the Turtle Bay Resort Master Plan. The future traffic noise levels and potential traffic noise impacts associated with the Proposed Action were examined by calculating future traffic noise levels in CY 2025 along Kamehameha Highway, Kuilima Drive, Marconi Road, and the proposed Kaihalulu Drive with the Proposed Action. In addition, future traffic noise levels in CY 2025 along Kamehameha Highway, Kuilima Drive, and Marconi Road were calculated for the Do Nothing (or No Build) Alternative. Future traffic noise levels under the Proposed Action and Do Nothing Alternative were compared with each other as well as with the existing traffic noise levels described in the previous chapter.

Predictions of future traffic noise levels were made using the traffic volume assignments of Reference 7 for CY 2025 with and without the Proposed Action. The future assignments of project plus non-project traffic on the roadway sections which would service the project are shown in Table 5 for the weekday and weekend PM peak hours of traffic. As indicated in Table 6, by CY 2025 and following complete project build-out of the Proposed Action, traffic noise levels on Kamehameha Highway in the areas fronting the project are predicted to increase by 1.2 to 4.3 DNL. The traffic noise increases due to project traffic range from 0.2 to 3.3 DNL. These increases in traffic noise levels are considered to be moderate to high, and reflect the growth in forecasted project and non-project traffic in the project environs by CY 2025.

Table 4 summarizes the predicted increases in the future setback distances to the 65, 70, and 75 DNL traffic noise contour lines along the roadways in the project environs and attributable to both project plus non-project traffic in CY 2025 under the Proposed Action. The setback distances in Table 4 do not include the beneficial effects of noise shielding from terrain features and buildings, or the detrimental effects of additive contributions of noise from intersecting streets. As indicated in Table 4, the setback distances to the 65 DNL contour are predicted to range from 81 to 173 FT from the centerline of Kamehameha Highway following project build-out in CY 2025 under the Proposed Action. The setback distances to the 65 DNL contour are predicted to increase from 23 to 33 FT from the centerline of Kuilima Drive following project build-out in CY 2025. Along the proposed Kaihalulu Drive access road through the project site, the setback distance to the 65 DNL contour is predicted to be approximately 29 FT from the centerline of that roadway.

Table 7 presents the predicted traffic noise levels resulting from both non-project and project traffic on Kamehameha Highway, Kuilima Drive, and Kaihalulu Drive by CY 2025 at various noise sensitive receptor locations in the project environs, and as measured by the DNL descriptor system. The applicable locations of the noise sensitive receptors in the project environs are shown in Figure 10. As indicated in Table 7, future traffic noise levels at existing and planned noise sensitive locations along Kamehameha Highway in the project environs are expected to exceed 65 DNL

TABLE 5

FUTURE (CY 2025) TRAFFIC VOLUMES AND NOISE LEVELS ALONG ROADWAYS IN PROJECT AREA (PROPOSED ACTION; PM PEAK HOUR, BUILD)

LOCATION	SPEED (MPH)	TOTAL VPH	****** VOLUMES (VPH) ******** AUTOS	M TRUCKS	H TRUCKS	50' Leq	75' Leq	100' Leq
Weekday:								
Kamehameha Hwy. West of Kaihalulu Dr. (Posted 35 mph)	45	1,473	1,449	11	13	70.0	66.5	63.7
Kamehameha Hwy. West of Kaihalulu Dr. (Posted 45 mph)	55	1,473	1,449	11	13	72.4	68.9	66.6
Kaihalulu Dr. At Kamehameha Hwy.	25	449	428	8	13	61.2	58.3	56.1
Kamehameha Hwy. from Kaihalulu to Kuilima (With Median)	45	1,205	1,185	9	11	69.2	65.7	62.9
Kamehameha Hwy. from Kaihalulu to Kuilima (W/O Median)	45	1,205	1,185	9	11	69.1	65.7	63.5
Kamehameha Hwy. East of Kuilima Dr. (Posted 35 mph)	45	1,341	1,319	10	12	69.6	66.1	63.3
Kamehameha Hwy. East of Kuilima Dr. (Posted 45 mph)	55	1,341	1,319	10	12	72.0	68.5	66.2
Kuilima Dr. At Kamehameha Hwy.	25	716	683	12	21	61.9	58.8	56.7
Kamehameha Hwy. West of Marconi Dr. (Posted 35 mph)	45	1,341	1,319	10	12	69.6	66.1	63.3
Kamehameha Hwy. West of Marconi Dr. (Posted 45 mph)	55	1,341	1,319	10	12	72.0	68.5	66.2
Kamehameha Hwy. East of Marconi Dr. (Posted 35 mph)	45	1,320	1,298	10	12	69.6	66.1	63.3
Kamehameha Hwy. East of Marconi Dr. (Posted 45 mph)	55	1,320	1,298	10	12	74.9	71.4	69.2
Marconi Rd. At Kamehameha Hwy.	25	299	294	2	3	55.3	52.1	50.1
Saturday:								
Kamehameha Hwy. West of Kaihalulu Dr. (Posted 35 mph)	45	1,784	1,755	13	16	70.9	67.4	64.6
Kamehameha Hwy. West of Kaihalulu Dr. (Posted 45 mph)	55	1,784	1,755	13	16	73.2	69.7	67.5
Kaihalulu Dr. At Kamehameha Hwy.	25	616	588	10	18	60.4	57.3	55.1
Kamehameha Hwy. from Kaihalulu to Kuilima (With Median)	45	1,478	1,454	11	13	70.1	66.6	63.7
Kamehameha Hwy. from Kaihalulu to Kuilima (W/O Median)	45					70.0	66.6	64.4
Kamehameha Hwy. East of Kuilima Dr. (Posted 35 mph)	45	1,630	1,603	12	15	70.5	67.0	64.2
Kamehameha Hwy. East of Kuilima Dr. (Posted 45 mph)	55	1,630	1,603	12	15	72.8	69.3	67.1
Kuilima Dr. At Kamehameha Hwy.	25	774	738	13	23	61.4	58.3	56.1
Kamehameha Hwy. West of Marconi Dr. (Posted 35 mph)	45	1,630	1,603	12	15	70.5	67.0	64.2
Kamehameha Hwy. West of Marconi Dr. (Posted 45 mph)	55	1,630	1,603	12	15	72.8	69.3	67.1
Kamehameha Hwy. East of Marconi Dr. (Posted 35 mph)	45	1,592	1,566	12	14	70.4	66.9	64.1
Kamehameha Hwy. East of Marconi Dr. (Posted 45 mph)	55	1,592	1,566	12	14	75.7	72.2	70.0
Marconi Rd. At Kamehameha Hwy.	25	518	509	4	5	57.6	54.5	52.5

Notes:

1. With medians and 35 mph posted within 600' of intersections on Kamehameha Highway.
2. Without medians and 45 mph posted beyond 600' of intersections on Kamehameha Highway, except 35 mph posted between Kuilima Dr and Kaihalulu Dr.

TABLE 6

CALCULATIONS OF PROJECT AND NON-PROJECT TRAFFIC NOISE CONTRIBUTIONS (CY 2025) (PM PEAK HOUR LEQ OR DNL)

STREET SECTION	NOISE LEVEL INCREASE DUE TO: NON-PROJECT TRAFFIC	PROJECT TRAFFIC
Kamehameha Hwy. West of Kaihalulu Dr. (Posted 35 mph)	1.0	2.6
Kamehameha Hwy. West of Kaihalulu Dr. (Posted 45 mph)	1.0	3.3
Kaihalulu Dr. At Kamehameha Hwy.	N/A	16.2
Kamehameha Hwy. from Kaihalulu to Kuilima (With Median)	1.0	1.8
Kamehameha Hwy. from Kaihalulu to Kuilima (W/O Median)	1.0	0.2
Kamehameha Hwy. East of Kuilima Dr. (Posted 35 mph)	1.1	2.4
Kamehameha Hwy. East of Kuilima Dr. (Posted 45 mph)	1.1	3.1
Kuilima Dr. At Kamehameha Hwy.	0.8	2.4
Kamehameha Hwy. West of Marconi Dr. (Posted 35 mph)	1.1	2.4
Kamehameha Hwy. West of Marconi Dr. (Posted 45 mph)	1.1	3.1
Kamehameha Hwy. East of Marconi Dr. (Posted 35 mph)	1.2	2.3
Kamehameha Hwy. East of Marconi Dr. (Posted 45 mph)	1.2	3.0
Marconi Rd. At Kamehameha Hwy.	0.0	8.4

Notes:

1. With medians and 35 mph posted within 600' of intersections on Kamehameha Highway.
2. Without medians and 45 mph posted beyond 600' of intersections on Kamehameha Highway, except 35 mph posted between Kuilima Dr. and Kaihalulu Dr.
3. At 50' from centerline of Kaihalulu Dr., future traffic noise levels predicted to be 16.2 DNL above existing background noise levels.

TABLE 7

PREDICTED TRAFFIC NOISE LEVELS AT VARIOUS RECEPTOR LOCATIONS
(4.92 FT HIGH RECEPTOR, 2025 DNL, WITH PROPOSED ACTION)

RECEPTOR LOCATION	SETBACK DIST. FROM EXIST. C.L.	2025 DNL W/O MITIGATION	2025 DNL WITH MITIGATION
Receiver #W1 (RR-1)	110 FT	66.9	61.0
Receiver #W2 (RR-1)	120 FT	66.4	60.2
Receiver #W3 (RR-1)	120 FT	65.9	60.2
Receiver #W4 (RR-2b)	135 FT	63.8	N/A
Receiver #W5 (RR-2b)	115 FT	65.1	60.4
Receiver #W6 (RR-2b)	310 FT	58.2	N/A
Receiver #E1 (TMK: 5-6-003:036)	48 FT	72.1	64.9
Receiver #E2 (TMK: 5-6-003:036)	106 FT	65.7	60.9
Receiver #E3 (RES-2)	110 FT	64.9	N/A
Receiver #E4 (RES-2))	120 FT	64.1	N/A
Receiver #E5 (RES-2)	454 FT	53.1	N/A

Notes:

1. Traffic noise levels include contributions from intersecting roadways.
2. "Loose Soil" ground attenuation assumed.
3. Minimum 6 foot high sound attenuation walls assumed for noise mitigation.

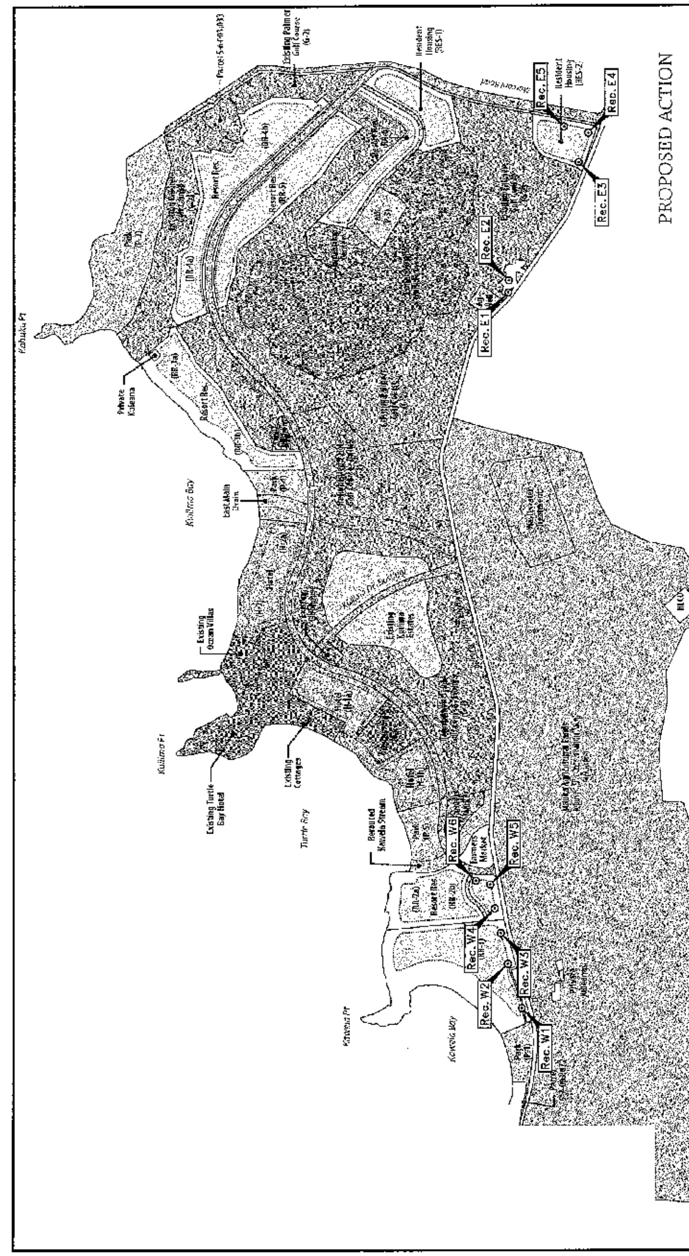


FIGURE 10

RECEPTOR LOCATIONS WHERE FUTURE TRAFFIC NOISE LEVELS WERE CALCULATED

without noise mitigation measures. Existing residences west of Kawela Bay and two existing residences located approximately 0.7 miles east of Kuilima Drive are predicted to experience future traffic noise levels greater than 65 DNL.

Calculations of future traffic noise levels under the Proposed Action at noise sensitive receptor locations shown in Figure 10 are presented in Table 7. Primarily as a result of forecasted traffic along Kamehameha Highway, future traffic noise levels at the Resort Residential (RR-1 and RR-2b) lots at locations W1, W2, W3, and W5 which front the highway are predicted to exceed the 65 DNL FHA/HUD noise standard. Due to even smaller setback distances from the highway, the Park (P-1) west of the Resort Residential (RR-1) lots will also experience traffic noise levels greater than 65 DNL. The proposed Resident Housing (RES-2) lots at locations E3, E4, and E5 west of the Marconi Road intersection should experience traffic noise levels which do not exceed the FHA/HUD standard of 65 DNL. Exceedances of the 65 DNL FHA/HUD noise standard are also expected at the two existing residences (E1 and E2) 0.7 miles east of the Kuilima Drive intersection. At one of the residences (E1), existing traffic noise levels currently exceed 65 DNL.

Along Kamehameha Highway west of the project to Pahipahialua Beach Park, the number of existing residences which experience traffic noise levels greater than 65 DNL will increase from thirteen to eighteen by 2025 under the Proposed Action. From Table 4, the setback distance to the 65 DNL contour in this residential area west of the project is predicted to increase from 75 to 122 FT setback distance to the highway centerline.

Along Kuilima Drive, and probably along the new Kaihalulu Drive, existing and future residences are predicted to experience traffic noise levels below 65 DNL, and be in the "Moderate Exposure, Acceptable" noise exposure category of Table 1.

CHAPTER VII. DISCUSSION OF PROJECT RELATED NOISE IMPACTS AND POSSIBLE NOISE MITIGATION MEASURES

Traffic Noise with Proposed Action. The increases in traffic noise levels attributable to the Proposed Action from the present to CY 2025 are predicted to range from 0.2 to 3.3 DNL along Kamehameha Highway, where traffic noise levels are expected to continue to be above 65 DNL along the highway Rights-of-Way. These increases in traffic noise levels along Kamehameha Highway which are attributable to the Proposed Action are considered to be in the moderate to high category, and are greater than the traffic noise level increases of approximately 1.0 DNL expected as a result of non-project traffic. Except for the two existing residences east of Kuilima Drive, the lands along the highway Rights-of-Way are generally vacant between Kawela Bay and Marconi Road. The closest noise sensitive residences beyond the project area are located west of Kawela Bay. Along public roadways, where traffic noise levels result from both project and non-project traffic, traffic noise mitigation measures are implemented by private land owners. Government agencies (such as the Hawaii State Department of Transportation, Highways Division) typically address traffic noise impacts within the limits of construction during public roadway improvement projects, and include traffic noise mitigation measures if they are considered to be "reasonable and feasible."

At noise sensitive receptor locations W1, W2, W3, W5, E1, and E2 (see Figure 10), future traffic noise levels with the Proposed Action are predicted to exceed the 65 DNL FHA/HUD noise standard. At locations W1, W2, W3, E1, and E2, reductions in the posted speed limit from 45 miles per hour to 35 miles per hour would reduce predicted traffic noise levels by approximately 2 DNL and to levels below the 65 DNL FHA/HUD noise standard at locations W3, W5, and E2. Predicted future traffic noise levels at receptor locations W1, W3, and E1 would still remain above 65 DNL with or without a 10 miles per hour reduction in the posted speed limit.

Other possible traffic noise mitigation measures are: increasing the setback distances of the receptors from the highway; constructing sound attenuating walls or berms between the highway and the receptors; or closure and air conditioning of the affected dwellings. Increasing the setback distances of future residences to 122 FT from the centerline of Kamehameha Highway should be considered as a possible noise mitigation measure. Alternately, the addition of approximately 6 FT high sound attenuating walls (or berms) would reduce future traffic noise levels below 65 DNL at single story structures in the Resort Residential area and at the two existing residences at locations E1 and E2. For two story (or higher) structures, the wall/berm height requirements increase due to the higher elevations of receptors on the upper floors. Whenever mitigation of traffic noise at the upper floors are required, the use of closure and air conditioning, or the use of sound attenuating windows are the more appropriate sound attenuation measures.

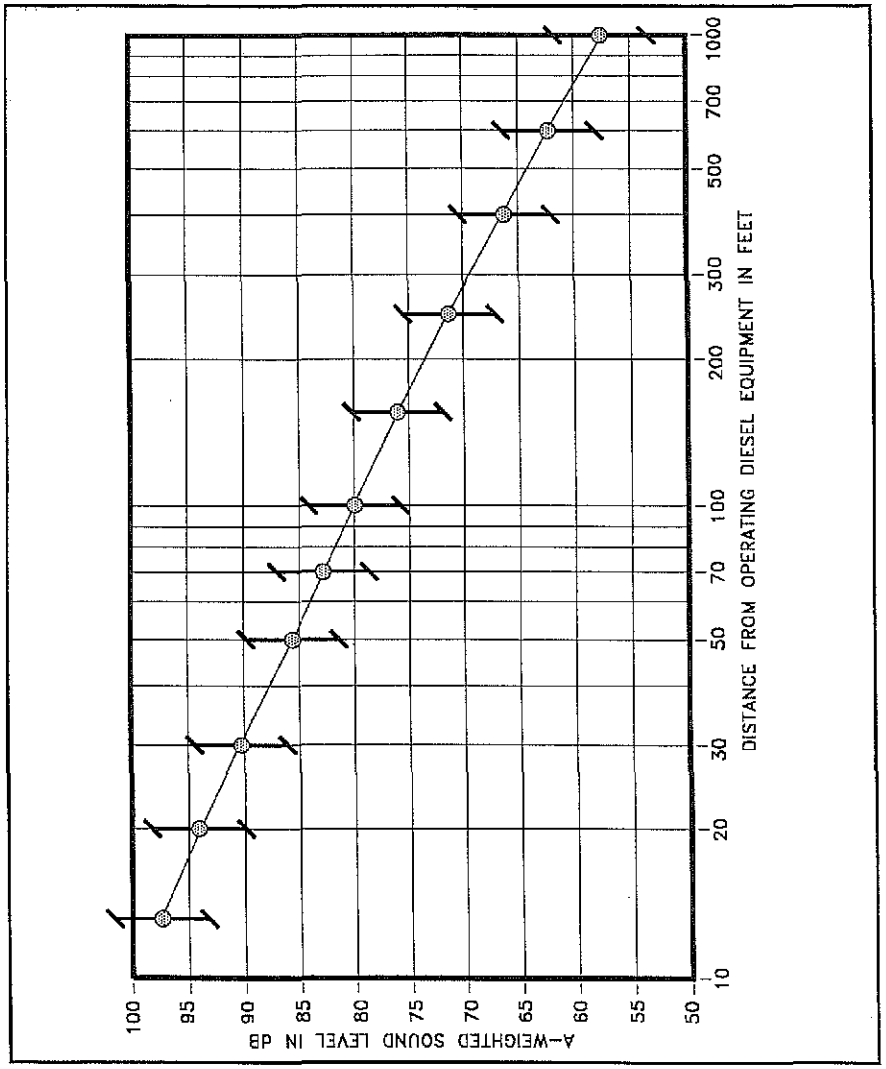
At existing receptor locations W1, W2, W3, W5, E1, and E2, the effectiveness of sound attenuating walls was examined. These results are shown in Table 7. Driveways to each residence will limit the sound attenuation performance of 6 FT high walls to approximately 4 to 7 dB, but these levels of attenuation should be sufficient to reduce future traffic noise to levels below 65 DNL at the affected dwellings.

Traffic Noise with Other Development Alternatives. A qualitative evaluation was performed to identify the differences in potential traffic noise levels among the Proposed Action and the three Master Plan Alternatives shown in Figures 6 through 9. The four Master Plan Alternatives (including the Proposed Action) were ranked in respect to the following:

- Increase in future traffic noise levels along Kamehameha Highway at existing residences west of Kuilima Drive due to the project;
- Increase in future traffic noise levels along Kamehameha Highway at existing residences east of Kuilima Drive due to the project;
- Increase in future traffic noise levels along Kuilima Drive at existing residences along Kuilima Drive;
- Potential traffic noise mitigation measures at existing and future residences along Kamehameha Highway within project limits; and
- Potential traffic noise mitigation measures at existing residences along Kamehameha Highway beyond project limits to Pahipahialua Beach Park.

The resulting rankings of the four alternatives, from lowest traffic noise impact to highest traffic noise impact were: Resort Residential Alternative; Conservation Partner Alternative; Proposed Action; and Full Build-Out Alternative. Future traffic volumes were lower under the Resort Residential and Conservation Partner Alternative, so they would cause the least traffic noise impacts at existing residences within and beyond the project area. In respect to minimizing traffic noise impacts on future residences within the project area, the Full Build-Out Alternative was ranked highest (or best) due to the location of hotel units and the Equestrian Center rather than residences next to Kamehameha Highway. Nevertheless, in all other aspects, the Full Build-Out Alternative was expected to cause the greatest noise impacts.

Construction Noise. Audible construction noise will probably be unavoidable during the entire project construction period. The total time period for construction is unknown, but it is anticipated that the actual work will be moving from one location on the project site to another during that period. Actual length of exposure to construction noise at any receptor location will probably be less than the total construction period for the entire project. Typical levels of noise from construction activity (excluding pile driving activity) are shown in Figure 11. Risks of adverse noise impacts during construction are highest at the existing hotel Cottages and Ocean Villas, and the



ANTICIPATED RANGE OF CONSTRUCTION NOISE LEVELS VS. DISTANCE

FIGURE 11

existing residences at Kuilima Estates. Adverse impacts from construction noise are not expected to be in the "public health and welfare" category due to the temporary nature of the work and due to the administrative controls available for its regulation. Instead, these impacts will probably be limited to the temporary degradation of the quality of the acoustic environment in the immediate vicinity of the project site.

Elimination of construction noise to inaudible levels will not be practical in all cases due to the intensity of construction noise sources (80 to 90+ dB at 50 FT distance), and due to the exterior nature of the work (grading and earth moving, trenching, concrete pouring, hammering, etc.). The use of properly muffled construction equipment should be required on the job site. The incorporation of State Department of Health construction noise limits and curfew times, which are applicable on the island of Oahu (Reference 5), is another noise mitigation measure which can be applied to this project. Figure 12 depicts the normally permitted hours of construction for construction noise as well as the curfew periods for construction noise. Noisy construction activities are not allowed on Sundays and holidays under the DOH permit procedures.

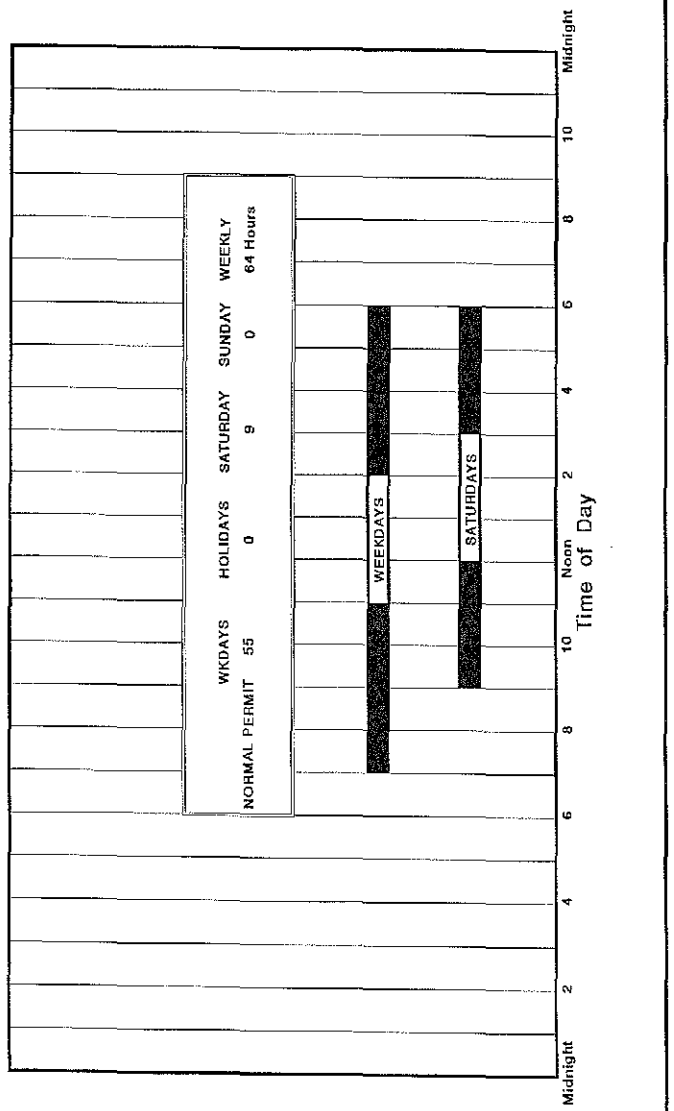


FIGURE 12

AVAILABLE WORK HOURS UNDER DOH PERMIT PROCEDURES FOR CONSTRUCTION NOISE

APPENDIX A. REFERENCES

(1) "Guidelines for Considering Noise in Land Use Planning and Control;" Federal Interagency Committee on Urban Noise; June 1980.

(2) American National Standard, "Sound Level Descriptors for Determination of Compatible Land Use," ANSI S12.9-1998/ Part 5; Acoustical Society of America.

(3) "Environmental Criteria and Standards, Noise Abatement and Control, 24 CFR, Part 51, Subpart B;" U.S. Department of Housing and Urban Development; July 12, 1979.

(4) "Information on Levels of Environmental Noise Requisite to Protect the Public Health and Welfare with an Adequate Margin of Safety;" U.S. Environmental Protection Agency; EPA 550/9-74- 004; March 1974.

(5) "Title 11, Administrative Rules, Chapter 46, Community Noise Control;" Hawaii State Department of Health; September 23, 1996.

(6) "FHWA Highway Traffic Noise Model User's Guide;" FHWA-PD-96-009, Federal Highway Administration; Washington, D.C.; January 1998 and Version 2.5 Upgrade (April 14, 2004).

(7) Existing and Future Traffic Volumes for the Turtle Bay Resort Master Plan; The Traffic Management Consultant; November 2011 and August 8, 2012.

(8) 24-Hour Traffic Counts, Station B72008300907, Kamehameha Highway West of Kuilima Drive; State Department of Transportation; January 19, 2011.

APPENDIX B

EXCERPTS FROM EPA'S ACOUSTIC TERMINOLOGY GUIDE

Descriptor Symbol Usage

The recommended symbols for the commonly used acoustic descriptors based on A-weighting are contained in Table I. As most acoustic criteria and standards used by EPA are derived from the A-weighted sound level, almost all descriptor symbol usage guidance is contained in Table I.

Since acoustic nomenclature includes weighting networks other than "A" and measurements other than pressure, an expansion of Table I was developed (Table II). The group adopted the ANSI descriptor-symbol scheme which is structured into three stages. The first stage indicates that the descriptor is a level (i.e., based upon the logarithm of a ratio), the second stage indicates the type of quantity (power, pressure, or sound exposure), and the third stage indicates the weighting network (A, B, C, D, E-----). If no weighting network is specified, "A" weighting is understood. Exceptions are the A-weighted sound level and the A-weighted peak sound level which require that the "A" be specified. For convenience in those situations in which an A-weighted descriptor is being compared to that of another weighting, the alternative column in Table II permits the inclusion of the "A". For example, a report on blast noise might wish to contrast the LCdn with the LAdn.

Although not included in the tables, it is also recommended that "Lpn" and "LepN" be used as symbols for perceived noise levels and effective perceived noise levels, respectively.

It is recommended that in their initial use within a report, such terms be written in full, rather than abbreviated. An example of preferred usage is as follows:

The A-weighted sound level (LA) was measured before and after the installation of acoustical treatment. The measured LA values were 85 and 75 dB respectively.

Descriptor Nomenclature

With regard to energy averaging over time, the term "average" should be discouraged in favor of the term "equivalent". Hence, Leq, is designated the "equivalent sound level". For Ld, Ln, and Ldn, "equivalent" need not be stated since the concept of day, night, or day-night averaging is by definition understood. Therefore, the designations are "day sound level", "night sound level", and "day-night sound level", respectively.

The peak sound level is the logarithmic ratio of peak sound pressure to a reference pressure and not the maximum root mean square pressure. While the latter is the maximum sound pressure level, it is often incorrectly labelled peak. In that sound level meters have "peak" settings, this distinction is most important.

"Background ambient" should be used in lieu of "background", "ambient", "residual", or "indigenous" to describe the level characteristics of the general background noise due to the contribution of many unidentifiable noise sources near and far.

With regard to units, it is recommended that the unit decibel (abbreviated dB) be used without modification. Hence, DBA, PNdB, and EPNdB are not to be used. Examples of this preferred usage are: the Perceived Noise Level (Lpn was found to be 75 dB. Lpn = 75 dB). This decision was based upon the recommendation of the National Bureau of Standards, and the policies of ANSI and the Acoustical Society of America, all of which disallow any modification of bel except for prefixes indicating its multiples or submultiples (e.g., deci).

Noise Impact

In discussing noise impact, it is recommended that "Level Weighted Population" (LWP) replace "Equivalent Noise Impact" (ENI). The term "Relative Change of Impact" (RCI) shall be used for comparing the relative differences in LWP between two alternatives.

Further, when appropriate, "Noise Impact Index" (NII) and "Population Weighed Loss of Hearing" (PHL) shall be used consistent with CHABA Working Group 69 Report Guidelines for Preparing Environmental Impact Statements (1977).

APPENDIX B (CONTINUED)

TABLE I

A-WEIGHTED RECOMMENDED DESCRIPTOR LIST

TERM	SYMBOL
1. A-Weighted Sound Level	L_A
2. A-Weighted Sound Power Level	L_{WA}
3. Maximum A-Weighted Sound Level	L_{max}
4. Peak A-Weighted Sound Level	L_{Apk}
5. Level Exceeded x% of the Time	L_x
6. Equivalent Sound Level	L_{eq}
7. Equivalent Sound Level over Time (T) (1)	$L_{eq(T)}$
8. Day Sound Level	L_d
9. Night Sound Level	L_n
10. Day-Night Sound Level	L_{dn}
11. Yearly Day-Night Sound Level	$L_{dn(Y)}$
12. Sound Exposure Level	L_{SE}

(1) Unless otherwise specified, time is in hours (e.g. the hourly equivalent level is $L_{eq(1)}$). Time may be specified in non-quantitative terms (e.g., could be specified a $L_{eq(WASH)}$ to mean the washing cycle noise for a washing machine).

SOURCE: EPA ACOUSTIC TERMINOLOGY GUIDE, BNA 8-14-78,

APPENDIX B (CONTINUED)

TABLE II

RECOMMENDED DESCRIPTOR LIST

TERM	A-WEIGHTING	ALTERNATIVE(1) A-WEIGHTING	OTHER(2) WEIGHTING	UNWEIGHTED
1. Sound (Pressure)(3) Level	L_A	L_{pA}	L_B, L_{pB}	L_p
2. Sound Power Level	L_{WA}		L_{WB}	L_W
3. Max. Sound Level	L_{max}	L_{Amax}	L_{Bmax}	L_{pmax}
4. Peak Sound (Pressure) Level	L_{Apk}		L_{Bpk}	L_{pk}
5. Level Exceeded x% of the Time	L_x	L_{Ax}	L_{Bx}	L_{px}
6. Equivalent Sound Level	L_{eq}	L_{Aeq}	L_{Beq}	L_{peq}
7. Equivalent Sound Level (4) Over Time(T)	$L_{eq(T)}$	$L_{Aeq(T)}$	$L_{Beq(T)}$	$L_{peq(T)}$
8. Day Sound Level	L_d	L_{Ad}	L_{Bd}	L_{pd}
9. Night Sound Level	L_n	L_{An}	L_{Bn}	L_{pn}
10. Day-Night Sound Level	L_{dn}	L_{Adn}	L_{Bdn}	L_{pdn}
11. Yearly Day-Night Sound Level	$L_{dn(Y)}$	$L_{Adn(Y)}$	$L_{Bdn(Y)}$	$L_{pdn(Y)}$
12. Sound Exposure Level	L_S	L_{SA}	L_{SB}	L_{Sp}
13. Energy Average Value Over (Non-Time Domain) Set of Observations	$L_{eq(e)}$	$L_{Aeq(e)}$	$L_{Beq(e)}$	$L_{peq(e)}$
14. Level Exceeded x% of the Total Set of (Non-Time Domain) Observations	$L_{x(e)}$	$L_{Ax(e)}$	$L_{Bx(e)}$	$L_{px(e)}$
15. Average L_x Value	L_x	L_{Ax}	L_{Bx}	L_{px}

(1) "Alternative" symbols may be used to assure clarity or consistency.

(2) Only B-weighting shown. Applies also to C,D,E,.....weighting.

(3) The term "pressure" is used only for the unweighted level.

(4) Unless otherwise specified, time is in hours (e.g., the hourly equivalent level is Leq(1). Time may be specified in non-quantitative terms (e.g., could be specified as Leq(WASH) to mean the washing cycle noise for a washing machine.

APPENDIX C

SUMMARY OF BASE YEAR AND YEAR 2025 (PROPOSED ACTION) TRAFFIC VOLUMES
DURING PM PEAK HOUR AND SATURDAY PEAK HOUR

ROADWAY LANES	******** CY 2011 *********		** CY 2025 (NO BUILD) **		*** CY 2025 (BUILD) ****	
	WEEKDAY	SATURDAY	WEEKDAY	SATURDAY	WEEKDAY	SATURDAY
Kamehameha Hwy. West of Kaihalulu Dr. (EB)	344	445	438	524	714	892
Kamehameha Hwy. West of Kaihalulu Dr. (WB)	368	426	458	522	759	882
Two-Way	712	871	896	1,046	1,473	1,784
Kamehameha Hwy. East of Kaihalulu Dr. (EB)	344	445	438	524	580	753
Kamehameha Hwy. East of Kaihalulu Dr. (WB)	368	426	458	522	624	725
Two-Way	712	871	896	1,046	1,204	1,478
Kaihalulu Dr. at Kamehameha Hwy. (NB)	N/A	N/A	N/A	N/A	224	294
Kaihalulu Dr. at Kamehameha Hwy. (SB)	N/A	N/A	N/A	N/A	225	322
Two-Way	N/A	N/A	N/A	N/A	449	616
Kamehameha Hwy. West of Kuilima Dr. (EB)	344	445	438	524	581	753
Kamehameha Hwy. West of Kuilima Dr. (WB)	368	426	458	522	624	725
Two-Way	712	871	896	1,046	1,205	1,478
Kamehameha Hwy. East of Kuilima Dr. (EB)	310	402	395	480	625	836
Kamehameha Hwy. East of Kuilima Dr. (WB)	353	417	455	518	716	794
Two-Way	663	819	850	998	1,341	1,630
Kuilima Dr. at Kamehameha Hwy. (NB)	180	212	226	254	382	380
Kuilima Dr. at Kamehameha Hwy. (SB)	161	178	186	214	334	394
Two-Way	341	390	412	468	716	774
Kamehameha Hwy. West of Marconi Rd. (EB)	306	394	395	480	625	836
Kamehameha Hwy. West of Marconi Rd. (WB)	348	415	455	518	716	794
Two-Way	554	809	850	998	1,341	1,630
Kamehameha Hwy. East of Marconi Rd. (EB)	311	394	396	478	613	795
Kamehameha Hwy. East of Marconi Rd. (WB)	352	415	463	520	707	797
Two-Way	663	809	859	998	1,320	1,592
Marconi Rd. at Kamehameha Hwy. (NB)	9	8	9	8	147	279
Marconi Rd. at Kamehameha Hwy. (SB)	10	8	10	8	152	239
Two-Way	19	16	19	16	299	518

APPENDIX L:

CULTURAL AND NATURAL RESOURCES MANAGEMENT PLAN

L

TURTLE BAY RESORT
CULTURAL MANAGEMENT PLAN

Executive Summary

Introduction: The guidelines and procedures outlined in the Turtle Bay Resort (TBR) Cultural Management Plan (CMP) are to be used to ensure the protection of historic properties (which includes human remains) discovered at TBR, including during planning, construction, operations and maintenance. These procedures have been prepared to plan for and respond to such contingencies in a culturally appropriate manner, as well as to facilitate the archaeological monitoring and the timely completion of TBR related activities.

The major components of this CMP include:

- Process to be followed in the event of an inadvertent discovery of human remains;
- Roles and responsibilities for TBR, Ku‘iwalu and the Archaeological Consultant;
- A call-out list for the project(s) with names, titles, phone and/or cellular numbers of everyone that may need to be contacted.

If historic properties are discovered, the CMP should facilitate rapid responses for taking prudent action to resolve the incident as soon as possible including:

1. Identification, determination of jurisdiction and notification;
2. Assisting the relevant authorities with their investigations;
3. Monitoring the situation and appropriately informing all of those affected;
4. Acknowledging the various responsibilities;
5. Implement restoration action as necessary; and
6. Documentation of the entire incident.

Project Requirements: TBR is required to comply with Chapter 6E, Hawai‘i Revised Statutes, and the applicable administrative rules. An Archaeological Monitoring Plan (AMP) was prepared for portion of the Alpha Road Construction within the Turtle Bay Resort Development Area dated April 2006. Although the AMP may not cover the entire TBR project site, the Archaeological Monitoring Provisions provides adequate guidelines for all subsurface activities.

Cultural Management Plan

1.0 Purpose: The guidelines and procedures outlined in this CMP will be used to plan for, report and respond to any inadvertent discovery of historic properties, including human remains (incidents) on all activities related to TBR.

2.0 Objectives:

- Enable those involved to respond in a timely and culturally appropriate manner;
- Maintain TBR’s credibility and minimize negative public and government agency’s reaction by effectively resolving the incident;
- Minimize work stoppage;
- Minimize liability exposure to TBR in compliance with laws and regulations; and
- Human remains must be accorded full dignity and respect and if at all possible, burial places should not be disturbed. If it is not feasible to protect a burial from future construction activities, consultation with appropriate parties for the culturally appropriate treatment of the human remains shall be a priority consideration.

3.0 Archaeological Specifications:

- There shall be an on-site archaeological monitor during all ground disturbance activities, unless otherwise amended by TBR’s Project Manager in consultation with the State Historic Preservation Division (SHPD); and
- Any other SHPD requirements.

4.0 Incident in Progress:

- *TBR’s Project Manager’s Responsibilities:*
  - Project Manager (PM) will be kept informed of all potential subsurface activities or construction and operations related activities within TBR, in particular, activities within the shoreline or beach areas, to ensure compliance with the CMP and applicable regulations;
  - Contact and retain the services of an archaeological monitor for all appropriate subsurface activity. If the PM is uncertain whether to have an on-site archaeological monitor, than he will consult with the Archaeological Consultant (AC) or Ku‘iwalu for assistance;
  - Immediately contact the AC upon the discovery of historic properties, specifically the discovery of human remains if the archaeologist is not onsite;
  - As the owner’s representative the PM will coordinate with the owner, TBR personnel, AC and Ku‘iwalu on all relevant matters related to the incident;
  - Immediately notify the call out list when alerted to a possible incident; and
  - Coordinate with the owner, TBR, and AC when work may resume.

- *TBR personnel (for ongoing maintenance or operations actions) or Contractor’s (for all other construction related activities)Responsibilities:*

- Confer with the PM on all excavation or installation of permanent equipment within the shoreline or beach area to ensure compliance with applicable regulations, i.e., conservation district use, special management area, etc.;
- Cease all work in the affected area upon the discovery of potential historic properties, including human remains and said area shall not be disturbed until it is inspected by the AC;
- Immediately notify the PM regarding the incident;
- Stake or flag off affected area to prevent additional disturbances;
- Coordinate restoration efforts with AC as necessary; and
- Resume work upon notice by the PM.

- *Archaeological Consultant's (AC) Responsibilities*:
  - Respond within 24 hours or sooner from notification of the discovery of human remains;
  - Stop construction activity when historic properties, including human remains, are found although the AC may redirect construction activity to another area;
  - Determine jurisdiction of the inadvertent discovery (human, over 50 years, and ethnicity);
  - Make all required notifications when human remains have been discovered (SHPD, Honolulu Police Department (HPD), O'ahu Island Burial Council (OIBC));
  - Notify the PM when work may resume;
  - Provide adequate information and summary of the incident regarding the discovery of historic properties, including human remains to Ku'iwalu who will prepare talking points on the incident; and
  - Comply with all requirements of SHPD or applicable regulations, including all appropriate documentation.

- *Ku'iwalu's Responsibilities:*
  - Coordinate and facilitate resolution of the incident and handle communications with the public including and appropriate regulatory agencies (including SHPD) when notified of an incident;
  - If human remains are involved, contact the Kahuku Burial Committee (KBC) members or any recognized lineal or cultural descendants of the discovery of human remains;
  - Consult with interested parties in the preparation and distribution of information and statements to the community, news media, and other groups, as required including draft and distribute talking points regarding the incident,
  - Provide incident follow-up and project status to the OIBC, SHPD, KBC, and other relevant organizations and or individuals, as required; and
  - Evaluate efficacy of the CMP and update as needed.

APPROVED BY: DATE:

AUG 7, 2012

DREW STOTESBURY
ceo | turtle bay resort | o'ahu

CALL-OUT LIST

State Historic Preservation Division:	
Pua Aiu, Administrator	(808) 692-8015 (on O'ahu)
HPD	911
TBR:	
Ralph Makaiau (PM)	(808) 447-6954 (o) / (808) 478-6548 (m)
Drew Stotesbury	(808) 352-4362 (m)
Scott McCormack	(808) 447-6956 (o) / (808) 755-5933 (m)
Danna Holck	(808) 293-6040 (o) / (808) 226-4034 (m)
Matt Hall (If Golf Courses involved)	(808) 795-3615 (o) / (808) 294-1699 (m)
Ku'iwalu:	
Dawn Naomi Chang	(808) 539-3583 (o) / (808) 728-5655 (m)
Archaeological Consultant – Haun & Associates:	
Alan Haun	(808) 982-7755 (o) / (808) 936-3205 (m)
O'ahu Island Burial Council:	
Hinaleimoana Kalu, Chair	(808) 225-4123
Steve Hoag, area OIBC representative	

APPENDIX M:

TRIP GENERATION SURVEY REPORT

M

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Established 1960

Database Marketing

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Modeling/Forecasting

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QUANTIFICATION OF TURTLE BAY RESORT TRAFFIC PATTERNS REPORT

SMS Affiliations and Associations:

Experian
International Survey Research
Solutions Pacific, LLC
SMS Consulting, LLC
3i Marketing & Communications

Prepared by:

SMS Research & Marketing Services, Inc.
December, 2011

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Quantification of Turtle Bay Resort Traffic Patterns Report

OBJECTIVE

The primary objective of this project is to understand and summarize the travel patterns of Turtle Bay Resort guests and tenants as they arrive and depart from the property.

METHODOLOGY

Fielding was conducted from October 31, 2011 to November 6; 2011, fielding times are shown in Table 1 below. A total of nine interviewers were trained and set up at one of four different entrances and locations at Turtle Bay (Appendix B).

Interviewers conducted a very brief one minute survey with cars entering and leaving the Turtle Bay Resort. The survey guide can be found in Appendix A. At the beginning of the study respondents were very cooperative and willing to participate; however, there were spikes of repeat refusals on November 2 and again on November 4 from hotel and condo guests staying at Turtle Bay who were tired of doing the survey with us.

A total of 4,800 surveys were completed; however, there were another 1,000 surveys conducted that were repeat refusals over the seven day period. The margin of error of the completed interviews is +/-1 percent at 95 percent confidence interval. Interviewers tried to interview every car, but if there was heavy traffic interviewers resorted to interviewing every third car instead. Furthermore, if an interviewer noticed a bus, he/she stopped interviewing cars that were in front of the bus and allowed it to pass before continuing to interview cars. This was done to not disrupt the scheduled arrival and departure times of tour buses. Throughout the seven days approximately 3,800 cars were not interviewed due to these missed cars and heavy rains.

There were some noteworthy events that occurred at Turtle Bay that may have affected the traffic flow. Thursday (11/3) there was a pre-golf tournament dinner, with the golf tournament taking place on Friday (11/4). On Saturday (11/5) a concert was held at Turtle Bay.

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Table 1: Fielding dates

	Monday 10/31/11	Tuesday 11/1/11	Wednesday 11/2/11	Thursday 11/3/11	Friday 11/4/11	Saturday 11/5/11	Sunday 11/6/11
7:00AM							
8:00AM							
9:00AM							
10:00AM							
11:00AM							
12:00PM							
1:00PM							
2:00PM							
3:00PM							
4:00PM							
5:00PM							
6:00PM							
7:00PM							
8:00PM							

RESULTS

This is a summary of the analysis executed to-date. As discussed, there is an extensive amount of data, and it can be reviewed in multiple manners. SMS will be pleased to provide additional data as needed.

The following tables summarize the major traffic patterns by segments, day part, and weekend vs. weekday.

Following is a breakdown of the drivers interviewed:

Table 2: Breakdown of drivers interviewed

DRIVERS INTERVIEWED		
	Number	Percent
Tourist - Hotel guest	1,070	16.8
Tourist - Condo guest	159	2.5
Tourist - Visiting	696	10.9
Oahu resident - Hotel guest	166	2.6
Oahu resident - Condo guest	328	5.2
Oahu resident - Visiting	1,299	20.4
NI resident - Hotel guest	6	0.1
NI resident - Condo guest	1	0.0
NI resident - Visiting	11	0.2
Employee	687	10.8
Condo resident	224	3.5
Construction	83	1.3
Drop off	72	1.1
Doesn't speak English	9	0.1
Repeat refusal	980	15.4
Total	5,791	90.9
No Driver Classification	577	9.1
Total	**6,368**	**100.0**

Table 3: Arriving respondents by point of origin and driver definition

	Total		Driver Definition									
	Count	Col %	TBR hotel/condo		TBR visitor		TBR condo resident		Employee		Others	
			Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %
Waialua	29	1.2%	4	0.5%	10	0.9%	1	0.9%	14	5.3%		
Haleiwa	202	8.6%	69	8.9%	84	7.3%	13	11.6%	32	12.1%	4	6.3%
Laniakea to Waimea bay	34	1.4%	18	2.3%	12	1.0%	2	1.8%	2	0.8%		
Three Tables beach to Kawela Beach	289	12.2%	81	10.5%	129	11.2%	19	17.0%	54	20.4%	6	9.5%
Kahuku	165	7.0%	61	7.9%	51	4.4%	13	11.6%	31	11.7%	9	14.3%
Laie	214	9.1%	67	8.7%	99	8.6%	22	19.6%	25	9.4%	1	1.6%
Hauula	83	3.5%	10	1.3%	34	3.0%	2	1.8%	34	12.8%	3	4.8%
Kaaawa	13	0.6%	5	0.6%	5	0.4%	1	0.9%	2	0.8%		
Windward	141	6.0%	34	4.4%	89	7.7%	4	3.6%	7	2.6%	7	11.1%
East Honolulu	20	0.8%	4	0.5%	13	1.1%	2	1.8%	1	0.4%		
Honolulu	728	30.8%	267	34.6%	405	35.2%	10	8.9%	25	9.4%	21	33.3%
Central Oahu	164	6.9%	36	4.7%	100	8.7%	4	3.6%	22	8.3%	2	3.2%
Leeward Oahu	141	6.0%	22	2.9%	99	8.6%	6	5.4%	6	2.3%	8	12.7%
Other	138	5.8%	93	12.1%	20	1.7%	13	11.6%	10	3.8%	2	3.2%
Total	2,361	100.0%	771	100.0%	1,150	100.0%	112	100.0%	265	100.0%	63	100.0%

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Table 4: Departing respondents by destination and driver definition

	Total		Driver Description									
	Count	Col %	TBR hotel/condo		TBR visitor		TBR condo resident		Employee		Others	
			Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %
Waialua	38	1.8%	4	0.5%	9	1.1%			24	7.1%	1	1.6%
Haleiwa	221	10.5%	97	11.7%	63	8.0%	8	9.3%	48	14.2%	5	8.2%
Laniakea to Waimea bay	19	0.9%	8	1.0%	9	1.1%			2	0.6%		
Three Tables beach to Kawela Beach	257	12.2%	100	12.0%	97	12.4%	11	12.8%	46	13.6%	3	4.9%
Kahuku	175	8.3%	46	5.5%	44	5.6%	13	15.1%	67	19.8%	5	8.2%
Laie	233	11.1%	97	11.7%	68	8.7%	15	17.4%	48	14.2%	5	8.2%
Hauula	58	2.8%	11	1.3%	25	3.2%	1	1.2%	21	6.2%		
Kaaawa	18	0.9%	5	0.6%	4	0.5%			9	2.7%		
Windward	130	6.2%	34	4.1%	75	9.6%	4	4.7%	12	3.5%	5	8.2%
East Honolulu	18	0.9%	3	0.4%	11	1.4%	1	1.2%	2	0.6%	1	1.6%
Honolulu	468	22.3%	193	23.2%	240	30.6%	4	4.7%	16	4.7%	15	24.6%
Central Oahu	126	6.0%	38	4.6%	56	7.1%	2	2.3%	26	7.7%	4	6.6%
Leeward Oahu	99	4.7%	22	2.6%	55	7.0%			11	3.2%	11	18.0%
Other	151	7.2%	113	13.6%	18	2.3%	14	16.3%	2	0.6%	4	6.6%
Unknown	92	4.4%	61	7.3%	11	1.4%	13	15.1%	5	1.5%	2	3.3%
Total	2,103	100.0%	832	100.0%	785	100.0%	86	100.0%	339	100.0%	61	100.0%

SMS,Inc. (Turtle Bay 2011)

Table 5: Arriving respondents by point of origin and direction

	Total		Directional distribution of arriving traffic			
			West		East	
	Count	Col %	Count	Col %	Count	Col %
Waialua	29	1.3%	28	2.0%	1	0.1%
Haleiwa	194	8.5%	185	13.2%	9	1.0%
Laniakea to Waimea bay	34	1.5%	30	2.1%	4	0.5%
Three Tables beach to Kawela Beach	275	12.1%	265	18.9%	10	1.2%
Kahuku	159	7.0%	26	1.9%	133	15.3%
Laie	210	9.3%	22	1.6%	188	21.6%
Hauula	80	3.5%	8	0.6%	72	8.3%
Kaaawa	14	0.6%	1	0.1%	13	1.5%
Windward	140	6.2%	25	1.8%	115	13.2%
East Honolulu	20	0.9%	15	1.1%	5	0.6%
Honolulu	709	31.2%	477	34.0%	232	26.7%
Central Oahu	159	7.0%	138	9.9%	21	2.4%
Leeward Oahu	139	6.1%	124	8.9%	15	1.7%
Other	108	4.8%	57	4.1%	51	5.9%
Total	2,270	100.0%	1,401	100.0%	869	100.0%

SMS,Inc. (Turtle Bay 2011)

Table 6: Departing respondents by destination and direction

	Total		Directional distribution of departing traffic			
			West		East	
	Count	Col %	Count	Col %	Count	Col %
Waialua	38	1.9%	37	3.1%	1	0.1%
Haleiwa	221	11.0%	208	17.5%	13	1.6%
Laniakea to Waimea bay	18	0.9%	18	1.5%		
Three Tables beach to Kawela Beach	242	12.1%	235	19.8%	7	0.9%
Kahuku	174	8.7%	19	1.6%	155	18.9%
Laie	234	11.7%	28	2.4%	206	25.1%
Hauula	55	2.7%	7	0.6%	48	5.9%
Kaaawa	18	0.9%			18	2.2%
Windward	126	6.3%	27	2.3%	99	12.1%
East Honolulu	19	0.9%	9	0.8%	10	1.2%
Honolulu	465	23.2%	300	25.3%	165	20.1%
Central Oahu	123	6.1%	109	9.2%	14	1.7%
Leeward Oahu	96	4.8%	81	6.8%	15	1.8%
Other	121	6.0%	77	6.5%	44	5.4%
Unknown	57	2.8%	32	2.7%	25	3.0%
Total	2,007	100.0%	1,187	100.0%	820	100.0%

SMS,Inc. (Turtle Bay 2011)

Table 7.1: Arriving respondents by point of origin and day part

			Start Time																					
			8am - 9am				9am - 10am				10am - 11am				11am - 12pm				12pm - 1pm				1pm - 2pm	
			Weekday vs Weekend				Weekday vs Weekend				Weekday vs Weekend				Weekday vs Weekend				Weekday vs Weekend				Weekday vs Weekend	
			Weekday		Weekend		Weekday		Weekend		Weekday		Weekend		Weekday		Weekend		Weekday		Weekend		Weekday		Weekend	
	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %
Waialua	30	1.3%	3	3.3%			3	3.2%	1	1.8%					4	2.5%			1	0.7%			1	0.6%	1	0.9%
Haleiwa	207	8.7%	4	4.4%	2	5.7%	4	4.2%	7	12.5%	9	4.6%	6	17.1%	12	7.5%	2	5.1%	15	9.9%	4	5.6%	15	8.4%	6	5.6%
Laniakea to Waimea bay	34	1.4%									1	0.5%			3	1.9%	1	2.6%	2	1.3%	2	2.8%			1	0.9%
Three Tables beach to Kawela Beach	294	12.3%	22	24.4%	7	20.0%	16	16.8%	10	17.9%	20	10.2%	2	5.7%	18	11.3%	4	10.3%	17	11.2%	14	19.4%	19	10.7%	9	8.3%
Kahuku	166	6.9%	7	7.8%			10	10.5%			13	6.6%	1	2.9%	13	8.1%	1	2.6%	14	9.2%	7	9.7%	15	8.4%	6	5.6%
Laie	216	9.0%	10	11.1%	5	14.3%	9	9.5%	5	8.9%	21	10.7%	4	11.4%	7	4.4%	5	12.8%	12	7.9%	7	9.7%	26	14.6%	9	8.3%
Hauula	84	3.5%	6	6.7%	4	11.4%	6	6.3%			6	3.1%	6	17.1%	3	1.9%	1	2.6%	6	3.9%			4	2.2%	4	3.7%
Kaaawa	14	0.6%	2	2.2%									1	2.9%	1	0.6%			1	0.7%	1	1.4%	1	0.6%	1	0.9%
Windward	142	5.9%	4	4.4%	5	14.3%	3	3.2%	3	5.4%	13	6.6%	2	5.7%	11	6.9%	5	12.8%	7	4.6%	5	6.9%	16	9.0%	12	11.1%
East Honolulu	19	0.8%	2	2.2%			1	1.1%	2	3.6%	3	1.5%			2	1.3%			1	0.7%			1	0.6%	1	0.9%
Honolulu	737	30.8%	13	14.4%	3	8.6%	19	20.0%	16	28.6%	59	30.1%	7	20.0%	58	36.3%	11	28.2%	52	34.2%	21	29.2%	56	31.5%	38	35.2%
Central Oahu	165	6.9%	8	8.9%	5	14.3%	9	9.5%	8	14.3%	26	13.3%	1	2.9%	10	6.3%	4	10.3%	3	2.0%	2	2.8%	10	5.6%	6	5.6%
Leeward Oahu	142	5.9%	8	8.9%	3	8.6%	7	7.4%	4	7.1%	14	7.1%	4	11.4%	11	6.9%	3	7.7%	12	7.9%	5	6.9%	8	4.5%	7	6.5%
Other	139	5.8%	1	1.1%	1	2.9%	8	8.4%			11	5.6%	1	2.9%	7	4.4%	2	5.1%	9	5.9%	4	5.6%	6	3.4%	7	6.5%
Total	2,389	100.0%	90	100.0%	35	100.0%	95	100.0%	56	100.0%	196	100.0%	35	100.0%	160	100.0%	39	100.0%	152	100.0%	72	100.0%	178	100.0%	108	100.0%

Table 7.2: Arriving respondents by point of origin and day part

			Start Time																					
			2pm - 3pm				3pm - 4pm				4pm - 5pm				5pm - 6pm				6pm - 7pm				7pm - 8pm	
			Weekday vs Weekend				Weekday vs Weekend				Weekday vs Weekend				Weekday vs Weekend				Weekday vs Weekend				Weekday vs Weekend	
			Weekday		Weekend		Weekday		Weekend		Weekday		Weekend		Weekday		Weekend		Weekday		Weekend		Weekday		Weekend	
	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %
Waialua	3	1.6%	1	1.4%	2	1.0%	3	3.6%	1	0.9%	1	1.3%	1	1.0%	2	2.5%							2	3.3%		
Haleiwa	9	4.9%	8	10.8%	20	9.8%	7	8.4%	11	9.8%	6	7.5%	16	16.0%	5	6.2%	15	15.5%	4	7.3%	14	23.0%	6	14.6%
Laniakea to Waimea bay	5	2.7%	1	1.4%	3	1.5%	2	2.4%	2	1.8%	1	1.3%	2	2.0%	2	2.5%	1	1.0%	2	3.6%	2	3.3%	1	2.4%
Three Tables beach to Kawela Beach	21	11.4%	7	9.5%	20	9.8%	8	9.6%	10	8.9%	14	17.5%	14	14.0%	5	6.2%	16	16.5%	11	20.0%	3	4.9%	7	17.1%
Kahuku	17	9.2%	6	8.1%	15	7.4%	1	1.2%	8	7.1%	6	7.5%	8	8.0%	3	3.7%	6	6.2%	3	5.5%	4	6.6%	2	4.9%
Laie	12	6.5%	2	2.7%	20	9.8%	2	2.4%	10	8.9%	2	2.5%	11	11.0%	3	3.7%	13	13.4%	7	12.7%	10	16.4%	4	9.8%
Hauula	15	8.1%	3	4.1%	1	0.5%	1	1.2%	3	2.7%	2	2.5%	4	4.0%			2	2.1%	1	1.8%	3	4.9%	3	7.3%
Kaaawa	2	1.1%					1	1.2%					1	1.0%			1	1.0%			1	1.6%		
Windward	7	3.8%	4	5.4%	10	4.9%	6	7.2%	5	4.5%	2	2.5%	7	7.0%	5	6.2%	4	4.1%	3	5.5%	1	1.6%	2	4.9%
East Honolulu			1	1.4%	2	1.0%	1	1.2%			1	1.3%			1	1.2%								
Honolulu	65	35.1%	28	37.8%	76	37.3%	30	36.1%	36	32.1%	24	30.0%	23	23.0%	39	48.1%	26	26.8%	12	21.8%	17	27.9%	8	19.5%
Central Oahu	15	8.1%	3	4.1%	15	7.4%	5	6.0%	9	8.0%	7	8.8%	4	4.0%	5	6.2%	4	4.1%	4	7.3%	1	1.6%	1	2.4%
Leeward Oahu	7	3.8%	3	4.1%	8	3.9%	7	8.4%	8	7.1%	8	10.0%	3	3.0%	2	2.5%	3	3.1%	5	9.1%	1	1.6%	1	2.4%
Other	7	3.8%	7	9.5%	12	5.9%	9	10.8%	9	8.0%	6	7.5%	6	6.0%	9	11.1%	6	6.2%	3	5.5%	2	3.3%	6	14.6%
Total	185	100.0%	74	100.0%	204	100.0%	83	100.0%	112	100.0%	80	100.0%	100	100.0%	81	100.0%	97	100.0%	55	100.0%	61	100.0%	41	100.0%

Table 8.1: Departing respondents by destination and day part

	Count	Col %	Start Time																							
			8am - 9am				9am - 10am				10am - 11am				11am - 12pm				12pm - 1pm				1pm - 2pm			
			Weekday vs Weekend				Weekday vs Weekend				Weekday vs Weekend				Weekday vs Weekend				Weekday vs Weekend				Weekday vs Weekend			
			Weekday		Weekend		Weekday		Weekend		Weekday		Weekend		Weekday		Weekend		Weekday		Weekend		Weekday		Weekend	
			Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %
Waialua	38	1.8%													3	1.8%			1	0.5%			3	1.3%		
Haleiwa	223	10.5%	7	8.0%	3	3.4%	6	5.2%	2	1.7%	11	7.5%			14	8.2%	2	1.2%	20	10.8%	4	2.2%	14	6.1%	4	1.7%
Laniakea to Waimea bay	19	0.9%			1	1.1%	1	0.9%							4	2.3%			2	1.1%						
Three Tables beach to Kawela Beach	257	12.1%	14	16.1%	4	4.6%	17	14.7%	2	1.7%	13	8.9%	1	0.7%	15	8.8%	4	2.3%	10	5.4%	7	3.8%	27	11.7%	1	0.4%
Kahuku	176	8.3%	3	3.4%			2	1.7%	1	0.9%	9	6.2%	2	1.4%	15	8.8%	2	1.2%	13	7.0%	5	2.7%	29	12.6%	3	1.3%
Laie	235	11.1%	6	6.9%	1	1.1%	8	6.9%	3	2.6%	10	6.8%	4	2.7%	16	9.4%	3	1.8%	13	7.0%	2	1.1%	17	7.4%	6	2.6%
Hauula	58	2.7%					1	0.9%			3	2.1%			2	1.2%	1	0.6%	2	1.1%	1	0.5%	6	2.6%		
Kaaawa	19	0.9%					1	0.9%			3	2.1%	1	0.7%					1	0.5%			1	0.4%		
Windward	132	6.2%	1	1.1%	3	3.4%	5	4.3%	2	1.7%	5	3.4%			9	5.3%	1	0.6%	5	2.7%	4	2.2%	13	5.6%	2	0.9%
East Honolulu	19	0.9%	3	3.4%			2	1.7%			1	0.7%			1	0.6%	1	0.6%	2	1.1%			1	0.4%	1	0.4%
Honolulu	475	22.4%	19	21.8%	3	3.4%	27	23.3%	7	6.0%	33	22.6%	3	2.1%	38	22.2%	6	3.5%	35	18.8%	10	5.4%	35	15.2%	15	6.5%
Central Oahu	126	5.9%	3	3.4%			3	2.6%	2	1.7%	7	4.8%	1	0.7%	7	4.1%			1	0.5%	3	1.6%	12	5.2%	4	1.7%
Leeward Oahu	99	4.7%	1	1.1%			1	0.9%			5	3.4%			4	2.3%	2	1.2%	10	5.4%	4	2.2%	9	3.9%	3	1.3%
Other	151	7.1%	8	9.2%	3	3.4%	13	11.2%	6	5.2%	20	13.7%	5	3.4%	11	6.4%	3	1.8%	11	5.9%	5	2.7%	7	3.0%	6	2.6%
Unknown	94	4.4%	3	3.4%	1	1.1%	3	2.6%	1	0.9%	7	4.8%	2	1.4%	7	4.1%			11	5.9%	4	2.2%	11	4.8%	1	0.4%
Total	2,121	100.0%	68	78.2%	19	21.8%	90	77.6%	26	22.4%	127	87.0%	19	13.0%	146	85.4%	25	14.6%	137	73.7%	49	26.3%	185	80.1%	46	19.9%

Table 8.2: Departing respondents by destination and day part

	Start Time																							
	2pm - 3pm				3pm - 4pm				4pm - 5pm				5pm - 6pm				6pm - 7pm				7pm - 8pm			
	Weekday vs Weekend				Weekday vs Weekend				Weekday vs Weekend				Weekday vs Weekend				Weekday vs Weekend				Weekday vs Weekend			
	Weekday		Weekend		Weekday		Weekend		Weekday		Weekend		Weekday		Weekend		Weekday		Weekend		Weekday		Weekend	
	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %	Count	Col %
Waialua	1	0.4%			3	1.1%	1	0.4%	6	2.7%	3	1.3%	5	2.7%			4	2.6%	4	2.6%	3	3.1%	1	1.0%
Haleiwa	20	8.2%	8	3.3%	27	9.6%	6	2.1%	14	6.3%	6	2.7%	14	7.5%	2	1.1%	17	11.2%	3	2.0%	17	17.5%	2	2.1%
Laniakea to Waimea bay	2	0.8%			1	0.4%	3	1.1%	2	0.9%			1	0.5%			2	1.3%						
Three Tables beach to Kawela Beach	27	11.0%	3	1.2%	21	7.5%	4	1.4%	21	9.4%	10	4.5%	10	5.4%	9	4.8%	11	7.2%	12	7.9%	9	9.3%	5	5.2%
Kahuku	9	3.7%	4	1.6%	20	7.1%	5	1.8%	12	5.4%	12	5.4%	9	4.8%	1	0.5%	11	7.2%	2	1.3%	5	5.2%	2	2.1%
Laie	18	7.3%	6	2.4%	28	10.0%	9	3.2%	19	8.5%	8	3.6%	21	11.3%	10	5.4%	15	9.9%	1	0.7%	10	10.3%	1	1.0%
Hauula	2	0.8%	3	1.2%	7	2.5%	2	0.7%	9	4.0%	3	1.3%	2	1.1%	2	1.1%	5	3.3%	1	0.7%	3	3.1%	3	3.1%
Kaaawa	2	0.8%	2	0.8%	3	1.1%			2	0.9%	2	0.9%	1	0.5%										
Windward	7	2.9%	7	2.9%	12	4.3%	18	6.4%	2	0.9%	5	2.2%	16	8.6%	2	1.1%	5	3.3%	5	3.3%	2	2.1%	1	1.0%
East Honolulu	1	0.4%	1	0.4%	1	0.4%					1	0.4%			1	0.5%			1	0.7%	1	1.0%		
Honolulu	42	17.1%	26	10.6%	32	11.4%	25	8.9%	23	10.3%	21	9.4%	25	13.4%	11	5.9%	10	6.6%	16	10.5%	10	10.3%	3	3.1%
Central Oahu	11	4.5%	7	2.9%	7	2.5%	8	2.9%	15	6.7%	5	2.2%	7	3.8%	7	3.8%	6	3.9%	2	1.3%	7	7.2%	1	1.0%
Leeward Oahu	13	5.3%	4	1.6%	10	3.6%	7	2.5%	6	2.7%	5	2.2%	2	1.1%	7	3.8%	3	2.0%			2	2.1%	1	1.0%
Other	7	2.9%	6	2.4%	7	2.5%	2	0.7%	3	1.3%	3	1.3%	8	4.3%	6	3.2%	4	2.6%	3	2.0%	1	1.0%	3	3.1%
Unknown	5	2.0%	1	0.4%	8	2.9%	3	1.1%	2	0.9%	4	1.8%	6	3.2%	1	0.5%	7	4.6%	2	1.3%	3	3.1%	1	1.0%
Total	167	68.2%	78	31.8%	187	66.8%	93	33.2%	136	60.7%	88	39.3%	127	68.3%	59	31.7%	100	65.8%	52	34.2%	73	75.3%	24	24.7%

Table 9: Arriving respondents by day part and direction

	Total		Directional distribution of arriving traffic			
			West		East	
	Count	Col %	Count	Col %	Count	Col %
8am - 9am	122	4.6%	79	4.9%	43	4.2%
9am - 10am	146	5.5%	99	6.1%	47	4.6%
10am - 11am	238	9.0%	142	8.8%	96	9.5%
11am - 12pm	202	7.7%	130	8.0%	72	7.1%
12pm - 1pm	223	8.5%	131	8.1%	92	9.1%
1pm - 2pm	306	11.6%	155	9.6%	151	14.9%
2pm - 3pm	302	11.5%	181	11.2%	121	11.9%
3pm - 4pm	320	12.1%	214	13.2%	106	10.5%
4pm - 5pm	242	9.2%	147	9.1%	95	9.4%
5pm - 6pm	226	8.6%	142	8.8%	84	8.3%
6pm - 7pm	184	7.0%	112	6.9%	72	7.1%
7pm - 8pm	123	4.7%	89	5.5%	34	3.4%
Total	2,634	100.0%	1,621	100.0%	1,013	100.0%

Table 10: Departing respondents by day part and direction

	Total		Directional distribution of departing traffic			
			West		East	
	Count	Col %	Count	Col %	Count	Col %
8am - 9am	100	4.1%	68	4.6%	32	3.3%
9am - 10am	142	5.8%	92	6.2%	50	5.1%
10am - 11am	182	7.4%	107	7.2%	75	7.6%
11am - 12pm	242	9.8%	157	10.6%	85	8.6%
12pm - 1pm	258	10.5%	148	10.0%	110	11.2%
1pm - 2pm	250	10.1%	144	9.7%	106	10.8%
2pm - 3pm	255	10.3%	155	10.5%	100	10.2%
3pm - 4pm	317	12.8%	175	11.8%	142	14.4%
4pm - 5pm	247	10.0%	147	9.9%	100	10.2%
5pm - 6pm	211	8.6%	116	7.8%	95	9.7%
6pm - 7pm	163	6.6%	110	7.4%	53	5.4%
7pm - 8pm	100	4.1%	64	4.3%	36	3.7%
Total	2,467	100.0%	1,483	100.0%	984	100.0%

Table 11: Arriving respondents by point of origin by weekday vs. weekend

	Total		Weekday vs Weekend			
			Weekday		Weekend	
	Count	Col %	Count	Col %	Count	Col %
Waialua	30	1.3%	21	1.3%	9	1.2%
Haleiwa	207	8.6%	144	8.8%	63	8.2%
Laniakea to Waimea bay	34	1.4%	21	1.3%	13	1.7%
Three Tables beach to Kawela Beach	295	12.3%	196	12.0%	99	13.0%
Kahuku	167	7.0%	131	8.0%	36	4.7%
Laie	216	9.0%	161	9.8%	55	7.2%
Hauula	84	3.5%	59	3.6%	25	3.3%
Kaaawa	14	0.6%	10	0.6%	4	0.5%
Windward	142	5.9%	88	5.4%	54	7.1%
East Honolulu	20	0.8%	12	0.7%	8	1.0%
Honolulu	743	31.0%	504	30.8%	239	31.3%
Central Oahu	165	6.9%	114	7.0%	51	6.7%
Leeward Oahu	142	5.9%	90	5.5%	52	6.8%
Other	140	5.8%	84	5.1%	56	7.3%
Total	2,399	100.0%	1,635	100.0%	764	100.0%

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Table 12: Departing respondents by point of origin by weekday vs. weekend

	Total		Weekday vs Weekend			
			Weekday		Weekend	
	Count	Col %	Count	Col %	Count	Col %
Waialua	38	1.8%	29	1.9%	9	1.5%
Haleiwa	225	10.6%	183	11.8%	42	7.2%
Laniakea to Waimea bay	19	0.9%	15	1.0%	4	0.7%
Three Tables beach to Kawela Beach	258	12.1%	195	12.6%	63	10.8%
Kahuku	177	8.3%	138	8.9%	39	6.7%
Laie	236	11.1%	182	11.7%	54	9.3%
Hauula	59	2.8%	43	2.8%	16	2.8%
Kaaawa	19	0.9%	14	0.9%	5	0.9%
Windward	132	6.2%	82	5.3%	50	8.6%
East Honolulu	19	0.9%	13	0.8%	6	1.0%
Honolulu	477	22.4%	330	21.3%	147	25.3%
Central Oahu	126	5.9%	86	5.6%	40	6.9%
Leeward Oahu	100	4.7%	66	4.3%	34	5.9%
Other	151	7.1%	100	6.5%	51	8.8%
Unknown	94	4.4%	73	4.7%	21	3.6%
Total	2,130	100.0%	1,549	100.0%	581	100.0%

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Table 13: Total arrivals by direction and weekday vs. weekend

	Total		Directional distribution of arriving traffic			
			West		East	
	Count	Col %	Count	Col %	Count	Col %
Weekday	1,638	61.9%	989	60.7%	649	63.8%
Weekend	1,008	38.1%	640	39.3%	368	36.2%
Total	2,646	100.0%	1,629	100.0%	1,017	100.0%

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Table 14: Total departures by direction and weekday vs. weekend

	Total		Directional distribution of departing traffic			
			West		East	
	Count	Col %	Count	Col %	Count	Col %
Weekday	1,626	65.6%	966	64.9%	660	66.7%
Weekend	851	34.4%	522	35.1%	329	33.3%
Total	2,477	100.0%	1,488	100.0%	989	100.0%

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Table 15: Arriving respondents by point of origin – hotel vs. condominium

	Total		Hotel guest vs. Condo guest/resident			
			Hotel guest		Condo guest/resident	
	Count	Col %	Count	Col %	Count	Col %
Waialua	5	0.6%	2	0.4%	3	0.9%
Haleiwa	82	9.3%	53	9.5%	29	8.9%
Laniakea to Waimea bay	20	2.3%	12	2.2%	8	2.5%
Three Tables beach to Kawela Beach	100	11.3%	52	9.3%	48	14.8%
Kahuku	74	8.4%	33	5.9%	41	12.6%
Laie	89	10.1%	46	8.2%	43	13.2%
Hauula	12	1.4%	5	0.9%	7	2.2%
Kaaawa	6	0.7%	5	0.9%	1	0.3%
Windward	38	4.3%	19	3.4%	19	5.8%
East Honolulu	6	0.7%	4	0.7%	2	0.6%
Honolulu	277	31.4%	227	40.7%	50	15.4%
Central Oahu	40	4.5%	24	4.3%	16	4.9%
Leeward Oahu	28	3.2%	11	2.0%	17	5.2%
Other	106	12.0%	65	11.6%	41	12.6%
Total	883	100.0%	558	100.0%	325	100.0%

SMS,Inc. (Turtle Bay 2011)

Table 16: Departing respondents by point of origin – hotel vs. condominium

	Total		Hotel guest vs. Condo guest/resident			
	Count	Col %	Hotel guest		Condo guest/resident	
			Count	Col %	Count	Col %
Waialua	4	0.4%	1	0.2%	3	1.0%
Haleiwa	105	11.4%	80	13.1%	25	8.1%
Laniakea to Waimea bay	8	0.9%	5	0.8%	3	1.0%
Three Tables beach to Kawela Beach	111	12.1%	64	10.5%	47	15.3%
Kahuku	59	6.4%	29	4.7%	30	9.8%
Laie	112	12.2%	72	11.8%	40	13.0%
Hauula	12	1.3%	4	0.7%	8	2.6%
Kaaawa	5	0.5%	4	0.7%	1	0.3%
Windward	38	4.1%	19	3.1%	19	6.2%
East Honolulu	4	0.4%	2	0.3%	2	0.7%
Honolulu	197	21.5%	176	28.8%	21	6.8%
Central Oahu	40	4.4%	23	3.8%	17	5.5%
Leeward Oahu	22	2.4%	18	2.9%	4	1.3%
Other	127	13.8%	81	13.3%	46	15.0%
Unknown	74	8.1%	33	5.4%	41	13.4%
Total	918	100.0%	611	100.0%	307	100.0%

SMS,Inc. (Turtle Bay 2011)

Table 17: Respondents traveling west who left and returned to Turtle Bay same day

	Count	Col %
Turtle Bay	6	1.6%
Three Tables to Kawela Beach	70	19.1%
Laniakea to Waimea	76	20.7%
Haleiwa	62	16.9%
Waialua	2	0.5%
Honolulu	46	12.5%
Central Oahu	22	6.0%
Leeward Oahu	6	1.6%
Other	77	21.0%
Total	367	100.0%

SMS, Inc. (Turtle Bay, 2011)

Table 18: Respondents traveling east who left and returned to Turtle Bay same day

	Count	Col %
Kahuku	48	19.8%
Laie	86	35.5%
Hauula	3	1.2%
Kaaawa	5	2.1%
Windward	13	5.4%
East Honolulu	4	1.7%
Honolulu	17	7.0%
Central Oahu	1	0.4%
Leeward Oahu	3	1.2%
Other	58	24.0%
Total	242	100.0%

SMS, Inc. (Turtle Bay, 2011)

Table 19: Final Destination of respondents traveling west

	Departing	Final Destination
Turtle bay	988	-
Three Tables to Kawela Beach	753	235
Laniakea to Waimea	735	18
Haleiwa	527	208
Waialua	490	37
Honolulu	190	300
Central Oahu	81	109
Leeward Oahu	0	81

SMS, Inc. (Turtle Bay, 2011)

Table 20: Final Destination of respondents traveling east

	Departing	Final Destination
Turtle Bay	730	-
Kahuku	575	155
Laie	369	206
Hauula	321	48
Kaaawa	303	18
Windward	204	99
East Honolulu	194	10
Honolulu	29	165
Central Oahu	15	14
Leeward Oahu	0	15

SMS, Inc. (Turtle Bay, 2011)

APPENDIX

Appendix A: Survey Instrument

	Time Started	Status	Direction from/To		Starting Point	Final Destination	Planned Stops	Time left Origin	Refused	Cars missed
			Haleiwa	Laie						
1			☐	☐					☐	
2			☐	☐					☐	
3			☐	☐					☐	
4			☐	☐					☐	
5			☐	☐					☐	
6			☐	☐					☐	
7			☐	☐					☐	
8			☐	☐					☐	
9			☐	☐					☐	
10			☐	☐					☐	
11			☐	☐					☐	
12			☐	☐					☐	
13			☐	☐					☐	
14			☐	☐					☐	
15			☐	☐					☐	

Appendix B: Map

There was a total of four survey locations (marked in red), but only three locations were being fielded at any given time. Survey station 1 which is the entrance to Turtle Bay Resort guests and golf course was always fielded at, while interviewers rotated every two hours between stations 2, 3, and 4 (entrances to Kuilima Estates).
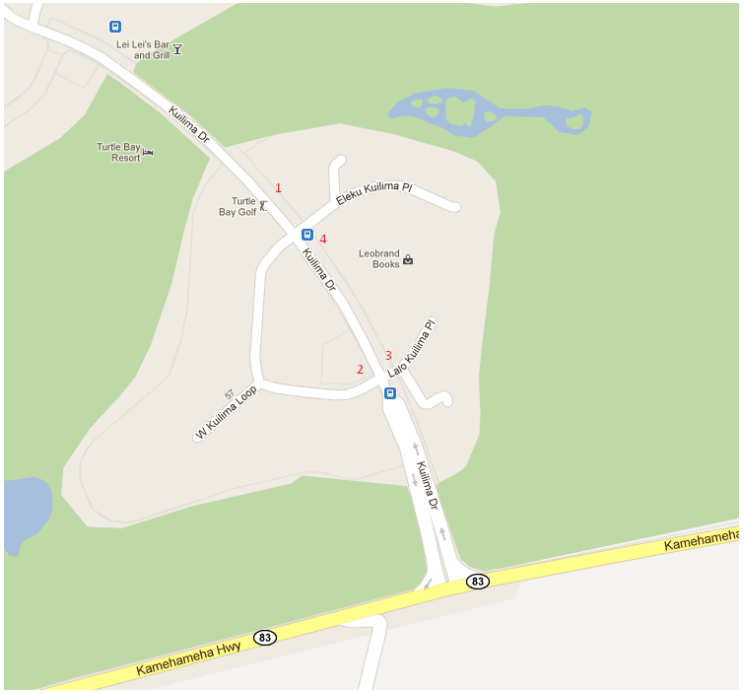
Figure 1: Turtle Bay fielding location