

**Draft Environmental Assessment for
Kalaniana'ole Highway
Sewer System Improvements
(SRF Project No. C150046-86)
Honolulu, Hawaii**

**Prepared for:
Department of Design and Construction
City and County of Honolulu**

**Prepared by:
HDR|Hawaii Pacific Engineers**

**Project No. 2004011
April 28, 2009**

Draft Environmental Assessment
for
KALANIANAOLE HIGHWAY
SEWER SYSTEM IMPROVEMENTS
(SRF Project No. C150046-86)

Honolulu, Hawaii
TMK: 3-5-22, 23 & 58; 3-6-01, 02 & 03; 3-7-01, 10 & 11; 3-8-14

April 28, 2009

THIS ENVIRONMENTAL DOCUMENT HAS BEEN PREPARED PURSUANT TO
CHAPTER 343, HAWAII REVISED STATUTES

PROPOSING AGENCY: Department of Design and Construction
City and County of Honolulu
650 South King Street, 11th Floor
Honolulu, Hawaii 96813

PREPARED BY: HDR|Hawaii Pacific Engineers
1132 Bishop Street, Suite 1003
Honolulu, Hawaii 96813-2830

TABLE OF CONTENTS

ABBREVIATIONS AND ACRONYMS	AA-1
---	------

SUMMARY

Executive Summary	S-1
Project Information Summary	S-2

CHAPTER 1 – PROJECT DESCRIPTION

A. Introduction and General Overview	1-1
B. General Background on the Existing Sewer System	1-3
C. Sewer System Problems	1-6
D. Project Objectives and Needs	1-9
E. Description of the Proposed Action	1-10
F. Project Funding	1-16
G. Project Schedule	1-16
H. Permits and Approval Required	1-16

CHAPTER 2 – ENVIRONMENTAL SETTING

A. Introduction	2-1
B. Characteristics of the Physical and Biological Environment	2-1
1. Location, Topography and Land Use	2-1
2. Climate	2-2
3. Soils	2-2
4. Streams	2-11
5. Coastal Waters	2-12
6. Hydrology and Water Resources	2-13
7. Flood, Tsunami and Earthquake Hazards	2-14
8. Flora and Fauna	2-16
9. Historic and Archaeological Sites	2-18
10. Cultural Resources and Practices	2-19
11. Air Quality	2-20
12. Noise	2-21
13. Hazardous Substances	2-22
14. Wastewater Spills	2-22
15. Utilities Infrastructure	2-23
16. Roadways and Traffic	2-23
17. Scenic and Recreational Resources	2-23
C. Socio-Economic Setting	2-24
1. General	2-24
2. Population	2-24

CHAPTER 2 – ENVIRONMENTAL SETTING (continued).....

- 3. Socio-Economic Background 2-25
- 4. Land Ownership 2-25
- 5. Land Use Designations 2-26

CHAPTER 3 – POTENTIAL IMPACTS AND PROPOSED MITIGATION MEASURES

- A. Introduction 3-1
- B. Land Alteration and Aesthetics 3-1
- C. Flood Hazard 3-1
- D. Flora and Fauna 3-2
- E. Surface Water Quality 3-3
- F. Groundwater Quality 3-4
- G. Air Quality and Wastewater Odors 3-5
- H. Noise 3-6
- I. Archaeological and Historic Sites 3-7
- J. Cultural Resources Impacts 3-8
- K. Hazardous Substances 3-9
- L. Transportation Impacts 3-9
- M. Use of Energy 3-12
- N. Use of Potable Water 3-13
- O. Use of Reclaimed Materials and Disposal of Construction Materials 3-13
- P. Utilities, Roads and Other Infrastructure 3-13
- Q. Scenic and Recreational Resources 3-14
- R. Socio-Economic Impacts 3-15
- S. Environmental Justice 3-16
- T. Relationship to Land Use Policies and Controls 3-17
 - 1. State Land Use District 3-17
 - 2. Hawaii State Plan 3-17
 - 3. City and County of Honolulu General Plan 3-17
 - 4. East Honolulu Sustainable Communities Plan. 3-18
 - 5. East Honolulu Public Infrastructure Map 3-18
 - 6. City and County of Honolulu Special Management Area 3-19
- U. Federal “Cross-Cutter” Regulatory Requirements 3-19

CHAPTER 4 – ALTERNATIVES CONSIDERED

- A. Introduction 4-1
- B. No Action Alternative 4-1
- C. Capacity Upgrade Alternatives 4-1
 - 1. Alternative 1: Kahala Wastewater Pump Station Capacity Upgrade 4-2
 - 2. Alternative 2: Sewer Cleaning 4-3
 - 3. Alternative 3: Wailupe Stream Inverted Siphon Flow Split Modification 4-3
 - 4. Alternative 4: Infiltration/Inflow Reduction 4-3

CHAPTER 4 – ALTERNATIVES CONSIDERED (continued)

- 5. Alternative 5: Trunk Sewer Realignment Upstream of Inverted Siphon 4-3
- 6. Alternative 6: Relief Sewer from Wailupe Stream to Wailupe Beach Park 4-4
- 7. Alternative 7: Relief Sewer from West Hind Drive to Waiialae Country Club 4-4
- 8. Alternative 8: Niu Valley WWPS Force Main Extension and Relief Sewer.. 4-4
- 9. Alternative 9: Wailupe WWPS and Force Main to Waiialae Country Club .. 4-9
- 10. Alternative 10: West Hind Drive WWPS and Force Main to Sewer Tunnel 4-9
- 11. Evaluation of Capacity Upgrade Alternatives 4-12
- D. Sewer Rehabilitation Alternatives 4-12
 - 1. Cured-in-Place Pipe (CIPP) 4-18
 - 2. Sliplining 4-19
 - 3. Pipe Bursting 4-20
 - 4. Recommended Sewer Line Rehabilitation Alternative 4-20

CHAPTER 5 – DETERMINATION

- A. Determination..... 5-1
- B. Supporting Rationale 5-1

CHAPTER 6 – PERSONS AND AGENCIES CONTACTED

- A. Pre-assessment Consultation 6-1
 - 1. Federal Government 6-1
 - 2. State Government 6-2
 - 3. County Government 6-2
 - 4. Elected Officials 6-2
 - 5. Others 6-2
- B. Parties to be Consulted Prior to Preparation of the Final Environmental Assessment 6-3
 - 1. Federal Government 6-4
 - 2. State Government 6-4
 - 3. County Government 6-4
 - 4. Elected Officials 6-4
 - 5. Others 6-4

CHAPTER 7 – REFERENCES

APPENDICES

APPENDIX A	Sewer Cleaning Equipment Literature
APPENDIX B	Archaeological Literature Review, Field Inspection, and Cultural Background Study
APPENDIX C	Biological Resources Assessment Supplemental Information
Appendix C-1	Personal Communication with U.S. Fish & Wildlife Service
Appendix C-2	Report on Hawaiian Monk Seal Use of Maunalua Bay
Appendix C-3	Report on Marine Turtle Activity in Maunalua Bay Area
Appendix C-4	Fish Survey for Maunalua Bay
APPENDIX D	Traffic Assessment Study
APPENDIX E	Pre-Assessment Consultation Correspondence and Documentation

LIST OF FIGURES

FIGURE 1-1	General Project Location Map	1-2
FIGURE 1-2	General Plan for Segment 1	1-4
FIGURE 1-3	General Plan for Segment 2	1-5
FIGURE 1-4	General Plan for Segment 3	1-7
FIGURE 2-1	Aerial Location of Segment 1	2-3
FIGURE 2-2	Aerial Location of Segment 2	2-5
FIGURE 2-3	Aerial Location of Segment 3	2-6
FIGURE 2-4	USGS Topographic Map	2-7
FIGURE 2-5	Zoning, SMA and UIC Map	2-9
FIGURE 2-6	Flood Insurance Rate Map and Tsunami Evacuation Zones	2-15
FIGURE 4-1	Alternative 5 – Trunk Sewer Realignment Upstream of Inverted Siphon	4-5
FIGURE 4-2	Alternative 6 – Relief Sewer from Wailupe Stream to Wailupe Beach Park	4-6
FIGURE 4-3	Alternative 7 – Relief Sewer from West Hind Drive to Waialae Country Club	4-7
FIGURE 4-4	Alternative 8 – Niu Valley WWPS Force Main Extension and Relief Sewer	4-8
FIGURE 4-5	Alternative 9 – Wailupe WWPS and Force Main to Waialae Country Club	4-10
FIGURE 4-6	Alternative 10 – West Hind Drive WWPS and Force Main to Sewer Tunnel	4-11

TABLES

TABLE 4-1	Comparison of Capacity Upgrade Alternatives	4-13
-----------	---	------

ABBREVIATIONS AND ACRONYMS

ARRA	American Recovery and Reinvestment Act of 2009
BMP	Best Management Practices
C&C	City and County
CDP	Census Designated Places
CIP	Capital Improvement Program
CIPP	Cured-in-place pipe
CITY	City and County of Honolulu
DLNR	State of Hawaii Department of Land and Natural Resources
DOH	State of Hawaii Department of Health
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FONSI	Finding of No Significant Impact
GIS	Geographic Information System
HAR	Hawaii Administrative Rules
HRS	Hawaii Revised Statutes
MSL	Mean Sea Level
NAAQS	National Ambient Air Quality Standards
NOAA	National Oceanic and Atmospheric Association
NPDES	National Pollutant Discharge Elimination System
O&M	Operation and maintenance
PIFSC	Pacific island Fisheries Science Center
PVC	Polyvinyl chloride
RCP	Reinforced concrete pipe
SHPD	State of Hawaii Historic Preservation Division
SMA	Special Management Area
SRF	State Revolving Fund
UIC	Underground Injection Control
US EPA	United State's Environmental Protection Agency
VCP	Vitrified clay pipe
WWPS	Wastewater pump station

SUMMARY

EXECUTIVE SUMMARY

The objective of the Kalanianaʻole Highway Sewer System Improvements project is to address capacity and structural deficiencies in the primary sewer lines servicing East Honolulu between Kahala and Niu Valley. The project is part of the City's overall long-term effort to upgrade and rehabilitate Honolulu's aging sewer system.

The project's 12,400 feet of 24- to 36-inch diameter main trunk sewer line is aligned along Kalanianaʻole Highway from Kawaikui Beach Park to the Wailupe Beach Park, and then along the shoreline to the Kahala Wastewater Pump Station near Waialae Beach Park. The project involves cleaning/rehabilitating the upstream portion of the line and cleaning of the previously rehabilitated downstream sections. The project also includes cleaning and rehabilitation of approximately 1,700 feet of 10-inch diameter sewer along Kalanianaʻole Highway in the Niu Valley area.

Existing structural deficiencies include corrosion in the large reinforced concrete sewer pipes and cracks/broken joints in the vitrified clay pipe sewers. Excessive groundwater and rainwater entering through pipe defects have contributed to capacity problems that result in sewage spills and backups. The proposed cleaning of the sewer lines will help alleviate capacity problems caused by long-term accumulation of sediments, grease and other debris.

Cleaning of the sewers along the Kahala shoreline will be performed using special high-capacity "long-reach" sewer cleaning equipment due to the difficult access to manholes located within a sensitive resort environment and in the backyards of existing homes. Sewer lines within Kalanianaʻole Highway will be rehabilitated using cured-in-place pipe (CIPP) "trenchless" sewer rehabilitation technology. The project includes rehabilitation of corroded manholes with an epoxy lining and cover replacement/modifications on selected manholes.

The construction will be generally confined to the highway right-of-way, existing sewer easements and temporary staging areas. Proposed locations of staging areas for the sewer cleaning operations include the Waialae Beach Park, Waialae Country Club golf course, privately-owned Keahia Way road, and Wailupe Beach Park. There will be short-term construction impacts such as increased traffic congestion, noise, odors and dust. Night work is proposed to facilitate construction, reduce traffic impacts and shorten the duration of the project. No impacts to endangered species, archaeological resources or cultural practices are anticipated. An archaeological monitoring program will be employed as a precautionary measure.

The construction cost for this project is estimated to be approximately \$10 million. The construction work is expected to begin in September 2009 at the earliest and will last approximately 18 months.

PROJECT INFORMATION SUMMARY

1. Proposing and Approving Agency: City and County of Honolulu
Department of Design and Construction
650 South King Street, 11th Floor
Honolulu, Hawaii 96813
2. Prepared By: HDR | Hawaii Pacific Engineers
1132 Bishop Street, Suite 1003
Honolulu, Hawaii 96813-2830
Roy K. Abe, Project Manager, Ph. 808-522-7425
3. Project Name: Kalanianaole Highway Sewer System Improvements
4. Project Location: East Honolulu between Kahala and Niu Valley
Honolulu, Hawaii 96821
5. Tax Map Key: 3-5-22, 23 & 58; 3-6-01, 02 & 03; 3-7-01, 10 & 11; 3-8-14
6. Sewer Length: 14,100 feet (approximately)
7. Property Owner: City and County of Honolulu (Kahala Wastewater Pump Station,
Wailupe Beach Park)
State of Hawaii (Kalanianaole Highway right-of-way)
Various private property owners (sewer easements)
8. State land Use: Urban
9. County Zoning: R-5, R-10, Residential District
Resort District
A-2, Medium-Density Apartment District
P-2, General Preservation District
10. Special Designations: Shoreline Management Area (SMA)
11. Determination: Anticipate FONSI (Finding of No Significant Impact)

CHAPTER 1

PROJECT DESCRIPTION

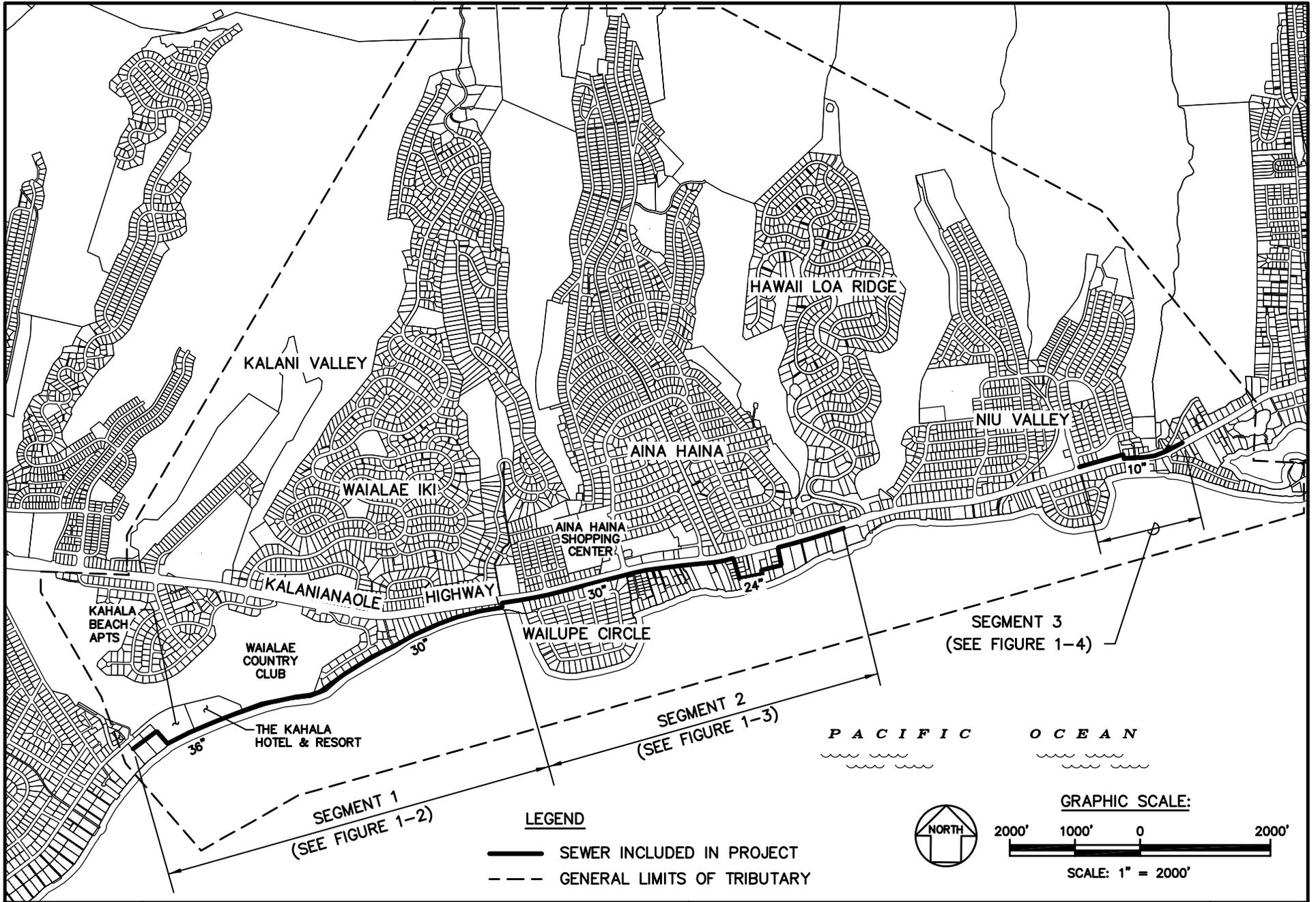
A. INTRODUCTION AND GENERAL OVERVIEW

The City and County of Honolulu maintains an extensive wastewater collection system that consists of a network of gravity sewers, wastewater pump stations and force mains (pressure lines). On the east end of Honolulu, wastewater collected between Niu Valley and Kahala is conveyed to the Kahala Wastewater Pump Station (WWPS), which is located near the Waialae Beach Park and Waialae Country Club. The Kahala WWPS pumps the wastewater up to the Waialae/Kaimuki area where it is then conveyed to the Sand Island Wastewater Treatment Plant for treatment and disposal.

The City is currently in the process of implementing a 20-year comprehensive plan to upgrade and rehabilitate its aging sanitary sewer system that has been hampered by capacity and structural problems. Key sewer lines with significant capacity and structural problems have been identified in the City's sewer system servicing East Honolulu.

The Kalaniana'ole Highway Sewer System Improvements project focuses on correcting problems on three main gravity sewer segments of the east Honolulu sewer system (see Figure 1-1). An overview of the proposed work is as follows:

- Segment 1. The work on Segment 1 will involve major cleaning of approximately 6,400 feet of 30- and 36-inch diameter lines of the Kalaniana'ole Highway trunk sewer. This line segment is located along the coastline between Wailupe Beach Park and the Kahala resort area. Work on this downstream half of the trunk sewer involves primarily cleaning of the sewer lines since the pipeline and manholes were previously rehabilitated in the early 1990's. The Segment 1 work will also involve replacing corroded manhole frames and covers at selected sewer manholes.
- Segment 2. The work on Segment 2 will involve cleaning and rehabilitating approximately 6,000 feet of 24- and 30-inch diameter trunk sewer lines located between Kawaikui Beach Park and Wailupe Beach Park. This upstream half of the trunk sewer is located along Kalaniana'ole Highway with the exception of one area in Aina Haina that is located in private property easements. The work will also include rehabilitating three inverted siphon (depressed sewer) pipes that cross under Wailupe Stream. Work involving rehabilitation of the sewer manholes will also be performed.



- Segment 3. The Segment 3 work involves cleaning and rehabilitating approximately 1,700 feet of 10-inch diameter sewer along Kalanianaole Highway in the Niu Valley area. Work on this segment also includes rehabilitating a 54 feet long 8-inch diameter branch line.

This Environmental Assessment (EA) describes the proposed Kalanianaole Highway Sewer System Improvements project and anticipated environmental impacts. The EA has been prepared pursuant to the State of Hawaii environmental review process as required and defined by Chapter 343, Hawaii Revised Statutes (HRS) and Title 11, Chapter 200, Hawaii Administrative Rules (HAR). This document also addresses compliance with applicable Federal “cross-cutter” regulations due to possible funding by the State Revolving Fund (SRF) and American Recovery and Reinvestment Act of 2009 (ARRA) programs.

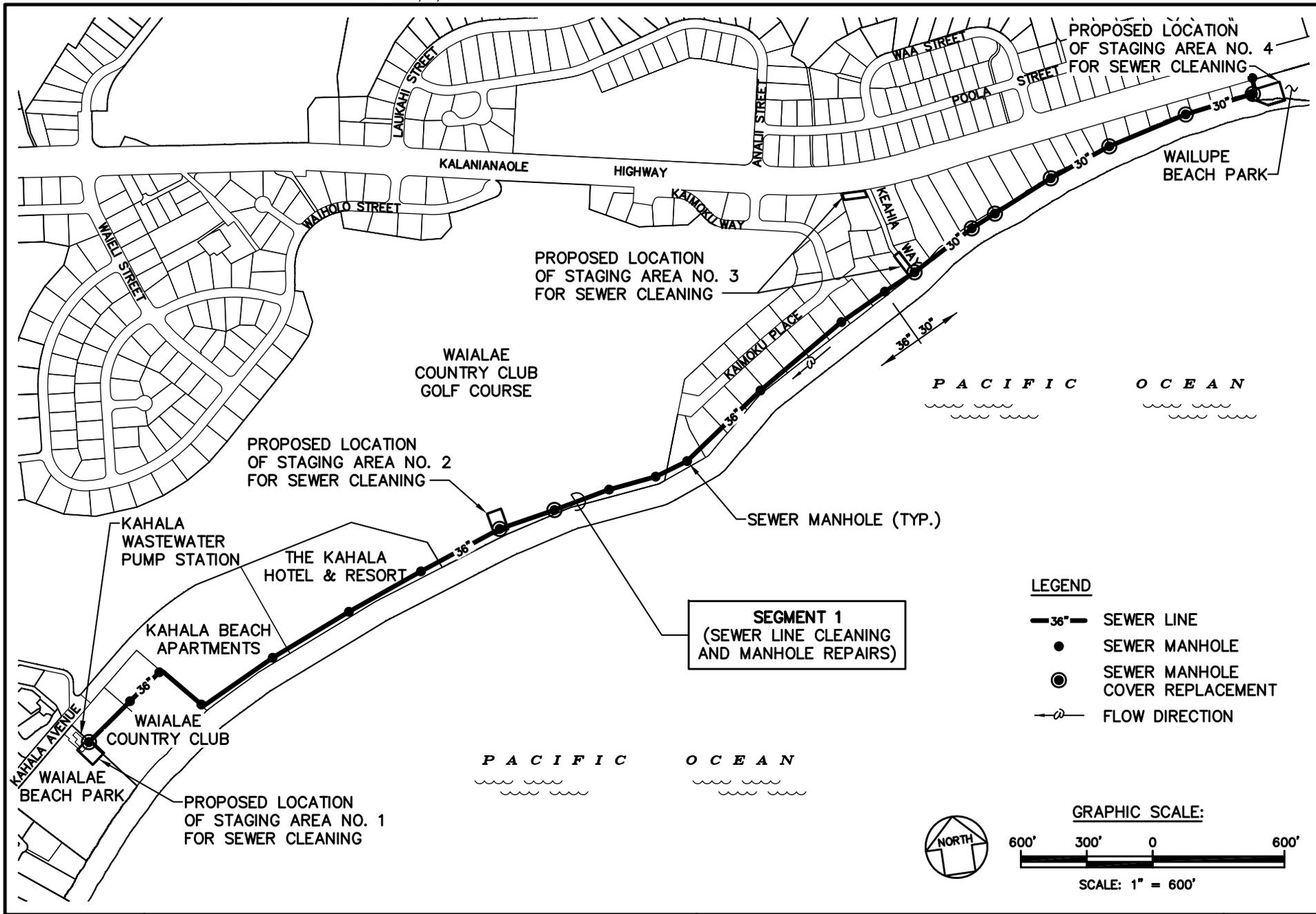
B. GENERAL BACKGROUND ON THE EXISTING SEWER SYSTEM

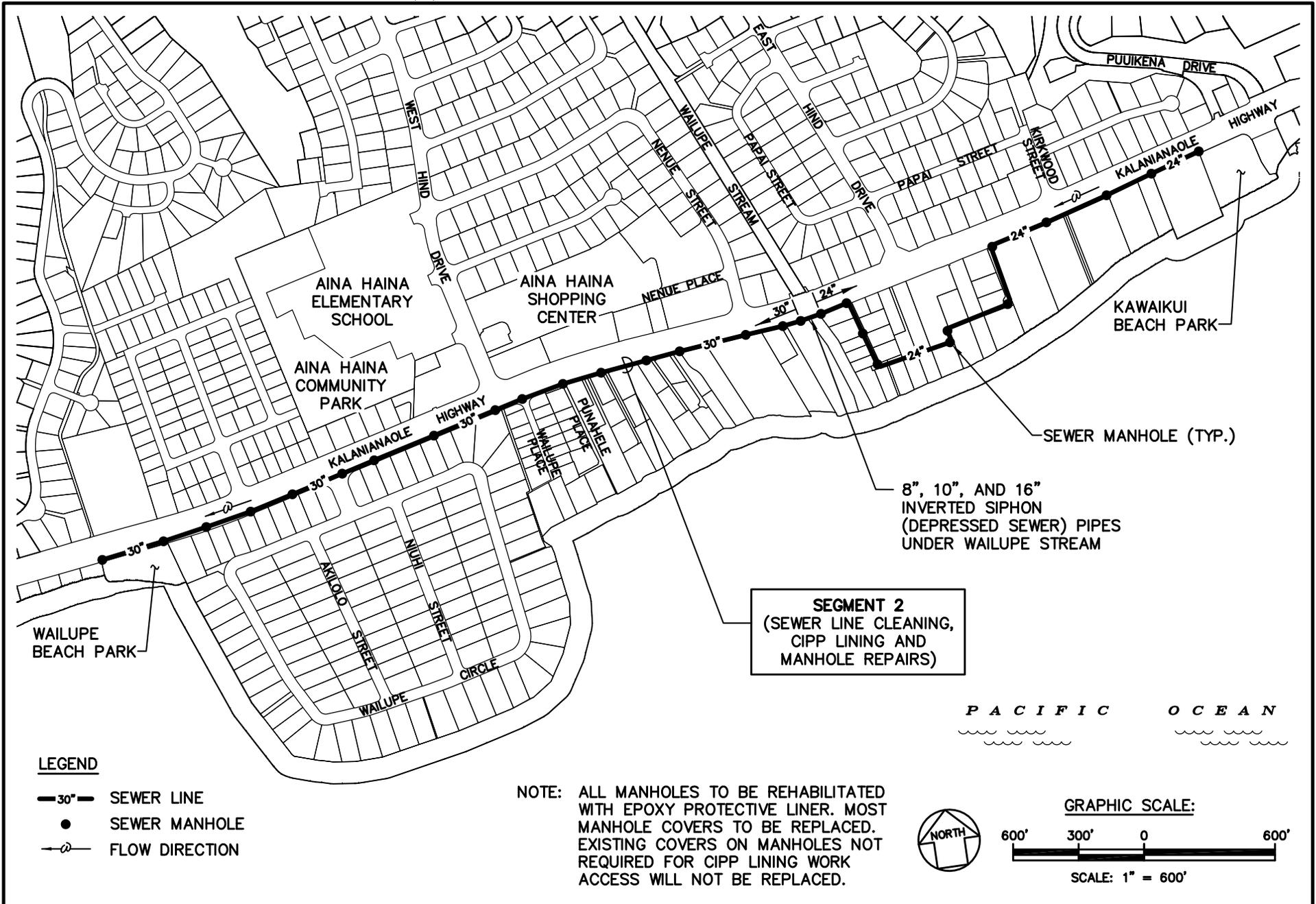
The east Honolulu wastewater tributary area serviced by the Kahala WWPS encompasses approximately 1,700 acres comprised primarily of single-family residential parcels, but also includes various parcels zoned for multi-family, commercial, public and other non-residential uses. The service population is estimated to be on the order of 15,000 people, of which approximately 13,000 is estimated to be residential users. Communities within the tributary area include Niu Valley, Hawaii Loa Ridge, Aina Haina, Wailupe, Waialae Iki, Kalani Valley and Kahala.

Wastewater from the various collector sewers in communities from Hawaii Loa Ridge to Kahala flows toward the large Kalanianaole Highway trunk sewer located along the highway and the Kahala Beach coastline. The Kalanianaole Highway trunk sewer, which was constructed in the mid-1950’s and is approximately 12,500 feet in length, encompasses most of the proposed work for the Kalanianaole Highway Sewer System Improvements project. For the purpose of this project, due to differences in the pipeline characteristics and proposed work, the downstream and upstream sections of the trunk sewer are referred to as Segment 1 and Segment 2, respectively.

The downstream end of the trunk sewer (Segment 1 on Figure 1-2) begins at the Kahala WWPS and traverses eastward along the coastline past the Kahala Beach Apartments, Kahala Hotel & Resort, Waialae Country Club and exclusive beachfront homes towards Kalanianaole Highway. The remainder of the trunk sewer line (Segment 2 on Figure 1-3) is aligned primarily along the makai right-of-way of Kalanianaole Highway starting at Wailupe Beach Park and terminating on the upstream end near Kawaikui Beach Park at the foot of Hawaii Loa Ridge.

Flows from Niu Valley and Paiko Peninsula are conveyed to the Niu Valley WWPS and pumped to the upstream end of the trunk sewer near Kawaikui Beach Park. A portion of the sewer line that conveys flow to the Niu Valley WWPS is included in the current project, and





is referred to as Segment 3 (see Figure 1-4). This section of sewer is located along the mauka side of Kalanianaole Highway between Halemaumau Street and Paiko Drive.

C. SEWER SYSTEM PROBLEMS

Like many of the other aging sewers on Oahu and throughout the mainland, sewers located in east Honolulu experience problems related to flow capacity and structural integrity. As a result of these problems, sewage spills from manholes and backups into homes have occurred within the lower lying Aina Haina and Wailupe sections of the system.

Capacity Problems

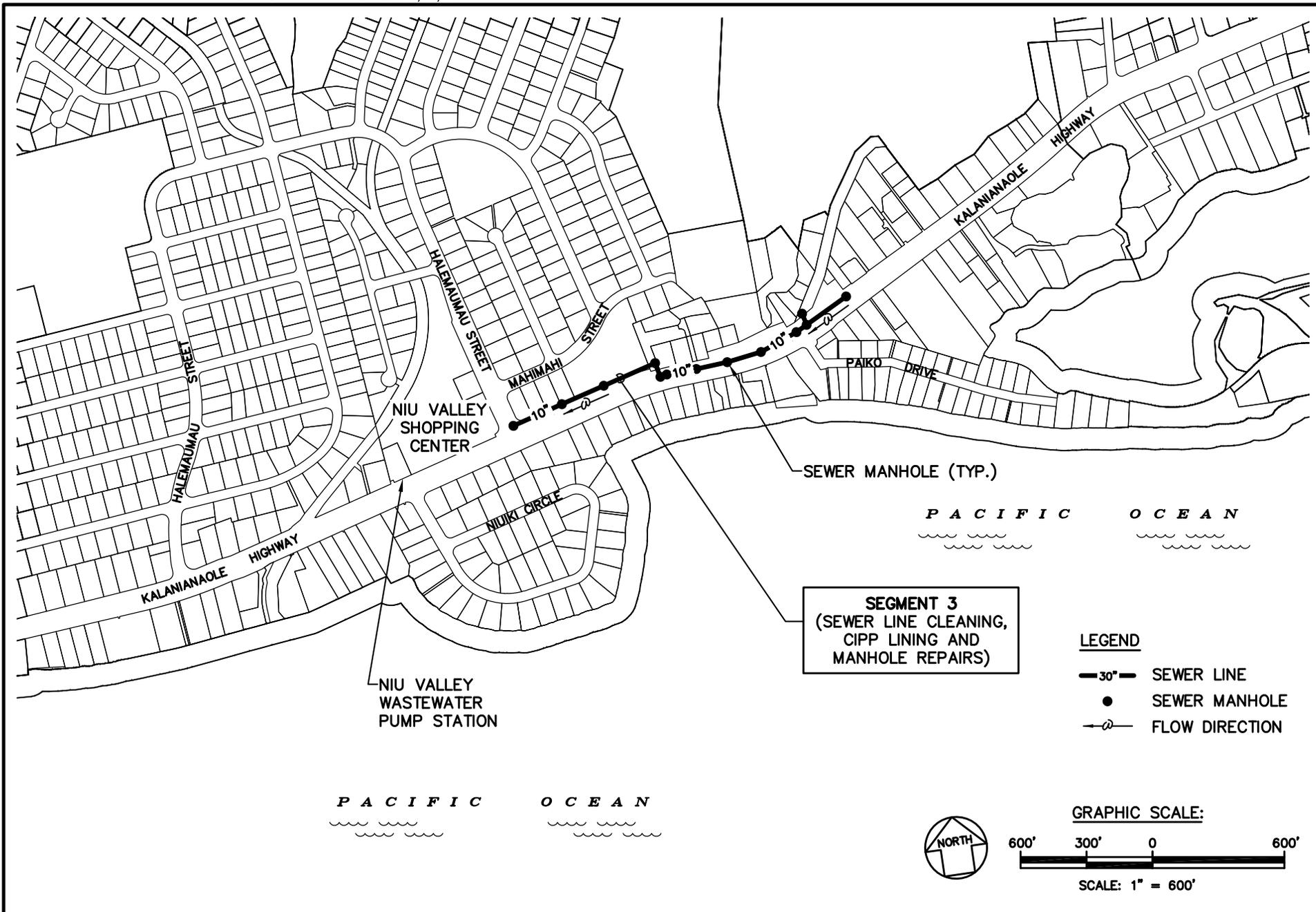
The capacity problems within the Kalanianaole Highway have resulted in a number sewage spills during peak flow conditions that occur during large storm events. The three primary causes of the capacity problems are:

- Actual peak flows that are above the original projected design flows due to excess infiltration and inflow of groundwater and rainwater in sewer defects.
- Actual flow capacity of sewers not meeting the original design capacity due to partial clogging of the sewers with sediments and grease.
- Inability of the Kahala WWPS to accommodate the current extreme peak flow during very large storm events.

A large portion of the sewer lines in the low lying areas of east Honolulu are located below the water table. Ground settlement, particularly in older sewer lines, typically causes cracks, broken/separated joints and other defects in the sewer pipes that allow groundwater to enter the lines. The infiltration of groundwater into sewer lines generally increases during heavy rain due to the rise in water table. In addition, rainwater saturating the ground will infiltrate into sewer trenches and defective lines above the water table

A large portion of the increase in flow during wet weather can often be attributed to inflow of rainwater from illicit residential connections such as roof gutters, outdoor drains, and pool and pond overflow drains. Other significant sources of rainwater inflow, particularly in areas with drainage and flooding problems, include poorly sealed manhole frames and covers, manhole cover pickhole openings, and uncapped sewer cleanouts.

Due to the relatively flat coastal terrain between Aina Haina and Kahala, the Kalanianaole Highway trunk sewer (Segments 1 and 2) exhibits relatively flat slopes and low to moderate flow velocities within the pipeline. This promotes accumulation of sediments in the line with time. Some grease accumulation has also been observed at some locations in the system. Sediment and grease accumulation in the sewer lines impede the flow of wastewater and can substantially reduce the capacity of the line. The City has not been able to clean the trunk



sewer on a regular basis. The line has many manholes with poor accessibility due to their location in the resort properties, backyards of homes, and location along the beach. Due to limited manpower, the City also is required to focus its cleaning efforts on smaller sewer lines that require intensive regular cleaning to prevent clogging and sewage spills.

Minimizing sediment deposition and maintaining flow capacity is especially challenging for the inverted siphon sewer under Wailupe Stream. Due to the depressed configuration of the 8-, 10- and 16-inch pipes under the stream, there is higher propensity for accumulation of sediments at the depressed segments of the line. Inverted siphons are typically designed to preferentially direct flow to the smaller pipe(s) during normal flows to maintain good flushing velocities and minimize sediment accumulation. This is currently not occurring due to the operating configuration of the existing upstream pipes. Flow presently enters all the pipes at all times, which results in sluggish flow and sediment accumulation in each pipe.

Analysis of pumping data for the Kahala WWPS indicates that the pump station may not be achieving its design pumping capacity during the extreme peak flow events. The inadequate pumping capacity may have contributed to sewage spills in the past but is not the sole cause of the system's capacity problems.

Structural Problems

Acidic conditions created by sewer gases can result in significant damage to reinforced concrete sewer pipe and manholes. Inspection of the sewer lines using closed-circuit television (CCTV) equipment indicates that the approximately 3,400 feet of 30-inch diameter reinforced concrete pipe in Segment 2 has been moderately to severely corroded by sewer gases. Sewer gases have also resulted in some corrosion of the reinforced concrete manhole walls.

The sewer line and manholes in Segment 1 were previously lined and rehabilitated in the early 1990's and are currently in satisfactory condition. One manhole on the grounds of the Kahala Resort which was observed to have damaged lining was recently repaired during renovation work at the resort.

The 24-inch sewers in Segment 2 and the 8- and 10-inch sewer in Segment 3 are constructed of corrosion resistant vitrified clay pipe (VCP). Although these VCP pipe segments are not subject to corrosion problems, they are subject to cracks and broken/separated joints that result in infiltration of groundwater. Significant structural defects that result in a large amount of groundwater infiltration have been identified in Segment 3. Damage to this section of pipe may have occurred during the construction of the Kalanianaole Highway widening project.

D. PROJECT OBJECTIVES AND NEEDS

The City proposes to clean and rehabilitate key sections of the east Honolulu sewer system to address capacity and structural integrity problems, to improve the overall system reliability, and to facilitate future maintenance.

Major objectives and needs of the project are as follows:

- *Prevent sewage spills and backups.* Overflows of untreated sewage from sewer manholes into streets and yards can pollute streams and coastal waters and create hazards to public health and the environment. In addition to being a health hazard, sewage backups into homes create significant mental anguish for the affected residents. This primary objective is intended to be satisfied by meeting the other objectives and needs discussed below.
- *Reduce infiltration and inflow.* Infiltration of groundwater and inflow of rainwater into the project's sewer lines have caused the problem of increased peak flows that the lines were not designed to handle. The increased flow in the lines have contributed to surcharged pipe conditions (pipes flowing full under pressure) and ultimately sewage backup and spills. In addition to contributing to sewage spill problems, excessive infiltration and inflow can result in the need for costly construction and operation of higher capacity downstream pumping and treatment facilities.
- *Increase flow capacity and facilitate cleaning and maintenance.* Currently, little or no routine cleaning is performed by the City on the larger diameter trunk sewer lines. Thorough cleaning of critical lines is required to remove existing sediments, grease and other debris to restore and achieve the original design flow capacity of the lines. A new long-term cleaning program is required to provide more frequent routine sewer cleaning to minimize future capacity problems. Installation of larger manhole covers on selected manholes is desirable to facilitate sewer cleaning operations. Increasing the pumping capacity of the Kahala WWPS is also required to maximize flow handling capacity of the system.
- *Improve the structural integrity of the sewer lines and manholes.* To help ensure the long term reliability of the sewer system, problems related to corrosion of the pipes and manholes, as well as structural defects such as cracks and joint problems, must be addressed. Rehabilitating sewer lines with interior protective linings and manholes with protective coatings would restore structural integrity and prevent future deterioration and the need for much more costly replacement work. Lining of the sewers will help to reduce infiltration by sealing leaks, and also increase flow capacity slightly by providing smoother interior pipe walls.

E. DESCRIPTION OF THE PROPOSED ACTION

The Kalanianaole Highway Sewer System Improvements project was initiated as a result of the findings in, “Sewer Rehabilitation and Infiltration and Inflow Minimization Study,” prepared by Fukunaga & Associates (1999). The study involved island-wide evaluations of the City’s wastewater collection systems with the objective of minimizing sanitary sewer overflows.

The details and the basis of the proposed actions for Segments 1 and 2 were developed in the engineering study, “Design Alternatives Report for Kalanianaole Highway Relief Sewer and Sewer Rehabilitation Project, 90% Prefinal Submittal,” prepared by HDR|Hawaii Pacific Engineers (2008). The “Design Alternatives Report, Elelupe Road and Kalanianaole Highway Sewer Rehabilitation SMPR No. 36,” prepared by Fukunaga & Associates (2005), evaluated problems and developed recommendations for rehabilitation work for Segment 3.

The following is a summary of the proposed actions for Segments 1, 2 and 3 that are the focus of this environmental assessment document. Brief descriptions of the existing sewer line are included for additional background information. Information pertaining to odor, traffic and other impacts, alternatives considered, and other relevant aspects of the project are described in subsequent chapters of this environmental assessment.

Other routine maintenance and repair work that are also proposed to be performed to meet the City’s objectives are described at the end of this section. This additional routine work is considered by the City to be exempt from the HRS Chapter 343 environmental assessment requirements, but is briefly described in this document as it is part of the overall solution to address the sewer capacity problem.

Proposed Actions for Segment 1

The Segment 1 portion of the project is located in a 10-foot wide sewer easement that runs between the Kahala WWPS near Waialae Beach Park and the Wailupe Beach Park (see Figure 1-2). From the downstream end at the Kahala WWPS, the sewer line traverses in front of the Waialae Country Club Clubhouse and then runs on the shoreline side of the Kahala Beach Apartments, the Kahala Hotel & Resort, and the Waialae Country Club Golf Course. The trunk sewer then continues along the shoreline through and behind thirty private beachfront residential lots. At Wailupe Beach Park, the sewer line segment turns toward a manhole on Kalanianaole Highway.

Segment 1 of the Kalanianaole Highway Trunk Sewer was constructed in 1955 and consists of approximately 6,400 linear feet of 36- and 30-inch reinforced concrete pipe (RCP). Due to heavy corrosion in this portion of the trunk sewer, the entire segment was rehabilitated in 1992 with a trenchless rehabilitation method called cured-in-place-pipe (CIPP). In addition to the pipe being relined, all manholes along Segment 1 were rehabilitated, which included

sealing of manhole interior and replacement of manhole rungs. Currently, the Segment 1 line exhibits grease and sediment buildup.

There are a total of 22 manholes along Segment 1, excluding the last manhole on Kalanianaole Highway. The majority of the manholes along Segment 1 are not readily accessible for sewer cleaning operations because the manholes are located in the backyards of homes or in a sensitive resort-type environment where noise and odors are a major concern.

The following is a summary of work proposed for Segment 1:

- *Clean lines with high capacity sewer cleaning equipment.* Cleaning of the Segment 1 sewer line is especially difficult due to the need to minimize impacts to resort operations and residents and the limited access to many of the manholes. Special large diameter sewer cleaning equipment from a mainland contractor is proposed to be used. The equipment would utilize a high capacity water jetter designed to snake into the pipeline and flush the line to dislodge and pull sediments, grease and other debris downstream for removal. At the downstream manhole, the sediments and debris will be pumped as a slurry to a grit separation bin where the sediments are dewatered, and relatively sediment-free water is released back into the sewer. The dewatered solids would be trucked to the landfill for disposal.

Literature describing the typical high capacity cleaning equipment proposed to be used is included in Appendix A. The advantages of the high capacity sewer cleaning system include: 1) the ability to clean long stretches of sewer from a single staging area, 2) the use of a sealed grit separation bin for minimal odor generation, and 3) high capacity to minimize the duration of the cleaning work.

The intense and thorough cleaning of the lines is intended to restore the pipes to their original design capacity. Following this initial cleaning work, a program will be established to provide routine cleaning and proactive preventative maintenance of key sewer lines. Future routine cleaning is expected to require less effort. The frequency of cleaning will be adjusted as required to avoid excessive accumulation of sediments and grease.

- *Replace manhole frames and covers.* At the locations shown on Figure 1-2, existing manhole frames and covers will be replaced with new corrosion resistant frames and covers. At the four proposed staging areas for sewer cleaning, the existing 24-inch diameter covers will be replaced with new 32-inch diameter covers to facilitate access for personnel entry and cleaning operations. Enlarging the manhole openings will require replacement of the existing top section of the

manhole, and therefore more extensive excavation and restoration work will be required.

Inflow inserts will be installed with the new manhole covers. These dish-like inserts are placed below the manhole cover to help prevent rainwater leaking past the cover from entering manholes and adding extraneous flow into the sewer system.

Proposed Actions for Segment 2

As shown in Figure 1-3, Segment 2 of the trunk sewer begins at the manhole on Kalanianaole Highway near Wailupe Beach Park. The sewer line traverses along the makai side of Kalanianaole Highway. At Wailupe Stream, there is an inverted siphon that crosses under the stream (see previous discussions). Upstream (eastward) of the inverted siphon, the segment jogs off Kalanianaole Highway toward the ocean through a low lying area along narrow dead streets and private property easements. The sewer line then returns to its alignment along Kalanianaole Highway before ending at a sewer manhole in front of Kawaikui Beach Park.

Segment 2 was constructed in 1955 and 1956. This segment consists of approximately 6,000 linear feet of 30-inch RCP, 24-inch vitrified clay pipe (VCP) with 24-inch RCP bends, and the inverted siphon crossing under Wailupe Stream. The Wailupe Stream inverted siphon consists of three 95-foot long cast iron pipes with diameters of 8-, 10-, and 16-inches. The pipes start at the upstream manhole, slopes down to cross under Wailupe Stream and then slopes up again to emerge at the downstream manhole.

Sewer inspections utilizing a closed-circuit television (CCTV) camera found heavy concrete corrosion in the unlined sections of the RCP lines due to exposure to sewer gases. VCP sections exhibit some cracks and joint problems that are likely due to ground settlement. The cast iron pipes on the Wailupe Stream inverted siphon were observed to have moderate corrosion. Similar to Segment 1, grease and sediment accumulation in the lines was observed in the Segment 2 portion of the trunk sewer.

There are a total of 29 manholes along Segment 2. Manhole inspections revealed signs of manhole corrosion, such as flaking concrete walls, exposed concrete aggregate and corroded rungs. Some manhole covers in Segment 2 were found to be severely corroded.

The following is a summary of work proposed for Segment 2:

- *Clean lines with high capacity or conventional sewer cleaning equipment.* The cleaning of the Segment 2 sewer lines is expected to be relatively straightforward due to the accessibility of the manholes, which are primarily located in the shoulder and sidewalk areas of Kalanianaole Highway. The contractor would be

given the option of using either high capacity cleaning equipment described above for Segment 1 or conventional sewer cleaning equipment which employs similar cleaning principles but smaller in scale (all the equipment is typically truck mounted). Similar to Segment 1, a routine cleaning program is proposed to be established to minimize future capacity problems.

- *Rehabilitate sewer lines with CIPP.* The Segment 2 sewer lines are proposed to be rehabilitated using cured-in-place-pipe (CIPP) sewer lining technology. CIPP is a “trenchless” means of pipe rehabilitation as the work is performed through existing manholes. The CIPP process, which minimizes the need for disruptive excavation work, essentially forms a new pipe within the existing pipe. This technology consists of installing a soft fabric tube impregnated with a thermoset resin in the existing pipe. The resin is cured by the application of heat in the form of hot water or steam. Once cured, the resin lining hardens and essentially becomes the new pipe.

The CIPP rehabilitation process results in a structurally sound pipe with a smooth interior surface that is jointless and corrosion resistant. Sewer line rehabilitation with CIPP restores aged and corroded pipes, prevents further deterioration, and increases the structural integrity of the existing line. The smooth surface of the CIPP liner promotes improved flow of wastewater through the pipe to increase capacity.

The CIPP process requires there be no sewage flow in the pipes being rehabilitated. During CIPP installation, the affected section of pipeline will be taken out of service and sewage will be temporarily bypassed around the work site. This will typically involve the use of temporary pumps (engine driven pumps or electric pumps powered by engine-driven generators) and bypass piping (above ground where possible and in shallow trenches where necessary).

The CIPP process will require nighttime work and operation of equipment due to the need for adequate time to install and cure the CIPP liner, and to maintain continuous operation of flow bypassing systems. Night work will include operation of pumps, boiler trucks (to generate hot water or steam for liner curing), generators, lights and other essential equipment.

- *Modifications in the upstream and downstream Wailupe Stream inverted siphon manholes.* Modification of the flow channels and installation of flow diversion gates in the inverted siphon manholes are proposed to improve flow characteristics and pipe flushing velocities. This will reduce accumulation of sediments and grease that can reduce flow capacity.

- *Rehabilitate sewer manholes with epoxy coating and remove existing corroded rungs.* Repair of damaged concrete and application of an epoxy protective lining are proposed to protect the manhole interior from further deterioration. The work will involve removal of damaged concrete, removal of corroded rungs, application of a high-strength cementitious underlayment, and either spraying or troweling a corrosion resistant epoxy coating.
- *Replace manhole frames and covers.* The majority of the existing 24-inch diameter manhole frames and covers on Segment 2 will be replaced with new 32-inch diameter manhole frames and covers to facilitate access for this project and for future maintenance operations. Similar to Segment 1, the upper portion of the manhole will be replaced to accommodate the larger covers. Existing covers will remain on manholes not used for lining installation or flow bypassing operations.

Proposed Actions for Segment 3

Although not part of the Kalanianaole Highway trunk sewer, the Segment 3 work is located within the trunk sewer's tributary area. As shown on Figure 1-4, the Segment 3 lines are located along the mauka side of Kalanianaole Highway, between Halemaumau Street and the Paiko Drive area. This line conveys flow to a 15-inch sewer that receives flow from Niu Valley and discharges to the Niu Valley WWPS.

The main portion of Segment 3 was constructed in 1970 and consists of approximately 1,700 linear feet of 10-inch VCP. In 1993, a new branch line consisting of approximately 54 feet of 8-inch VCP was constructed as part of the Kalanianaole Highway widening project.

Past field investigations have identified cracks in the pipes, defective joints and significant infiltration of groundwater in the Segment 3 line. The volume of infiltration is estimated to be approximately one million gallons per day. Much of the infiltration appears to be discharged from two unused service laterals. One leads to a vacant lot, and the other is an abandoned lateral that appears to not have been properly plugged during the highway widening project.

The following is a summary of work proposed for Segment 3:

- *Clean lines with conventional sewer cleaning equipment.* Due to the accessibility of all the manholes and small size of the line, the cleaning of the Segment 3 sewer lines would be performed with conventional sewer cleaning equipment. Some precautions in cleaning the line, however, are required due to possible damaged sections of the vitrified clay sewer pipe.
- *Rehabilitate sewer lines with CIPP.* The Segment 3 sewer lines are proposed to be rehabilitated using CIPP sewer lining technology similar to that described

above for Segment 2. Prior to installation of the CIPP liner, leaks from the two service laterals and other defects that contribute to infiltration problems will be stopped. This pre-CIPP work is expected to be performed using trenchless methods in which a short section of epoxy resin liner is expanded over the opening of the service lateral connection or leak and then cured by the chemical reaction of the epoxy rather than heat.

- *Remove rungs in selected manholes.* Rehabilitation of the manhole walls and replacement of the manhole covers is not required for the Segment 3 manholes due the lower age and lower level of corrosive sewer gases in this portion of the system. Corroded rungs will be removed on selected manholes based on the findings of past studies.

Other Proposed Work

The following routine maintenance and repair work that are also proposed to be performed to help resolve the sewer system capacity problems are as follows:

- *Rehabilitate sewers in upstream tributary areas.* Additional CIPP rehabilitation of sewers in selected tributary areas is proposed to be performed to further reduce infiltration and inflow and the risk of sewage spills. The work is proposed to be performed by existing City contractors with existing repair and maintenance contracts. These contractors perform sewer repair and rehabilitation work on an as-needed basis based on competitive bids received for fixed unit prices for various items of work. The rehabilitation work is expected to focus on the low-lying sewers in the Niu Valley and Aina Haina areas where infiltration reduction has the most potential and the greatest benefit. Cleaning and CIPP rehabilitation of smaller diameter sewers on residential streets can typically be accomplished within several days to a week and typically has minimal traffic and other impacts.
- *Reduce wet-weather inflow from private properties in the upstream tributary areas.* The City regularly performs smoke testing of sewers to identify sources of wet-weather rainwater inflow. This procedure involves pumping non-toxic smoke into the sewer manholes and observing the discharge of smoke from illicit private property connections such as roof gutters and outdoor drains. Smoke testing also allows the detection of large leaks in house service laterals, uncapped yard cleanouts and leaky manhole covers. Once the defects are identified, homeowners are required to take corrective action for private property defects.
- *Resolve capacity limitations at the Kahala Wastewater Pump Station.* Pump upgrade and other modification work are proposed to be implemented as required to enable the pump station to meet or exceed its original peak design capacity of 18 million gallons per day. Pump testing and evaluation of the existing pumping

facilities are proposed as the first step to pinpoint the cause of capacity problems that may be causing the pump station to be pumping as much as 4 million gallons per day below its design capacity.

This above routine maintenance and repair work is normally considered by the City to be exempt from the HRS Chapter 343 environmental assessment requirements. The work is described in this document as it is part of the recommended actions to resolve the sewer capacity problem.

F. PROJECT FUNDING

The estimated cost to implement the proposed project is approximately \$10 million. The project may potentially be funded by the State Revolving Fund (SRF) and American Recovery and Reinvestment Act of 2009 (ARRA) programs. If SRF and ARRA funds are not available, the project will be funded by the City and County of Honolulu under its Capital Improvement Program budget that is funded by user sewer fees. There will be no direct assessment fees levied on the residents served by the project.

G. PROJECT SCHEDULE

Construction of the main project, which encompasses the sewer cleaning and rehabilitation work on Segments 1, 2 and 3, is expected to begin in mid 2009 at the earliest. The work is anticipated to be completed within an 18 month period.

H. PERMITS AND APPROVALS REQUIRED

<u>Federal Permits/Approvals</u>	See discussions below.
<u>State Permits/Approvals</u>	
Environmental Assessment	Office of Environmental Quality Control, Department of Health
Community noise permit	Department of Health
Noise variance	Department of Health
Permit to perform work within a State highway right-of-way	Department of Transportation
Use and Occupancy Agreement	Department of Transportation

State Permits/Approvals (continued)

Construction plans approval	Department of Health Disability Communication Access Board State Historic Preservation Division
-----------------------------	---

City and County of Honolulu Permits/Approvals

Construction plans approvals	Department of Planning & Permitting Department of Design and Construction Department of Environmental Services
Street usage and trenching permit	Department of Transportation Services/Department of Planning & Permitting

The U.S. Army Corps of Engineers will be provided with additional detailed information on the project, with emphasis on the proposed Segment 1 work on manholes within the high tide mark. Since the sewer cleaning and manhole work involves repair and maintenance, an exemption from Department of Army permits will be requested. Similar exemptions will be requested from the State and City regarding the Conservation District Use Permit and Shoreline Setback Variance, respectively.

A National Pollutant Discharge System (NPDES) permit is not anticipated to be required. The total work area, including the contractor's staging areas, is not anticipated to exceed one acre and disposal of dewatering effluent or hydrotesting water to drainage systems or state waters should not be required. The contractor will be required to obtain the applicable NPDES permit if these conditions are not met.

CHAPTER 2

ENVIRONMENTAL SETTING

A. INTRODUCTION

The environmental setting of a project can significantly affect the type and extent of impacts. This section provides an overview of the environmental setting of the project site, including physical and biological aspects of the natural environment and the socio-economic characteristics of the surrounding community.

B. CHARACTERISTICS OF THE PHYSICAL AND BIOLOGICAL ENVIRONMENT

1. Location, Topography and Land Use

The project is located in East Honolulu on the Island of Oahu. The wastewater tributary area, which encompasses approximately 1,700 acres, spans from Kalani Valley and Kahala on the west to Niu Valley on the east (see Figure 1-1 in Chapter 1).

The alignment of the Segment 1 and 2 sewer lines, which comprise the Kalanianaʻole Highway Trunk Sewer, is shown on Figures 2-1 and 2-2. The sewer lines traverse through developed areas, including the Kahala Beach Apartments, the Kahala Hotel & Resort, Waialae Country Club and Golf Course, private residential lots, City and County of Honolulu property (Wailupe Beach Park), and State of Hawaii land (beach land and Kalanianaʻole Highway right-of-way). Much of the Segment 2 trunk sewer alignment along Kalanianaʻole Highway lies within the east-bound makai lane.

The Segment 3 sewer line is located further east in the Niu Valley area (see Figure 2-3). This portion of the project traverses along the west-bound lanes, sidewalk and shoulder area of Kalanianaʻole Highway between Halemaumau Street (east of the Niu Valley Shopping Center) and the Paiko Drive area.

The topography of East Honolulu is characterized by a series of ridges and valleys formed by the Koolau Mountain Range and bordered by Maunalua Bay (see Figure 2-4). Residential areas along the project include Kahala, Waialae, Aina Haina, Hawaii Loa Ridge, and Niu Valley.

In general, the topography along the trunk sewer alignment is relatively flat due to location of the sewer line in the lower lying coastal area. Ground elevations typically range from 5 to 10 feet above mean seal level (MSL). A few sewer manholes are located in low lying shoreline areas. Due to beach erosion, one manhole on the beach west of Wailupe Beach Park is located within the high tide zone. Another manhole

located in the revetment along the Waialae Country Club golf course is within the splash zone.

The topographic features and land uses along the sewer alignment varies widely, and includes natural sandy beach areas, moderately to very well landscaped areas (including resort grounds, golf course, and backyards of exclusive beachfront mansions), swimming pools and decks, a restaurant lanai area, road pavement (from narrow dead end streets to the multi-lane Kalanianaole Highway), sidewalks, a church wedding area, and school grounds. In Segment 2, the sewer traverses under a single family home. The sewer lines also traverse under Wailupe Stream as well as a number of other drainage channels.

A zoning, Special Management Area (SMA) and Underground Injection Control (UIC) boundary map is shown in Figure 2-5. The service area of the project sewer lines is comprised primarily of single-family residential parcels, but also includes various parcels zoned for multi-family, commercial, resort, public and other non-residential uses. The SMA and UIC boundaries are discussed in later sections of this chapter.

Previous land use in East Honolulu during ancient Hawaiian times consisted of fishing, gathering and agriculture. In the 1880s, the area was used for pasture and dairy farms. The residential development that gives the area its current character began in the 1940s (Cultural Surveys Hawaii, 2009).

2. Climate

Climate on the Island of Oahu is influenced by its subtropical location, topography, and the surrounding Pacific Ocean. Precipitation is primarily associated with the prevailing northeasterly trade winds that are intercepted and forced upwards at the Koolau Mountain range. The prevailing winds occur approximately 70 percent of the time. Trade wind frequency ranges from about 45 percent in January to more than 90 percent in July. Winds may blow from any direction. High winds are most likely to occur during the winter months.

Average annual rainfall of the southeast coast of Oahu is typically 20 to 30 inches per year (Cultural Surveys Hawaii, 2009). Average mean temperatures in the south shore area range from mean highs between 75 and 85 degrees to mean lows between 62 and 67 degrees Fahrenheit (Environmental Communications, Inc., 2004).

3. Soils

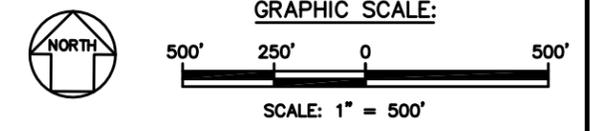
The project site spans a shoreline area encompassing various types of soil. In Waialae and Wailupe, soil in the project area include Beaches, Jaucas sand (0-15% slopes), Malama Stony Silty Clay (0-12% slopes), Coral Outcrop, Mokuleia Clay Loam, and Pamoia Silty Clay (5-20% slopes). In the Niu and Kuliouou portion of the project area,

DATE: 10/03/08 PM: RKA
 SCALE: 1" = 500' OPER: *ML/KA
 FILE: 2004011-53 REVISED: 04/27/09



SOURCE: GOOGLE EARTH, 2007

- LEGEND**
- SEWER SEGMENT 1
 - SEWER SEGMENT 2

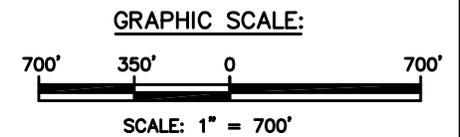




SOURCE: GOOGLE EARTH, 2007

LEGEND

- SEWER SEGMENT 1
- SEWER SEGMENT 2





SOURCE: GOOGLE EARTH, 2007

LEGEND



SEWER SEGMENT 3



GRAPHIC SCALE:



SCALE: 1" = 300'

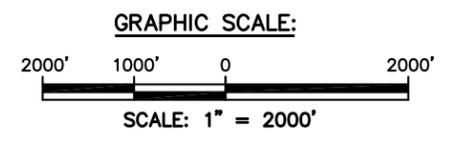


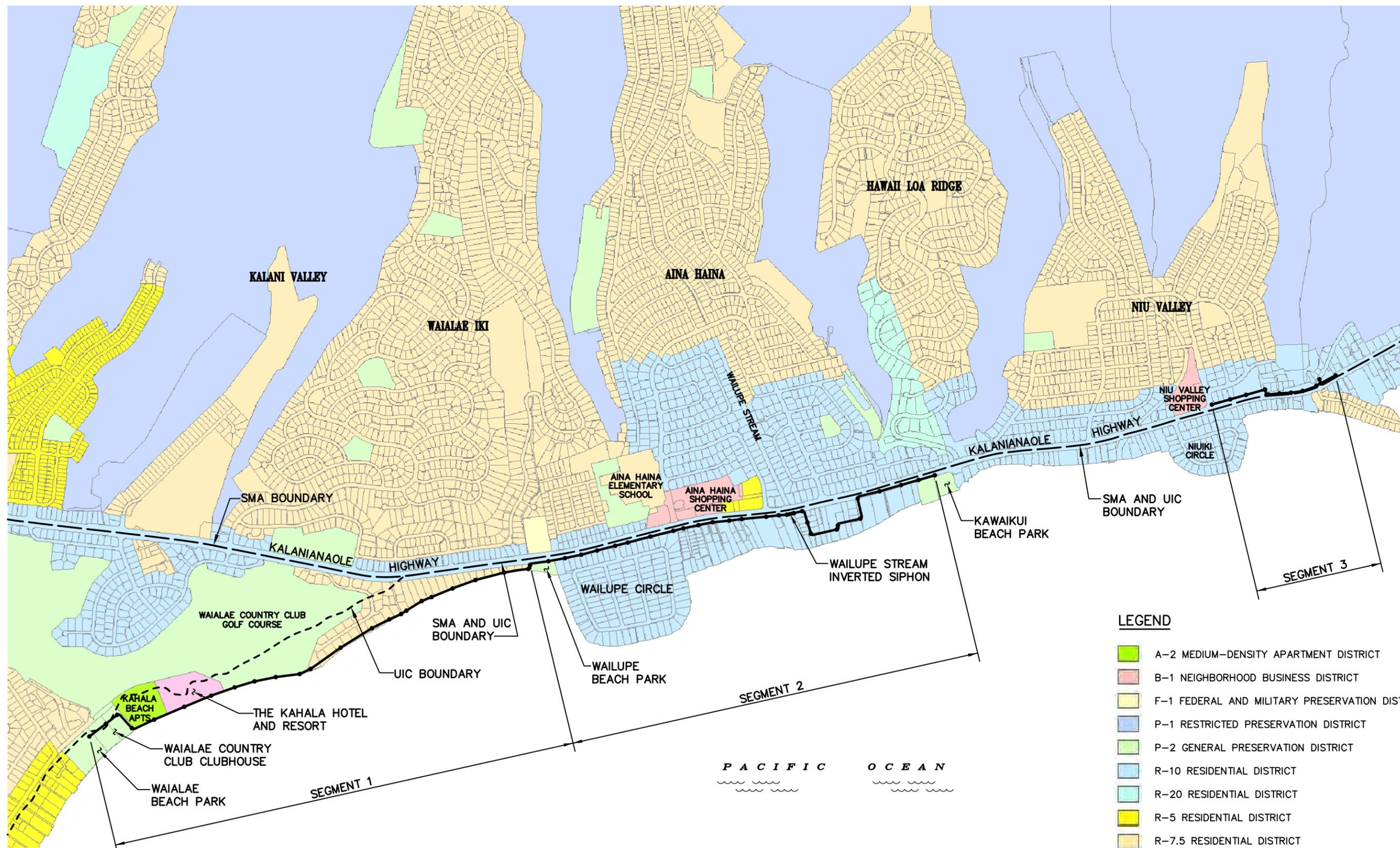
DATE: 10/27/08 PM: RKA
 SCALE: 1" = 1 MILE: BTY, KA, *ML
 FILE: 2004011-66 REVISED: 04/13/09

SOURCE: ADAPTED FROM
 USGS QUADRANGLE MAPS
 (HONOLULU, HI &
 KOKO HEAD, HI)

LEGEND

- SEWER SEGMENT 1
- SEWER SEGMENT 2
- SEWER SEGMENT 3

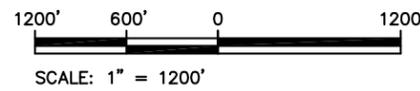




LEGEND

- A-2 MEDIUM-DENSITY APARTMENT DISTRICT
- B-1 NEIGHBORHOOD BUSINESS DISTRICT
- F-1 FEDERAL AND MILITARY PRESERVATION DISTRICT
- P-1 RESTRICTED PRESERVATION DISTRICT
- P-2 GENERAL PRESERVATION DISTRICT
- R-10 RESIDENTIAL DISTRICT
- R-20 RESIDENTIAL DISTRICT
- R-5 RESIDENTIAL DISTRICT
- R-7.5 RESIDENTIAL DISTRICT
- RESORT DISTRICT
- SMA BOUNDARY
- UIC BOUNDARY
- SEWER LINE

GRAPHIC SCALE:



DATE: 10/27/08 PM: RKA
 SCALE: 1" = 1200' BTY, KAML, *FAI
 FILE: 2004011-64 REVISED: 04/27/09

SOURCE: CITY & COUNTY OF HONOLULU
 DEPARTMENT OF PLANNING AND
 PERMITTING; HAWAII STATE
 DEPARTMENT OF HEALTH.

soil consists of Mokuleia Clay Loam and Kawaihapai Clay Loam (0-2% slopes). A map showing the location of the various soil types are included in the archeological report prepared by Cultural Surveys Hawaii (see Appendix B).

Most of the soils usually found on or near the coast consisting of calcareous sand are well drained. The Jaucas sands are usually very permeable deep soils. The Mamala and Mokuleia series are formed from alluvium deposited over coral limestone and coral sand, respectively. Significantly different soil characteristics that occur in parts of Segment 3 include clay soils on coastal plains that are poorly drained (USDA, 1972).

The project will be limited to relatively shallow excavations for temporary buried sewage bypass lines and work on the upper portion of sewer manholes. The excavations will typically not exceed a depth of 4 feet. Although burials could potentially be found in any soil, areas with Jaucas sand are of particular concern since past burials have been encountered in deposits of Jaucas sand (Cultural Surveys Hawaii, 2009). This issue is discussed further later in this chapter under "Historic and Archaeological Sites."

4. Streams

The streams in East Honolulu begin along the south-east side of the Koolau mountain range and drain to Maunalua Bay. Streams located in or near the project area (from west to east) include Kapakahi Stream, Waialae-Iki Stream, Wailupe Stream, Niu Stream and Kuliouou Stream (see Figure 2-4).

Kapakahi Stream

Kapakahi Stream travels through the residential neighborhood in Waialae Nui Lower before entering the Waialae Country Club Golf Course. Shortly after entering the golf course, an adjacent stream from the west, Waialae-Nui Stream, joins with Kapakahi Stream and flows through the golf course. Kapakahi Stream then flows under Kahala Avenue and traverses across Waialae Beach Park near the east end of the project. A manmade drainage ditch on Kahala Avenue servicing the area connects to Kapakahi Stream near the entrance to the Waialae Country Club.

Waialae-Iki Stream

Waialae-Iki Stream begins as a flood control channel near Kalaniiki Street in Kalani Valley. It flows down through Kalani Valley, past Kalani High School, under Kalanianaole Highway and into the east portion of the Waialae Country Club Golf Course. The stream drains out to Maunalua Bay where the golf course borders the bay.

Wiliwili-Nui Stream

Wiliwili-Nui Stream is a narrow stream that stems from the Wiliwili Gulch and flows through the west side of Aina Haina. The flow splits into two separate streams above Kalanianaole Highway. The two streams flow under Kalanianaole Highway and drains into Maunalua Bay on the east and west sides of Wailupe Beach Park.

Wailupe Stream

Wailupe Stream is an 8.4 mile long perennial stream. As the major stream that flows out of the Wailupe watershed, the Wailupe stream drainage basin is bordered by the Hawaii Loa and Wiliwilinui Ridges and stretches from the Koolau mountain range to Maunalua Bay. Runoff from the Aina Haina residential community contributes to the Wailupe Stream flow. Another tributary to the Wailupe Stream flow is Kului Stream, which enters Wailupe Stream upstream of the Kalanianaole Highway bridge crossing. The project's inverted siphon sewer lines are located under the stream at the bridge crossing.

This perennial stream has a history of debris flow occurrences that can cause damage by bridge collisions or diversion of flood waters out of the channels from plugging the stream system. Wailupe Stream is the only unchannelized natural stream left in East Honolulu. The stream suffers from a stream bank erosion problem, which usually occurs at or near bridge abutments and drainage outlets (US Department of Army, 2007).

Niu Stream

Niu Stream is a channelized stream that receives the flow from two flood control channels—one from West Niu Valley and the second from East Niu Valley. After merging, the stream flows down Niu Valley, passes Niu Valley Shopping Center, and then flows under Kalanianaole Highway and out into Maunalua Bay.

Kuliouou Stream and Paiko Lagoon

Kuliouou Stream conveys runoff from Kuliouou Valley into Paiko Lagoon, which is sheltered by the Paiko Peninsula at the edge of Kuliouou. Water from a spring also flows into Paiko Lagoon.

5. Coastal Waters

Maunalua Bay spans from Kahala to Hawaii Kai on the south shore of Oahu. The bay is one of the largest in Hawaii and shelters communities of intact coral reefs and limu beds, some of which are endemic to Hawaii (Malama Maunalua, 2008). The Bay is utilized for water recreational activities such as jet skiing, SCUBA diving, surfing, parasailing, boating and paddling. Portions of project are located along the northwest shoreline.

Under the State of Hawaii Department of Health (DOH) Chapter 11-54, "Water Quality Standards," Maunalua Bay is classified as Class AA open coastal marine waters. Class AA waters are to be maintained in its "natural pristine state as nearly as possible with an absolute minimum of pollution or alteration of water quality" (DOH, 2004). The marine bottom ecosystem in Maunalua Bay is designated as Class II under Chapter 11-54. Waters under this class, which include harbors within degraded reef flats near the shore, are protected for fish and wildlife propagation and recreational purposes (DOH, 2004). The bay is also part of the federally protected marine whale sanctuary in the area (DOH, 2008).

Information obtained from the DOH's "2006 State of Hawaii Water Quality Monitoring and Assessment" Report, pursuant to sections 303(d) and 305(b) of the Clean Water Act, indicates that five beaches in the project area are on the 2006 list of impaired water bodies for Hawaii. Waialae Beach Park and Kawaikui Beach Park are on the list for not meeting water quality standards for enterococci, but have "low" priority for TMDL (Total Maximum Daily Load) development. Both beach parks are in Categories 3 and 5. Category 3 denotes insufficient data. Category 5 denotes that available data shows that at least one of the water's designated uses is threatened and establishment of a TMDL is called for. Also on the list are the Kahala Beach shoreline, Kahala Hilton Beach, and Wailupe Beach Park, all in Category 3 with unknown pollutants and unlisted TMDL priorities.

6. Hydrology and Water Resources

The project area is located in the Waialae-East aquifer. The Waialae-East aquifer has a sustainable yield of 2 million gallons per day and is a major source of potable water (DLNR, 2001).

This project is located in an area that has balanced the natural recharge and current removal of groundwater. Recharge includes the contribution of small aquifers in the mountainous regions draining high level dike and perched groundwater into the basal lenses. To achieve a balance between inflow and outflow, the groundwater level rose from the sedimentary caprock of the coastal plain (DLNR, 1990).

All of the Segment 1 and the downstream portion of the Segment 2 sewer lines are located below groundwater. The upstream sections of the Segment 2 sewer line are located near the tidally influenced water table. All of Segment 3 lies above the water table.

In 1982, the Underground Injection Control (UIC) Program was established by the Safe Drinking Water Act to protect groundwater resources. In Hawaii, injection wells are regulated by the State Department of Health's Administrative Rules, Title 11, Chapter 23, "Underground Injection Control." The UIC Line marks the boundary between non-

drinking water aquifers and drinking water aquifers. Aquifers in areas below (or makai) of the UIC Line are not sources of drinking water and aquifers in areas above (or mauka) of the UIC Line are drinking water sources. The location of the UIC boundary within the project limits are shown on Figure 2-5.

Since the Segment 1 sewer lines are located along the shoreline, the affected areas are makai of the UIC line and outside the drinking water aquifers. Since Kalanianaole Highway within the project area serves as the UIC boundary, the Segment 2 and 3 sewer lines are essentially located along the UIC Line boundary.

7. Flood, Tsunami and Earthquake Hazards

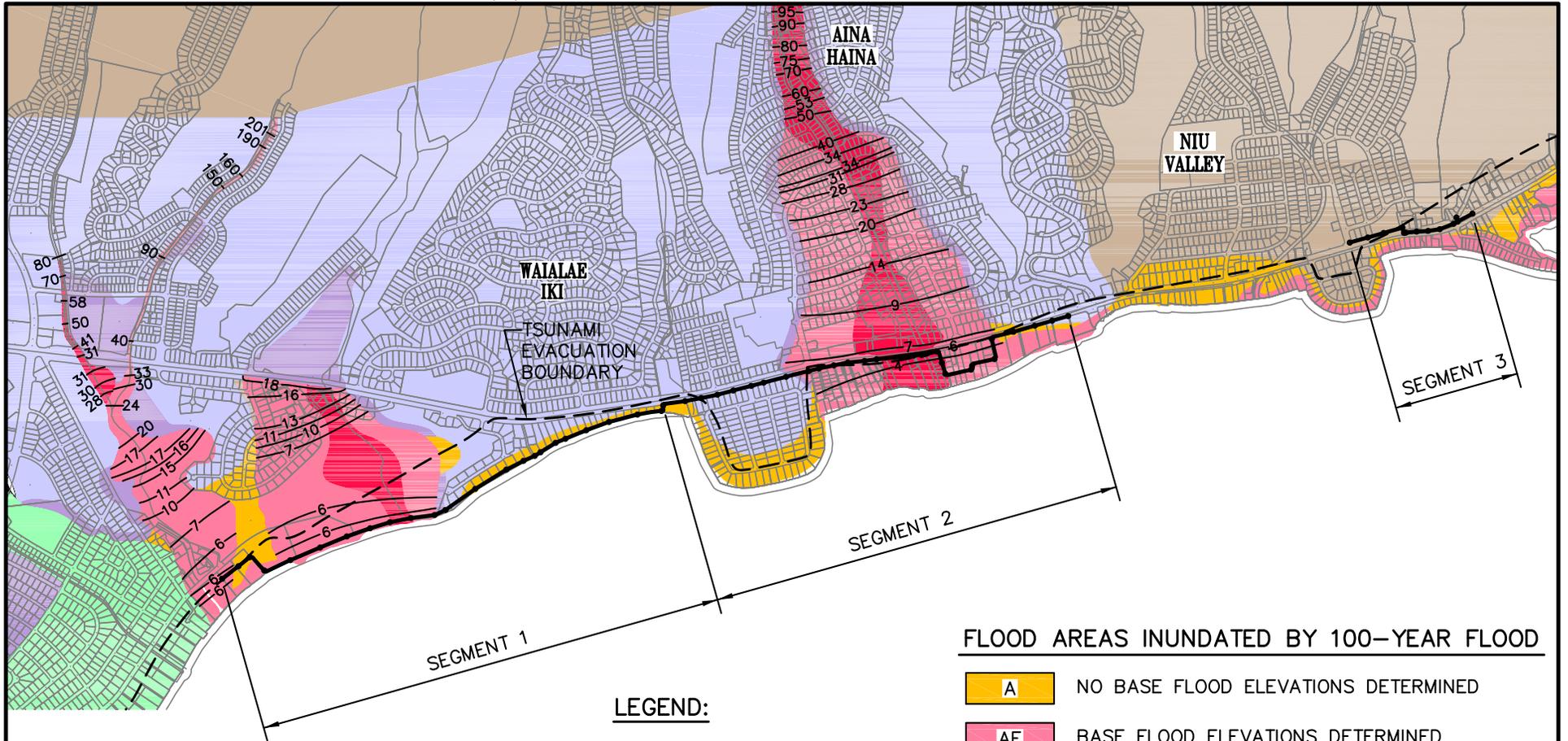
The project site is located within various flood hazard zones based on information from the Federal Emergency Management Agency's (FEMA) Federal Insurance Rate Map (FIRM) and the City's Geographic Information System (GIS) website. As shown in Figure 2-6, flood zones in the project area include Zones A, AE, D and X.

Based on FEMA's definition, Zone A regions are high risk areas where flooding has a 1% chance annually (100 year flood) and 26% probability over the life of a 30 year mortgage. Detailed analyses have not been done for Zone A regions so the depths or base flood elevations are unknown. As indicated in Figure 2-6, project areas in Zone A regions include a portion of the Waialae Country Club property, sections of the sewer line along the beach front homes in the Kahala and Wailupe shoreline area, and the east end of Segment 2.

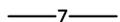
Zone AE regions are high risk areas, similar to Zone A, where flooding has a 1% chance annually (100 year flood) and 26% over the life of a 30 year mortgage. Base flood elevations have been determined within these zones from previous detailed analyses. The City and County of Honolulu refers to the floodway areas in Zone AE as Zone AEF. Project areas in Zone AE and Zone AEF include most of the downstream end of Segment 1 starting at the Waialae Country Club golf course, and the approximately 2,500 foot wide floodplain area of Wailupe Stream.

The project is located within or just beyond the tsunami evacuation zone based on Civil Defense Tsunami Evacuation Zone maps from the Pacific Disaster Center (see Figure 2-6). The, tsunami evacuation areas are generally located makai of Kahala Avenue and Kalanianaole Highway, except for higher areas within Wailupe Peninsula and Niuiki Peninsula.

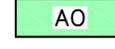
The earthquake hazard for the project site is relatively low. The entire island of Oahu is in seismic Zone 2A based on the Uniform Building Code.



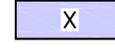
LEGEND:

-  SEWER LINE
-  FLOOD ELEVATION
-  TSUNAMI EVACUATION BOUNDARY

FLOOD AREAS INUNDATED BY 100-YEAR FLOOD

-  NO BASE FLOOD ELEVATIONS DETERMINED
-  BASE FLOOD ELEVATIONS DETERMINED
-  FLOODWAY AREA WITHIN AE ZONE
-  FLOOD DEPTHS 1 TO 3 FEET

OTHER AREAS

-  500-YEAR FLOOD PLAIN
-  BEYOND 500-YEAR FLOOD PLAIN
-  UNDETERMINED FLOOD HAZARD

GRAPHIC SCALE:



SCALE: 1" = 2000'



SOURCE: CITY & COUNTY OF HONOLULU
 DEPARTMENT OF PLANNING AND PERMITTING;
 OAHU CIVIL DEFENSE.

8. Flora and Fauna

Based on information provided by the U.S. Fish & Wildlife Service (FWS), there are no critical habitats within the immediate project area. Species of wildlife that may be potentially found in the area, however, include the federally endangered Hawaiian monk seal, the Hawksbill sea turtle, Hawaiian coot and Hawaiian stilt, and the threatened green sea turtle (Nadig, 2008). Correspondence with Mr. Aaron Nadig of the FWS is included in Appendix C-1.

Data solicited from the Pacific Island Fisheries Science Center (PIFSC) of the National Marine Fisheries Service indicated 31 reported sightings of Hawaiian monk seals in Maunalua Bay since 1991. A summary of the findings prepared by Ms. Tracy Wurth of PIFSC is presented in Appendix C-2 (NOAA, 2008). The study area included Kahala, Wailupe Peninsula, Aina Haina, Niu Peninsula, Paiko Peninsula, Hawaii Kai and Portlock. Sighting information was mainly collected by reports from the general public. Aerial surveys were conducted in 2000-2001 and 2008 by the PIFSC, but found no Hawaiian monk seal sightings in Maunalua Bay at the time of the surveys.

A Wailupe resident recalls two incidents of monk seal sightings along Wailupe Beach, of which the last one was in late 2008 (Chang, 2009).

A report on marine turtle activity in Maunalua Bay, prepared by Ms. Stacy Hargrove of PIFSC's Marine Turtle Research Program, is included in Appendix C-3. The PIFSC program has collected and reported data of Hawaiian green turtles during all months of the year, since the 1970's. Ocean capture research has not been conducted in Maunalua Bay, but the bay has been used for releasing rehabilitated turtles back into the wild. There have been 173 green turtle strandings recorded in Maunalua Bay since 1982, but no nesting has been reported in the area. Fewer strandings have been documented in fall and winter months than in spring and summer months. Since the location is a suitable habitat for marine turtles, the area is assumed to be used as a foraging and resting area by green turtles.

A Wailupe resident indicated that resident sea turtles have been regularly sighted in the Wailupe Beach Park area (Chang, 2009). The resident indicated that turtles can be found in the deeper drainage channel area on the Wailupe Circle side of the park during low tide.

Paiko Lagoon, located near the east end of the project, is protected and managed by the State of Hawaii's Department of Land and Natural Resources (DLNR) as the Paiko Lagoon Wildlife Sanctuary. The lagoon sanctuary is a habitat to the endangered Hawaiian stilt and other migratory birds.

A native Wedge-tail shearwater seabird nesting colony is located at Black Point (Nadig, 2008). Wedge-tail shearwater sea birds are protected under the Migratory Bird Treaty Act (16 U.S.C. 703 et seq.) as amended (MBTA). The colony is managed by the Hawaii Audubon Society. Black Point is located more than a mile east of the eastern end of the project.

A Wailupe resident indicated that the Pacific golden plover (kolea) and other water birds can be found along Wailupe Beach, (Chang, 2009).

The State Division of Aquatic Resources (DAR) has been conducting fish surveys in two locations in Maunalua Bay near Niu Valley (Schumacher, 2008). The survey locations are sites with water depths of about 40 feet. The location of the two sites and the list of species identified during the fish surveys are included in Appendix C-4. Although a variety of fish species were found, none are considered endangered.

A study of the Wailupe watershed by the Hawaii State Division of Aquatic Resources published in April 2008 reported five native species of fish found in Wailupe Stream. This list includes two species of oopu, the oopu nakea or Pacific River Goby (*Awaous guamensis*), which is indigenous, and the Sandwich Island Sleeper (*Eleotris sandwicensis*), which is endemic. The Hawaiian flagtail (*Kuhlia xenura*) is also endemic, while the striped mullet (*Mugil cephalus*), and bandfin mullet goby (*Mugilogobius cavifrons*) are indigenous. There are also introduced species of fauna in the stream, including the cane toad (*Bufo marinus*), monkey river shrimp (*Macrobrachium lar*), painted turtles (*Chrysemys* sp.), convict cichlid (*Archocentrus nigrofasciatus*), guppy (*Poecilia reticulata*), tilapia, live bearing fish and various species of snails (Division of Aquatic Resources, 2008). Fauna in other streams in the project area may be similar to those found in Wailupe Stream.

Other fauna that would likely be found within the limits of the project site include domesticated animals that typically inhabit urban residential areas of Oahu, including dogs, cats, mongoose, rats and mice. Within the project work areas, introduced alien species are the dominant fauna. The Kahala Hotel & Resort provides a home for domesticated ocean dwellers, including porpoises, turtles and fish in a controlled environment.

Majority of the project site has been subjected to extensive urban development, resulting in no known endangered flora within the site. Existing flora near Kalanianaole Highway include exotic grass, koa haole (*Leucaena glauca*), and landscaped plants such as laua'e (*Polypodium phymatodes*), roses (*Rosa* spp.), citrus (*Citrus nobilis*), Samoan coconut (*Cocos nucifera*), plumeria (*plumeria acuminata*), and other ornamental plants (Cultural Surveys Hawaii, Inc., 2009). Predominantly, flora found on the beaches is naupaka

kahakai. Along Wailupe Beach, limu eleele (*Enteromorpha prolifera*) and ogo (*Gracilaria parvisipoa*) can also be found (Chang, 2009).

9. Historic and Archaeological Sites

The area of potential effect with respect to historic and archaeological resources is limited to the public right-of-way and sewer easements that have been previously disturbed, filled and developed.

Cultural Surveys Hawaii, Inc. was solicited to perform a literature review, field inspection and cultural background study of the project area and to provide a report of their findings, predictions and recommendations. The following is a summary of the findings. The full report has been included in Appendix B.

Historic sites listed under the State Inventory of Historic Properties and the National Register of Historic Places have been documented near the project area. These historic sites exist in the form of fishponds, burial caves, partially destroyed heiaus, cultural layers and excavated burial pits. There are no known historic sites directly along the alignment. Based on the study by Cultural Surveys Hawaii, however, the potential for archaeological discovery in the project area is relatively high. Historically, the area was well-populated and the potential of finding burials, artifacts and places of archaeological significance is high. Of particular concern are burials and artifacts in the vicinity of the project area.

Areas of Jaucas sand have been used by people of ancient times for burial grounds up until the twentieth century. As a result, areas below modern fill layers with intact Jaucas sand deposits exhibit high potential for findings of archaeological significance. Undisturbed deposits of Jaucas sand below modern fill layers under the sewer line could pose possible encounters for burials, artifacts or cultural layers.

The downstream portion of Segment 1 traverses along Kahala Beach. There have been written evidence of a large Hawaiian burial ground on an eroding beach in Waialae Nui in the Kahala Beach area, however, the exact location or whether the site still exists today is unknown. Archaeological excavations in properties along Kahala Avenue have uncovered burials in the sand layers in the area. Burials have also been uncovered in the Waialae Country Club property in an area that was once a private cemetery called Puu Makani, or Waialae Private Cemetery, which was used by residents and Waialae Ranch workers. The Waialae Country Club property was the location of the former Waialae Ranch.

Historic sites have also been found underneath Kalanianaole Highway. These historic sites include traditional Hawaiian burial pits, isolated historic burials and private family cemeteries. The part of Kalanianaole Highway from Ainakoa Avenue at the end of the

H-1 freeway to Kirkwood Street in Aina Haina was first widened in the late 1960s. At the time, there were no provisions for archaeological monitoring during construction. Any archaeological finds in the area could have been left undocumented, and in place or intermixed with fill. Since the sewer segments in the project were constructed in the 1950s to 1960s during the development of the area, there is also a possibility that disturbed fill along the sewer line will contain archaeological artifacts intermixed within. In 1991, during the Phase II widening of Kalanianaole Highway from West Hind Drive in Wailupe to East Halemaumau Road in Niu Valley, a skull and human clavicle were found intermixed with fill material. The remains were discovered during the excavation of a sewer trench at the northern boundary of Kawaikui Beach Park.

Other potential archaeological findings could include agricultural deposits, artifacts, and early historic trash deposits. During a field investigation by Cultural Surveys Hawaii, no surface historic features were found.

10. Cultural Resources and Practices

Much of the information on traditional cultural practices and resources was obtained from the archaeological literature review, field inspection work and cultural background investigations performed by Cultural Surveys Hawaii for this project (see Appendix B). Solicitation of input during the pre-assessment consultation phase from residents living near the project and native Hawaiian cultural groups (see list in Chapter 6) yielded some additional information. Information was also obtained from an environmental assessment for the “New Pier at 292 Wailupe Circle” (Oceanit, 2003) project that included a cultural impact assessment for the Wailupe Peninsula area.

Past cultural practices and resources in the Waialae, Wailupe, Niu and Kuliouou ahupuaas are generally associated with habitation, farming, fishing, gathering, religious activities and burials. During the early post contact period, the project area was well-populated and several settlements, fishing villages and fishponds lined the coast. Areas along streams and springs were used for taro patches while other areas were used for dry land cultivation or pasture.

Prior to development of the region, streams were a resource for oopu (gobies), frogs, ama ama (mullet), oama (juvenile of the goatfish, weke), and moili (juvenile of the threadfish, moi).

Cultural practices associated with former fishponds in the Wailupe region were significant prior to development of the area (Oceanit, 2003). Fishponds played an important role in Hawaiian culture, providing a definite supply of food. Hawaiian fishponds were usually constructed in estuaries where freshwater streams flowed into the ocean. The salinity of the brackish water in the ponds was controlled using gates along the perimeter of the pond.

There were smaller fishponds in addition to the larger Wailupe Fishpond (now Wailupe Peninsula/Wailupe Circle) and Kupapa Fishpond (Niuiki Circle). Pertinent information on the two former large Hawaiian fishponds at Niuiki Circle and Wailupe Circle that have since been filled for residential development (Cultural Surveys Hawaii, 2009) includes the following:

- The former fishpond at Niuiki Circle, called Kupapa Pond or Niu Fishpond, exhibited water worn basalt walls 3-feet high and 8-feet wide that formed a 2,000 feet long semicircle around several acres. By 1933, the pond had been filled and used for agriculture. In 1953, the pond was filled and developed for residential use. The former fishpond is listed as State Inventory of Historic Properties No. 50-80-15-51 (Site #51).
- The former Wailupe Fishpond's perimeter wall was about 2,500 feet long, encompassing 41 acres. A 50-feet wide sandy area bordered the west side. The rest of the pond consisted of 12-feet wide water worn basalt rock walls. The pond was dredged in 1947 to accommodate a residential area. The former fishpond is listed as State Inventory of Historic Properties No. 50-80-15-56 (Site #56).

A resident living near the Wailupe Beach Park (Chang, 2009) indicated that fishing and limu gathering are currently practiced in the area. It was indicated that limu eleele and ogo, which are used in local dishes, can be found in the Wailupe area. Another long time resident of Wailupe also recalls gathering limu kohu (*Asparagopsis taxiformis*) and ogo (Cultural Surveys Hawaii, 2009). The area is home to schools of mullet and weke (goatfish). Throw-net fishing and spear fishing are practiced in the area to the west of Wailupe Beach Park (Oceanit, 2003).

Burial caves, Hawaiian pit burials, isolated historic burials and family cemeteries have been discovered in the area (see previous section "Historic and Archaeological Sites"). Based on field investigations, there are no surface historic features or documented historic sites located along the sewer alignment (Cultural Surveys Hawaii, 2009).

11. Air Quality

The U.S. Environmental Protection Agency issued National Ambient Air Quality Standards (NAAQS) for six major air pollutants: carbon monoxide, nitrogen dioxide, sulfur dioxide, lead, ozone, and particulate matter smaller than 10 microns and 2.5 microns (PM₁₀ and PM_{2.5}). The State of Hawaii Department of Health, Clean Air Branch, has also included a state ambient air standard for hydrogen sulfide. Statewide monitoring stations are maintained by the State Department of Health to ensure standards are met (DOH, 2008).

Six air quality monitoring stations are located across Oahu that measures various types of pollutants. The nearest station to the project site is located on the roof of the Department of Health (Kinau Hale) building in downtown Honolulu. Established in 1971, this station is located in an urban and center city area and monitors carbon monoxide, sulfur oxide, PM₁₀ and PM_{2.5} (DOH, 2008).

Data collected by the Department of Health in 2007 indicated the State of Hawaii to be in compliance with all NAAQS (DOH, 2008). Although air quality monitoring is not performed in the project site area, the air quality would generally be expected to be very good. Other than heavy vehicular traffic on Kalanianaole Highway, which would be comparable to or better than other monitored urban areas of Oahu, there are no other significant sources of air pollutants within or near the project area.

Relatively small amounts of odorous sewer gases are routinely vented from the sewer system through roof vents, pick holes in manhole covers, pipe defects and other intentional or unintentional openings in the sewer system. During field inspections that involved opening of manholes throughout the project sewer lines, the level of odors was not found to be significant and comparable to or lower than the odor level of other sewer lines of similar size.

12. Noise

The State of Hawaii Department of Health regulates noise under HAR Title 11, Chapter 42, “Vehicular Noise Control for Oahu,” and Chapter 46, “Community Noise Control.” Noise limits on Oahu for different zoning districts are as follows:

<u>Zoning</u>	<u>Daytime</u> (7:00 a.m. – 10:00 p.m.)	<u>Nighttime</u> (10:00 p.m. – 7:00 a.m.)
Class A	55 dBA	45 dBA
Class B	60 dBA	50 dBA
Class C	70 dBA	70 dBA

Class A zones include residential, conservation, preservation and public open space parcels. Class B zones include multi-family, apartment, business, commercial, hotel and resort areas. Class C zones include areas of agriculture, country and industrial lands (DOH, 1996).

Vehicular traffic on Kalanianaole Highway is the primary source of ambient noise in the project area. Other typical sources of noise in the area include aircraft, barking dogs, birds, wind, waves and people engaged in routine activities.

13. Hazardous Substances

High concentrations of hazardous substances that would impact the project are not anticipated to be encountered at the project site. The land was used primarily for agriculture in the past and was subsequently developed for residential and commercial uses.

The Department of Health Hazard Evaluation and Emergency Response Office has recorded reports of hazardous substance releases since 1988. Within the project site, the database indicated sewage spills caused by heavy rain in 2005 at 5307L Kalanianaole Highway and clogging of a sewer line with construction materials at Puuikena Street and Kalanianaole Highway (DOH, 2006). Wastewater spills are discussed further in the following section.

14. Wastewater Spills

During the initial planning phase of this project, the City's Department of Environmental Services, Collection System Maintenance Division (CSM), provided information on trouble calls and maintenance work orders associated with the Kalanianaole Highway Trunk Sewer (Segments 1 and 2). CSM trouble call logs and sewer complaint reports for the period from 1994 to 2005 was provided for review. The records indicate incidents of manhole overflows occurring at multiple sewer manholes as a result high flows occurring during heavy rainfall.

CSM records indicate that the overflows typically occur in the low-lying area near Wailupe Stream, particularly in the area where the Segment 2 sewer line jogs out in the makai direction from Kalanianaole Highway. Based on the records for the period reviewed, there have been at least five separate occasions where manholes or sewer cleanouts in this area have overflowed during significant storm events, prompting calls by residents to CSM.

Numerous sewage spills were also reported during the heavy rain that occurred in March of 2006. A resident living in the low-lying Segment 2 area indicated that sewage backed up into his shower and spilled into the bathroom during the 2006 storm (Kashiwa, 2009). He indicated that sewage also spilled from manholes at Wailupe Place (located across West Hind Drive) and Kawaikui Beach Park. The City also responded to a spill at a manhole downstream of Wailupe Beach Park. A resident walking her dog at the time indicated the sewage "exploded" from the top of the manhole. City crews repaired the corroded manhole frame and cover that was displaced by the pressure in the sewer line.

Based on discussions with residents living in other nearby low-lying areas and a hydraulic analysis of the sewer system, it appears that a number of past sewage spills were not reported. Reasons why spills may be unreported include no one observing the

spill, masking of low volume spills by stormwater runoff and ponding, and observers assuming that it is only stormwater overflowing from the manholes.

15. Utilities Infrastructure

In addition to sewer lines, other utility infrastructure in the project area includes water, drainage, gas, electrical power, cable and telephone. In the majority of the areas, power, cable TV and telephone lines are located below ground rather than on aboveground utility poles.

Sewer lines located within the public right-of-way and in easements in private property are owned and maintained by the City and County of Honolulu. Homeowners are responsible for repair and maintenance of the portion of the sewer service lateral that is located within their property.

16. Roadways and Traffic

Kalanianaole Highway provides primary access between East Oahu and Central Honolulu. Within the limits of the project, the highway is a six lane, divided highway with a landscaped median. Sidewalks line both sides of the highway with wheelchair curb ramps provided at intersections. An eastbound lane is used as a westbound contra-flow lane on weekdays between 5:30 a.m. and 8:30 a.m. from West Halemaumau Street to Ainakoa Avenue.

Cleaning of the Segment 1 sewer lines will occur off traveled roadways. Cleaning and rehabilitation work for Segments 2 and 3 will take place primarily along the heavily traveled Kalanianaole Highway.

Due to the need for lane closures on Kalanianaole Highway to perform the work, a traffic assessment study was conducted to evaluate the potential impacts on traffic. The study, prepared by Austin, Tsutsumi & Associates (2009), is included in Appendix D. The study indicates that weekday traffic pattern on Kalanianaole Highway generally consists of a commuter peak in the westbound direction in the morning hours of 6:30 a.m. to 7:30 a.m. In the eastbound direction, peak traffic hours are between 5:30 p.m. to 6:30 p.m. On weekends, the Saturday traffic peaks at 9:15 a.m. to 10:15 a.m. in the westbound direction and 1:45 p.m. to 2:45 p.m. in the eastbound direction. On Sundays, the traffic peaks at 12:30 p.m. to 1:30 p.m. in the westbound direction and 1:45 p.m. to 2:45 p.m. in the eastbound direction.

17. Scenic and Recreational Resources

Four panoramic views along Kalanianaole Highway near the project area were identified in the East Honolulu Sustainable Communities Plan (C&C of Honolulu, 2004). Starting at the transition from the H-1 Freeway to Kalanianaole Highway eastbound, the first panoramic view is along the Kalanianaole Highway overlooking the Waialae Golf

Course. Then further down right after Wailupe Circle is the second panoramic view looking into Aina Haina Valley. The third follows not far after and looks out towards Kawaikui Beach Park. The fourth is near Paiko Peninsula, east of the Segment 3 project area.

A number of recreational resources exist in the area. The project traverses along the shore and encroaches on a resort and golf course. Many recreational activities are related to the ocean. Within Maunalua Bay, general recreational activities include fishing, surfing, boating, canoe paddling and kayaking.

The project area is located along the Kahala and Wailupe shoreline and will have varying impacts on the Waialae, Wailupe and Kawaikui Beach Parks, which are operated by the City and County of Honolulu. The public uses the parks to gain access to the beach, fishing grounds, surfing areas and other ocean resources. The Waialae and Kahala beach areas and the Kawaikui Beach Park are popular location for weddings and wedding photos. All the parks are popular locations for picnics.

The Waialae Beach Park is adjacent to the Kahala Wastewater Pump Station and is the proposed location of one of the staging areas for the sewer cleaning equipment. The staging area will be at the corner of the park bordered by the Kahala Wastewater Pump Station and the Waialae Country Club's tennis courts. The west end of Wailupe Beach Park is also proposed to be utilized as a staging area for the sewer cleaning equipment.

C. SOCIO-ECONOMIC SETTING

1. General

The sewers in the project service the area between Niu Valley and Kahala in East Honolulu. The key characteristics that define the project area are the luxury beachfront resort and residential setting of the Waialae-Kahala areas; and the wide range of residential, commercial, recreational, and non-residential land uses along the busy Kalanianaole Highway corridor.

This area is represented by Neighborhood Board No. 2 (Kuliouou-Kalani Iki) and No. 3 (Waialae-Kahala). Residents represented by Neighborhood Board No. 1 (Hawaii Kai) will also be affected due to the traffic impacts on Kalanianaole Highway.

2. Population

Based on 2007 traffic zone estimates, the Waialae-Kahala neighborhood has a resident population of 9,680 and the Kuliouou-Kalani Iki neighborhood has a population of 16,673. These population estimates represent a 1.9 and 3.5 percent increase, respectively, from the 2000 census. In 2000, Waialae-Kahala had 3,538 households with an average size of 2.65, and Kuliouou-Kalani Iki had 5,466 households with an

average size of 2.95. In comparison, the average household size for all of Oahu was 2.95 (DEBDT, 2006).

The project site falls within the Urban Community Boundary, which contains urbanization of areas in the East Honolulu district. East Honolulu demographics are not expected to change substantially before 2020, and therefore, there will be minimal urban land growth within the project area (C&C of Honolulu, 1999).

3. Socio-Economic Background

Based on the 2000 census data (C&C of Honolulu, 2002), the median household age was 44.7 for the Kuliouou–Kalani Iki neighborhood, with 34.3 percent of households with individuals below 18 years of age and 40.4 percent of households with individual 65 or older. Workforce and economic reports indicated that 92.8 percent of residents older than 25 had a high school education or better. The unemployment rate for the civilian workforce was 1.5 percent. In 1999, the median household income was \$94,300, and 1.9 percent of the families were below the poverty level.

The 2000 census data indicates that for the Waialae–Kahala neighborhood, the median age was 46, with 29.5 percent of households with individuals below 18 years of age and 43.1 percent of households with individuals 65 or older. Workforce and economic reports indicated that 95 percent of residents older than 25 had a high school education or better. The unemployment rate for the civilian workforce was 1.7 percent. In 1999, the median household income was \$83,159, and 1.4 percent of the families were below the poverty level.

Both neighborhoods are above average in most socio-economic aspects in comparison to Oahu's overall statistics. The 2000 census data indicates that for Oahu, the median age was 35.7, with 37.8 percent of households with individuals below 18 years of age and 28.1 percent of households with individuals 65 or older. The census data for Oahu indicated that 85 percent of residents older than 25 had a high school education or better. The unemployment rate for the civilian workforce was 3.7 percent. In 1999, the median household income was \$60,142, and 7 percent of the families were below the poverty level.

The east end of the project is located in a highly affluent area of Oahu. The Kahala coastline is lined with exclusive beach front mansions. Also in the area are the Kahala Hotel & Resort and Waialae Country Club that contribute to the exclusivity of the area.

4. Land Ownership

A significant portion of the sewer lines in the project are located on privately-owned land. A 10-foot wide sewer easement traverses through the various privately-owned parcels that are owned by individual small land owners, corporate entities, churches and

large land owners. The Kahala Hotel & Resort, Kahala Beach Apartments, Waialae Country Club golf course and a portion of the Waialae Country Club clubhouse are located on land owned by Bishop Estate/Kamehameha Schools. Sewer cleaning staging areas proposed to be located on privately-owned land will require obtaining temporary construction easements. One proposed staging area is located at the Waialae Country Club golf course, and another at Keahia Way, a privately-owned road.

A substantial portion of the sewer lines in the project are located on publicly-owned land. Affected publicly owned lands include highway and beach lands under State jurisdiction and park lands under City jurisdiction.

The Kalanianaole Highway right-of-way, within which much of the sewer is located, is under the jurisdiction of the State of Hawaii Department of Transportation. A Use and Occupancy Agreement is in the process of being prepared and executed for this project.

The 10-foot wide sewer easement extends into beach land that is under the jurisdiction of the State of Hawaii Department of Land and Natural Resources. Verification of permit exemptions is in the process of being requested.

The temporary use of a portion of Waialae Beach Park and Wailupe Beach Park land for staging of the sewer cleaning work is being coordinated with the City's Department of Parks and Recreation.

5. Land Use Designations

The project area is located in a district classified as "Urban" by the State Land Use Commission.

The City and County of Honolulu zoning information was previously presented on Figure 2-5. The majority of the affected parcels are within the "Residential District" zones (R-10 and R-7.5). The Kahala Hotel & Resort parcel is zoned "Resort District," the Kahala Beach Apartments parcel is zoned "A-2, Medium-Density Apartment District," and the Waialae Country Club golf course and City parks are in the "P-2, General Preservation District."

The Special Management Area (SMA) has been designated to control development along the shoreline. Within the project area, the SMA boundary is the centerline of Kalanianaole Highway. As indicated in Figure 2-5, all of the Segments 1 and 2 sewer line work is located within the Special Management Area. The Segment 3 work is outside the SMA since it is on the mauka side of the Kalanianaole Highway median.

CHAPTER 3

POTENTIAL IMPACTS AND PROPOSED MITIGATION MEASURES

A. INTRODUCTION

This chapter discusses the potential environmental impacts and proposed mitigation measures for the proposed project. No significant negative long term impacts associated with the project are anticipated. Environmental impacts will be limited to short-term disruptions associated with construction activities. The project will have the beneficial effects of restoring deteriorated sewer infrastructure and reducing the potential for sewage spills caused by existing capacity limitations.

B. LAND ALTERATION AND AESTHETICS

Since the project involves rehabilitation of existing underground sewer lines, there will be no significant land alteration or adverse long-term visual impacts associated with the project. Short-term impacts associated with land alteration and aesthetics, however, will result from construction activities. Construction inspection and monitoring services will help ensure that the contractor performing the work adheres to applicable construction activity and environmental regulations to minimize short and long-term impacts.

Mitigative actions will be taken to minimize the adverse impacts to the aesthetics of the work areas. The contractor will be required to keep streets, sidewalks, driveways, public and private properties, baseyards, and staging areas clear of debris generated by the project. Staging areas for the sewer cleaning work will be fenced off as required to ensure the safety of park and beach patrons. Turf damage at the Waiālae Country Club golf course and City parks will be minimized by laying special plastic mats on grassed areas along heavy equipment ingress and egress routes to staging areas.

Aesthetic impacts will cease upon completion of construction and the affected areas will be restored to their original condition to the extent possible. Work within sewer easements located in private property will be coordinated with property owners and tenants to minimize damage to landscaping and property improvements, and help ensure that restoration work is completed in a timely and satisfactory manner. The replacement of corroded manhole frames and covers with new corrosion resistant ones will provide a renewed look to improve manhole aesthetics.

C. FLOOD HAZARD

The Federal Insurance Rate Map (FIRM) indicates that portions of the project site are located in Zones A, AE and AEF. As described in Chapter 2, these zones are high risk flood 100-

year flood areas. Sewage spills are most likely to occur during periods of heavy rainfall due to infiltration and inflow of rainwater into the sewer system.

The project will not result in changes to the existing grades in the floodway. During construction, the contractor will be prohibited from erecting temporary structures and storage of fill, excavated material, or equipment within the floodway to ensure that the floodway is not blocked or changed. The construction contract documents will require the contractor to monitor weather conditions and prepare the work area to prevent flood damage, prevent sewage overflows, and maintain continuity of wastewater service. The contractor will be required to provide sewage bypass pumps adequately sized for high wet-weather sewage flows and an appropriate number of backup pumps.

D. FLORA AND FAUNA

No significant long term adverse impacts to flora and fauna at the project site or in the general area are anticipated to result from the proposed project. Much of the construction work will be performed within the Kalanianaole Highway right-of-way comprised of asphalt or concrete pavements and sidewalks, and in private property easements with varying degrees of landscaping and site improvements. Sewer cleaning work along the Kahala and Wailupe beachfront areas will be performed from the previously described staging areas. Limited access along the beach area will be required to access manholes for replacement of corroded manhole frames and covers.

As noted in Chapter 1, sewer lining work along Kalanianaole Highway will require nighttime work. During nighttime construction, the contractor will be required to shield and direct construction lights downward to minimize the potential of attracting seabirds and causing seabird collisions with surrounding buildings. Nighttime construction is not anticipated to be performed in the areas along the beach. In the event that nighttime construction is needed along the beach, construction lights will also be required to be shielded and positioned to minimize lighting on the beach and the potential impacts to any beach habitats.

The Segment 1 sewer cleaning work is located near the beach area and therefore has the most potential for adversely impacting the area's flora and fauna and nearshore water quality. Mitigation measures for to minimize impacts from stormwater runoff and accidental sewage spills are discussed in the next section on water quality.

In response to a request by the U.S. Fish and Wildlife Service (FWS), the contractor will be required to incorporate the FWS's "Recommended Standard Best Management Practices" into the contractor's own Best Management Practices Plan (see FWS correspondence in Appendix E). The recommended management practices focus on measures to curtail the release of silt and other pollutants into the marine and aquatic environment to minimize the degradation of water quality and adverse impacts on fish and wildlife resources.

Encountering monk seals and other endangered wildlife during the Segment 1 construction work is highly unlikely. If monk seals or any endangered wildlife is encountered, the contractor will be required to stop work and contact the appropriate authorities.

Existing trees within the work areas are not anticipated to be adversely impacted by the proposed project. If any significant damage to trees occurs, the contractor will be required to retain a qualified arborist to assess the situation. Prior to beginning construction at the two City parks, the work area perimeter will be reviewed by the City's Department of Parks and Recreation, Division of Urban Forestry. Tree damage mitigation measures that may be implemented include tree protection fencing, tree protection warning signs, mulch layer around the tree trunk, and placement of plywood boards or steel plates over an eight inch mulch layer under the tree's drip line. The contractor will be required to protect the trees and roots from damage, compaction and erosion. Any trees damaged by the construction will be removed and replaced by the contractor. During construction, the contractor will be required to water the trees and grass within the work areas, staging areas and areas that require temporary disruption to the irrigation system due to construction.

Upon completion of the project, there will be some beneficial impacts to marine life in the nearby streams and Maunalua Bay due to the reduction of the frequency and magnitude of sewage spills.

E. SURFACE WATER QUALITY

With any project involving cleaning and rehabilitation of sewers, there is some potential for accidental sewage spills due to major equipment failure or human error despite utilizing backup systems and implementing spill prevention mitigation measures. The beach area is a particularly sensitive area because the public could be in direct contact with any spills. To minimize potential adverse surface water quality impacts, the contractor will be required to develop a Spill Mitigation Plan prior to commencing work and follow standard State Department of Health spill response and reporting procedures. At the park and beach staging areas, the contractor will be required to place sewage handling equipment in a bermed spill containment area with an impermeable liner.

Construction activities may increase the potential for erosion slightly in active work areas and increase the silt in stormwater runoff to streams and Maunalua Bay. Materials that may be present in runoff as a result of the construction work include silt from soil erosion in disturbed areas, soil from excavation and material stockpiles, particles from asphalt concrete pavement materials, and fuel and oil from construction equipment.

The contractor will be required to develop and implement a Best Management Practices (BMP) plan to minimize adverse water quality impacts from runoff. The contractor will be required to employ erosion control measures and keep the construction site as clean as possible to minimize contaminants in storm water runoff.

The contractor will be required to minimize silt-laden runoff from active work areas, construction access roads, and material stockpiles. Silt fences and sediment trapping drain inlet filters will be used to minimize the entry of contaminants through storm drain inlets. The pollution control measures will be required to be monitored and maintained by the contractor on a routine basis and immediately (within 24 hours) after each significant rain event (one-half inch or greater rainfall within a 24-hour period).

Provisions will be included in the contract plans and specifications that will limit the volume of soil that the contractor is allowed to stockpile at the construction site. This will minimize the risk of having significant amounts of soil washing into the storm drainage system and nearshore waters during a major storm.

Construction will be phased and scheduled to limit the extent and time that bare ground is exposed to minimize erosion from rainfall and storm water runoff. The contractor will be required to curtail work and take action as necessary to protect the work site and stored materials from storm damage and erosion.

Construction vehicles will be fueled offsite or in a designated area with appropriate spill containment features.

Water used in CIPP curing will be discharged into the existing sewer system and will not enter the drainage system. With the CIPP process, excavation will be minimal and no dewatering work is expected to be required.

City construction inspectors will monitor the operations of the contractor on a full-time basis. The State Department of Health will be responsible for citing the contractor for any illicit discharges and water quality violations.

With regards to long-term water quality impacts, the proposed project will not increase the volume of peak storm water runoff or increase the amount of contaminants in the runoff. Any pavements and groundcover disturbed during construction will be restored.

Implementation of the project will benefit water quality in the streams and Maunalua Bay since the project should resolve sewage overflow problems that result from clogging of sewer lines, inadequate line capacity, and excessively high wastewater flows caused by wet-weather infiltration/inflow.

F. GROUNDWATER QUALITY

As indicated in Chapter 2, the Segment 1 sewer lines are located makai of the UIC line and outside the drinking water aquifers. The Segment 2 and 3 sewer lines, which are located within Kalaniana'ole Highway, are essentially located along the UIC Line boundary.

The proposed rehabilitation project is not anticipated to have adverse impacts on groundwater quality. On the contrary, the project should improve groundwater quality in the service area. Sealing of cracks and other defects in the sewer will reduce exfiltration of wastewater into the soil that occurs when the pipelines are surcharged (flowing under pressure) during high flow conditions.

Since trenching will only be needed for the bypass lines and manhole cover replacement, excavations below the water table will not be required. Trench dewatering will not be required and therefore there should be no discharge of dewatering effluent to the storm drainage system. Throughout construction, the contractor will be required to prevent spillage of sewage within excavations and above ground to minimize potential groundwater contamination.

G. AIR QUALITY AND WASTEWATER ODORS

The use of construction equipment at the project site will create dust and exhaust emissions. The contractor will be required to comply with the provisions of Hawaii Administrative Rules (HAR), Chapter 11-60.1, "Air Pollution Control," which includes the requirements of Section 1-33 on fugitive dust. The air quality impacts during construction will be temporary in nature and will cease upon completion of the construction. The project will be implemented in appropriate incremental phases to minimize the extent of dust generating materials and activities.

In general, the excavation work for the bypass lines and manhole cover replacement is not expected to generate a significant amount of fugitive dust. The contractor will be required to control the generation of dust by adequately watering down the construction site and soil stockpiles, keeping the construction site and access roadways reasonably free of dust-causing materials, covering trucks hauling materials, and implementing other appropriate dust control practices.

The contractor will be required to control exhaust emissions by maintaining construction equipment (including emission control devices) in proper working order and minimizing unnecessary idling of engines. The construction equipment emissions should not significantly change the quality of air in the project area due to prevailing winds and existing exhaust emissions generated from traffic in the area.

The sewer rehabilitation project is not anticipated to generate a significant amount of odors during construction. Some temporary short term odors will be generated during work at the sewer manholes from removal of manhole covers or the top portion of manholes for cleaning, flow bypassing, CIPP installation, and manhole rehabilitation and cover replacement work. The sewer manholes are generally located in open areas and prevailing winds in the area would normally disperse sewage odors emitted from the manholes, styrene-based odors from uncured resin of the CIPP lining, and odors from epoxy manhole lining materials. Sewer

cleaning wastes will be discharged to and dewatered in enclosed receptacles to minimize odor generation. The contractor will be required to bypass sewage using enclosed pumping and piping systems.

Prior to construction, the contractor will be required to develop an Odor Mitigation Plan to provide details on methods of mitigating odors. Typical mitigation measures include minimizing the time manholes are left uncovered and providing temporary plywood or other suitable covers to minimize release of sewer gases. The temporary covers may need to be custom fitted to accommodate pipes and hoses that may be required to be passed through the top of manholes for extended periods.

Due to odor concerns and the sensitive environment, manholes within the Kahala Hotel & Resort property will not be allowed to be opened at any time during the project, except due to unlikely unforeseen emergency situations. The sewer cleaning work may require that manholes at the pipe bends, such as those at the Kahala Beach Apartments, to be opened for short periods (typically not more than 30 minutes) to assist passage of sewer cleaning equipment around the bends.

Residents will be given advanced notice regarding the date and time the cleaning and CIPP lining work will be performed to allow residents who may be sensitive to odors to take appropriate action to cope with the odors. Possible options include leaving the premises, closing windows (and air conditioning supply air vents) and remaining indoors. Styrene based odors, which may be the most bothersome, will typically not last more than 12 to 24 hours in any one location.

H. NOISE

Construction activities will be required to meet Chapter 11-46, "Community Noise Control," of the Administrative Rules of the Department of Health. The noise level will increase during the construction period due to use of construction equipment. Typical sound levels from 50 feet away were estimated to range between 50 dBA to nearly 100 dBA. Equipment used at night for bypass pumping and CIPP pipe rehabilitation may produce noise levels in excess of 70 dBA at a 50-foot distance.

To allow for adequate curing time for the CIPP installation, and to increase productivity and shorten the construction time and thereby reducing overall impacts, certain activities will be required to be performed at night, and potentially up to 24 hours per day, including Sundays. These activities will include pumping for sewage flow bypassing and the installation of the CIPP lining. Other activities with high noise levels will be permitted only during daylight hours to minimize impacts to the residents.

CIPP operations will generally require extended nighttime working hours for the larger sized pipes (such as pipes 24-inch in diameter and larger). Once the CIPP liner is inserted, a

continuous supply of heated water or steam from an onsite boiler unit must be provided to cure and harden the inserted liner. During the CIPP cleaning, pre-inspection, lining installation, liner curing and post-inspection periods, sewage must generally be bypassed to allow the work to be performed and to prevent backup of sewage into homes or spillage from manholes. If necessary to meet allowable noise limits, the contractor will be required to provide acoustical attenuation enclosures for the generators and/or engine-driven bypass pumps, and locate them away from residences to the extent possible.

The contractor will be required to make every effort to minimize noise emanating from the project. The noise impact of construction equipment will be minimized by requiring properly functioning mufflers on machinery. Use of reverse signal alarms (truck back-up alarms) will be prohibited during night and early morning hours. Alternate methods such as utilizing a ground guide for signaling will be employed. Noise control requirements will be included in the contract specifications.

Noise from certain construction activities may not comply with DOH's "Community Noise Control". As a result, the contractor will be required to obtain a noise permit from DOH to allow the daytime noise level limits to be exceeded during the working hours of 7:00 a.m. to 6 p.m., Monday through Friday, and 9:00 a.m. to 6:00 p.m. on Saturday. A noise variance will be obtained for all other hours to allow night work for the required CIPP lining activities. Construction will move along the sewer alignment so construction activities and noise will not remain in one place for an extended amount of time. It is estimated that the lining work for each 300 to 700 foot segment will generally require one to two weeks to complete. Bypass pumping systems may potentially remain in one location for the lining of multiple segments.

Residents who may be impacted by the construction activity will be given advanced notice regarding the project to allow them to prepare for coping with noise emanating from the project. The notice will explain the need for the sewer work and the benefits of the proposed "trenchless" CIPP method of pipe rehabilitation as compared to conventional open trench pipeline reconstruction/replacement methods. The contractor will have a job-site contact person to whom immediate noise complaints can be forwarded for prompt response, and who will have the general responsibility of monitoring the effectiveness of noise mitigation measures.

I. ARCHAEOLOGICAL AND HISTORIC SITES

Excavation work for the proposed project will be limited to shallow excavations typically not more than two to four feet deep for installation of temporary sewage bypass lines (typically in paved areas requiring vehicle access) and for cover replacement work on the upper portion of manholes. Most of the temporary sewage bypass lines will be installed aboveground. Bypass lines may be buried in trenches up to approximately five feet deep within Kalaniana'ole Highway if the line is to be used for an extended period since shallow

temporary lines covered with steel plates are generally not permitted to be used for more than two weeks. The excavation work for the manholes will be limited to the immediate area around the manhole, typically extending not more than one to two feet beyond the manhole structure. No excavation will be required for the sewer cleaning operations.

Excavation work will generally be limited to previously disturbed areas that have been backfilled as part of the original construction work, highway widening projects, or other subsequent work. Since the excavation work will generally be in previously disturbed areas, it is anticipated that excavation in intact Jaucus sand, where the potential for archaeological finds is the highest, will be somewhat limited. The primary concern will be encountering archaeological finds intermixed with modern fill due to lack of archaeological oversight on earlier projects.

Although it is not anticipated that burials or artifacts of historical significance will be affected or uncovered, an archaeological monitoring program will be employed as a precautionary measure as recommended by Cultural Surveys Hawaii, Inc. (see Appendix B). The program will include a monitoring plan, on-site monitoring during all ground breaking activities and a monitoring report. The contractor will be made aware of potential encounters with artifacts or remains such as shells, bones or charcoal deposits. Should archeologically significant features be uncovered, the work will be halted in the immediate vicinity of the find and the find will be protected from further disturbances. Immediate archeological consultation will be sought with the State of Hawaii Historic Preservation Division (SHPD) in accordance with applicable regulations and mitigation measures recommended by SHPD will be implemented as required.

J. CULTURAL RESOURCES IMPACTS

The proposed project has no identifiable adverse impacts on Hawaiian culture and traditional and customary rights. Due to the location and nature of the proposed work, the project does not lend itself to significant or direct promotion or protection of cultural beliefs, practices and resources of native Hawaiians or any other ethnic group. No significant cultural resources or potential adverse impacts to cultural practices related to the site or proposed project were identified by organizations and individuals that were contacted.

The work near the shoreline or in other areas will not temporarily or permanently hinder access to the ocean for gathering limu, fishing or other cultural activities. Every effort will be made to minimize the potential for accidental sewage spills during execution of the work. Long term cultural benefits will include reduction of sewage spills and improvement of nearshore water quality, which in turn will benefit cultural activities such as limu gathering and fishing.

K. HAZARDOUS SUBSTANCES

Based on the past use of the project area for agriculture and pasture and the existing residential and commercial land uses, remediation work for hazardous materials is not anticipated to be required at the project site. During construction, the contractor will be required to perform hazardous materials screening tests on soil hauled offsite for disposal. Also during construction, the contractor and City inspectors will visually monitor the trench excavation for signs of possible contamination such as oil sheens or odors. If soil contamination is suspected, the excavated materials and any ponded water will be immediately tested to determine if hazardous pollutants are present. Appropriate remedial action will be taken to meet applicable regulatory requirements and modification of the design and/or construction methods will be implemented as required. If in the event that hazardous materials exists in the soil, these materials will not likely enter the storm drainage system because trench dewatering and dewatering effluent disposal is not expected to be required.

L. TRANSPORTATION IMPACTS

Traffic on roadways near the construction work will be temporarily disrupted during the project. Some increases in traffic congestion on Kalanianaole Highway and connecting side streets will result from construction work on or near the heavily traveled thoroughfare. General mitigation measures to minimize short term traffic impacts include limiting lane closures to non-peak hours and conducting work at night. In addition to imposing less traffic impacts, night work will have the beneficial effect of shortening the overall duration of the project. There will be no significant increase in long-term traffic since the project only involves existing underground sewer lines.

The following discussions summarize the short-term construction impacts and proposed mitigation measures.

Lane Closures

The sewer line and manhole rehabilitation work will require lane closures on Kalanianaole Highway due to the location of the sewer lines within the active highway lanes. Only one lane along the highway will be required to be closed at a time during non-peak hours. Sewer line cleaning, sewer inspections, manhole rehabilitation work, temporary bypass line installation, and some of the CIPP lining installation work are proposed to be performed during the non-peak traffic hours of 9:00 a.m. to 3:00 p.m., Monday through Friday. Open trenches for temporary bypass lines and other open excavations will be covered as required with steel plates during non-working hours.

Much of CIPP lining installation work is expected to be conducted at night on weekdays and weekends due to the limited hours the contractor is allowed to work on Kalanianaole Highway during the day. The CIPP rehabilitation work requires that installation and curing

of the liner be completed with adequate time and without interruption to help avoid workmanship problems and to ensure proper curing of the liner.

A traffic assessment study prepared by Austin, Tsutsumi & Associates (2009) to determine appropriate nighttime lane closure hours is presented in Appendix D. The following tables indicate the proposed night lane closure hours based on the findings of the traffic analysis and adjustments requested by the State Department of Transportation following their review of the report.

Kalanianaole Highway Eastbound Lane Closure Schedule (Night Work)

	Start	End
Sunday – Monday	7:00 p.m.	4:30 a.m.
Monday – Tuesday	8:00 p.m.	4:30 a.m.
Tuesday – Wednesday	9:00 p.m.	4:30 a.m.
Wednesday – Thursday	9:00 p.m.	4:30 a.m.
Thursday - Friday	9:30 p.m.	4:30 a.m.
Friday – Saturday	10:00 p.m.	8:00 a.m.
Saturday – Sunday	7:30 p.m.	9:00 a.m.

Kalanianaole Highway Westbound Lane Closure Schedule (Night Work)

	Start	End
Sunday – Monday	6:30 p.m.	4:30 a.m.
Monday – Tuesday	6:00 p.m.	4:30 a.m.
Tuesday – Wednesday	6:00 p.m.	4:30 a.m.
Wednesday – Thursday	6:30 p.m.	4:30 a.m.
Thursday - Friday	6:30 p.m.	4:30 a.m.
Friday – Saturday	7:00 p.m.	7:00 a.m.
Saturday – Sunday	7:00 p.m.	8:30 a.m.

The above nighttime work hours are subject to revision based on input received from the State Department of Transportation and actual level of traffic congestion experienced.

Construction will be prohibited between the contra-flow lane hours of 5:30 a.m. and 9:00 a.m., Monday through Friday, due to the need to maintain two eastbound lanes at all times.

Construction work will not be permitted during the “Back to School Jam”, Thanksgiving weekend, and Christmas/New Year period.

Traffic Control

The contractor will be required to comply with safety precautions and measures as prescribed in the “Administrative Rules of Hawaii Governing the Use of Traffic Control Devices at Work Sites on or Adjacent to Public Streets and Highways,” as adopted by the State Director of Transportation, and Part VI, “Standards and Guides for Traffic Controls for Street and Highway Construction, Maintenance, Utility and Incident Management Operations,” of the “Manual of Uniform Traffic Control Devices for Streets and Highways,” as published by the Federal Highway Administration.

The contractor will be required to comply with traffic control plans approved by the State Department of Transportation. Construction will be phased and the contractor will generally be required to limit the work area to one where the work within the area can be completed during the day. Traffic control plans will cover each phase of work. Special-duty police officers will be employed as required to facilitate traffic flow, minimize traffic hazards and promote pedestrian safety. Monitoring will be performed to verify compliance with conditions imposed by permits issued for the construction work in the streets and highway. Existing traffic control devices, which may be damaged or removed during construction, will be required to be replaced immediately after the construction in the area is completed.

Affected Residents

Area residents and businesses will be kept well informed of the project prior to and during the construction work. Information will be published in major daily newspapers and on a project website to inform affected residents and commuters of upcoming lane closures. Electronic roadside message boards will also be used to notify motorists of lane closures. A telephone hotline number to reach a person knowledgeable about the project will be made available 24-hours per day during the construction period to receive questions and complaints on traffic, noise, and other project concerns. Residents and businesses within and near the project area will be informed about the project and the availability of the project website and hotline by direct mailings. Press releases may also be issued periodically.

The contractor will be required to minimize inconvenience to the property owners. Residents in the immediate work area may be inconvenienced by restrictions to driveway access and roadway frontage usage. Vehicular and pedestrian access to and from the private properties will be provided at all times, or the contractor will provide other suitable temporary accommodations. The contractor and the City will coordinate any temporary closure of private driveways with the affected property owners prior to the closure. Where necessary, parking may be temporarily restricted on both sides of streets.

Other Services

The contractor will be required to make provisions for emergency access and will be required to provide full access during non-working hours. Emergency services (fire, ambulance and police) will be notified prior to implementation of any required detours or street closures. The Honolulu Police Department may see an increase in complaints and calls related to traffic and other project related concerns.

The contractor will be required to notify Oahu Transit Services, Inc. a minimum of two weeks prior to construction of the location, scope of work, proposed closure of any streets or traffic lanes, and the need to relocate any bus stops. The contractor will be required to coordinate the location of the temporary relocated bus stops with Oahu Transit Services, Inc. Bus routes on Kalanianaole Highway potentially affected by increased traffic from the project are as follows:

On Kalanianaole Highway:

- Route 1/1L (Kalihi/Aala Park to Hawaii Kai/Kahala Mall/Kalihi Transit Center)
- Route 22 (Waikiki to Hawaii Kai-Sea Life Park/Hanauma Bay)
- Route 23 (Waikiki-Ala Moana to Hawaii Kai-Sea Life Park/Hawaii Kai-Kalama Valley)
- Route 24 (Aina Haina – Ala Moana)
- Route 80/80A/80B (Downtown/University of Hawaii to Hawaii Kai/Downtown)
- Route 82 (Downtown to Hawaii Kai)
- Route 95 (Downtown/Pearl Harbor to Hawaii Kai)
- Route 231 (Hahaione Valley – Koko Marina).

M. USE OF ENERGY

There will be short-term consumption of energy associated with the production and shipment of construction materials and the use of power and fuel to operate sewer cleaning and construction/rehabilitation equipment.

The sewer lines involved in the project area operates by gravity flow and requires no power for operation. The Niu Valley, Kahala and Ala Moana wastewater pump stations, however, are used to convey sewage collected in the East Honolulu service area to the Sand Island Wastewater Treatment Plant (WWTP). Rehabilitation of the lines is expected to reduce dry-weather infiltration of groundwater into the sewer system by approximately one million

gallons per day, or over 20 percent of the average daily flow from the service area. To illustrate the magnitude of the flow reduction, it may be noted that one million gallons is approximately equivalent to the total volume of 66 residential swimming pools, assuming a typical pool volume of 15,000 gallons. The reduction in infiltration will reduce the amount of energy required for pumping of sewage to the Sand Island WWTP.

N. USE OF POTABLE WATER

During rehabilitation of the sewer line, water will be used for dust control, concrete mixing, and other typical construction uses. The sewer lines in Segment 1 will be cleaned with high capacity jetting equipment that will likely use wastewater from the sewer to flush the sewer lines. The sewer lines in Segment 3 and probably Segment 2 will be cleaned with conventional cleaning equipment, which will use potable water from fire hydrants. CIPP lining work for Segments 2 and 3 may also use potable water from fire hydrants to install and cure the CIPP liner. The water used for cleaning and CIPP operations will be discharged into the sewer line.

Water will be provided by temporary water meters installed on fire hydrants and the contractor will be required to reimburse the Honolulu Board of Water supply for the water used. An approved backflow preventer will be installed at the water meter to prevent backflow of contaminated water into the water system in the event that pressure in the water system is lost. The City's Fire Communication Center (Ph. 523-4411) will be required to be notified regarding any interruption of the existing fire hydrant system.

O. USE OF RECLAIMED MATERIALS AND DISPOSAL OF CONSTRUCTION MATERIALS

In accordance with HRS Section 103D-407, recycled glass may be used for non-structural backfill material when available at a cost equal to or lower than the equivalent aggregate material. If feasible, excavated soil will be reused as backfill. Excavated soil not suitable for reuse as backfill will be removed from the site and hauled to a suitable reuse or disposal site. Existing asphalt concrete pavement removed from the roads will be recycled to the extent practicable.

P. UTILITIES, ROADS AND OTHER INFRASTRUCTURE

The construction work will take place within existing roadways containing various underground utility lines. Construction plans will be submitted to the utility companies and City and State agencies for review and approval and the work will be scheduled and coordinated to the extent possible to minimize impacts to other utilities. Existing utility lines will be located by toning, potholing or hand excavation as required to minimize the risk of damaging the lines. Residents will be given advance notice of any utility outages for such work as relocation of water and other utility lines.

With the use of the CIPP pipe rehabilitation method, the amount of trenching work is greatly reduced as excavation will primarily be required for burial of short sections of the sewage bypass lines. As a result, the potential for impacting existing utilities is significantly reduced. Where possible, the bypass line will be installed above ground to eliminate trenching impacts.

During the CIPP lining work, the contractor will be required to maintain satisfactory sewer service to all sewer customers, including homes connected to the line being rehabilitated. The contractor will be required to coordinate his work with the homeowner if temporary short-term disruption is to be allowed due to mutual agreement between the contractor and homeowner.

All existing street improvements (i.e., pavement, curbs and gutters, sidewalks and driveways, traffic control devices, etc.), utilities, and other public and private property improvements will be restored to their original or better condition following completion of the sewer system rehabilitation work.

The Kalanianaole Highway is a State-owned road and all restorations of the road will follow State guidelines. Proper compaction of the backfill material in utility trenches is necessary to minimize the probability of future pavement problems. This will be achieved through a comprehensive trench backfill inspection and testing program during construction.

Q. SCENIC AND RECREATIONAL RESOURCES

The project involves cleaning and rehabilitation of underground sewer systems so there will be no permanent impacts to view planes or scenic vistas. Sewer cleaning, CIPP lining and manhole rehabilitation equipment may temporarily obstruct portions of the view plane.

The staging areas for sewer cleaning and some of the manhole cover replacement work are located in public parks, a golf course and near the shoreline. During rehabilitation of these manholes, beach goers and users of the recreational facilities may experience temporary visual, noise and odor impacts discussed previously. There will be no blockage of beach access routes.

Set up and break down of the staging areas at Waialae and Wailupe Beach Parks could lead to damage to road pavements, concrete curbs, concrete walkway and landscaping. Shrubs in the staging area may be removed to allow room for the sewer cleaning equipment. All damage inflicted by the contractor will be repaired. The staging area for the sewer cleaning equipment will be fenced off to safeguard the public. Several parking stalls at the Waialae Beach Park will be taken out of service to accommodate the proposed staging area. All impacts will be temporary and impacts associated with the sewer cleaning staging areas are not expected to last more than several weeks. Work on replacement of manhole covers are expected to require several days to a week to complete per manhole.

Sewer cleaning and manhole work at the Waialae Country Club golf course may be expected to be a distraction and nuisance to some golfers. Ingress and egress of sewer cleaning equipment, including roll-off debris collection bins, through the golf course will be required. The contractor will be required to coordinate the construction work in the golf course area with golf course personnel to avoid interfering with any golf tournaments.

There will no long term adverse impacts on scenic and recreational resources. The project will reduce the risk of sewage spills, reduce the need for beach closures due to sewage spills, and improve nearshore water quality.

R. SOCIO-ECONOMIC IMPACTS

The project will not directly increase sewer fees for the impacted area. Any sewer fee increases will be assessed to all sewer users based on island-wide sewer maintenance and capital improvement costs.

Portions of the project site are located near or within residential and resort areas and the contractor's work will be in very close proximity to residences and vacation properties. One staging area for sewer cleaning will be within the Waialae Country Club golf course and others will be near beach areas that may be used by tourists. The short-term nature of the work and the implementation of measures to reduce impacts are expected to minimize negative reactions by visitors and any visitor industry economic impacts. The use of high capacity cleaning equipment, in particular, minimizes the number of staging areas required and the duration of the sewer cleaning operations. The long reach of the cleaning equipment allows the work to be performed without any staging areas within the Kahala Hotel & Resort property.

The estimated cost of the Kalanianaole Highway Sewer Systems Improvement project is approximately \$10 million. The project may potentially be funded by the American Recovery and Reinvestment Act of 2009 (ARRA) program, which is essentially equivalent to a Federal grant that will allow use of available City sewer funds for other projects.

The project will provide employment for contractors and their employees, material suppliers and others associated with the construction industry. The increased employment, however, will be temporary and will generally not directly benefit residents in the East Honolulu community. Although not part of the project, a cleaning program for the sewer system is proposed as part of a long term sewer maintenance plan. The cleaning program will provide continued long-term employment opportunities for wastewater maintenance personnel.

This project will benefit the residents of the service area by minimizing the probability of future public health hazards and sewer service disruptions caused by sewage spills. The City and County of Honolulu will benefit by reducing the expenditure of manpower for clean up and reporting/administrative tasks associated with wastewater spills. The City will further

benefit by the reduction of risk of legal actions and fines associated with the Clean Water Act. The tourist industry will benefit by potentially avoiding negative publicity associated with sewage spills and beach closures.

Some homeowners may be required by the City to repair their sewer lateral pipes within their property at their own cost if during construction, the lines are found to be defective and leaking excessive amounts of groundwater and storm runoff into the City's sewer system. Repair of the privately-owned sewer lateral lines may be a financial hardship for homeowners. The repairs, however, will have the benefits of reducing sewer overloading, risk of sewage spills, and capital and operation and maintenance costs associated with downstream wastewater facilities.

The proposed project is not intended to increase the wastewater capacity for development and population growth in the area, but rather to accommodate current dry- and wet-weather flows. Although the project increases sewer capacity, the intent is to rectify past capacity deficiencies and to provide a greater factor of safety against sewer overloading. Most of the service area is fully developed and no population increase due to the project is anticipated. If land is rezoned for higher density use in the future, additional capacity upgrades to the system will be required.

S. ENVIRONMENTAL JUSTICE

In 1994, Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations," was issued. The environmental justice program is designed to help ensure that for government programs and activities affecting human health or the environment, all members of the community, including minority and low-income members, are: 1) provided the opportunity to comment before decisions are rendered on, 2) allowed to share the benefits, and 3) not affected in a disproportionately high and adverse manner. The Waiālae–Kahala and Kuliouou–Kalani Iki neighborhoods in which the project is located are both well above average in socio-economic aspects.

The following points address the environmental justice issues with respect to the proposed project:

- Extensive effort was made to solicit input from members of the community through mailed information and a presentation at the Aina Haina Elementary school (See Chapter 6 and Appendix E). This draft environmental assessment will also be distributed to a wide range of community members for review and comments.
- The project is not located near minority or low-income residential areas within East Honolulu. Adverse impacts on minority and low-income members, as well as the rest of the community members and the environment, are not significant.

T. RELATIONSHIP TO LAND USE POLICIES AND CONTROLS

1. State Land Use District

The State Land Use Law, Chapter 205, Hawaii Revised Statutes (HRS), is intended to preserve, protect and encourage the development of lands in the State for uses which are best suited to the public health and welfare for Hawaii's people. The project site is located within the State "Urban" district and the proposed project is consistent with this designation.

2. Hawaii State Plan

The Hawaii State Plan, HRS Chapter 226 adopted in 1978, outlines broad goals, policies and objectives to serve as guidelines for the future growth and development of the State. The proposed project is consistent with the objective of "maintenance and pursuit of improved quality in Hawaii's land, air, and water resources" (§226-13[a][2]). It is also consistent with the policy of the State to "promote the proper management of Hawaii's land and water resources," (§226-13 [b][2]) and "promote effective measures to achieve desired quality in Hawaii's surface, ground, and coastal waters" (§226-13 [b][3]). The project will decrease the risk of sewage spills and thereby improve stream and coastal water quality. The project will meet the needs of the East Honolulu community and does not conflict with the State Plan with respect to the well being of the residents and protection of the environmental and cultural resources.

3. City and County of Honolulu General Plan

The General Plan of the City and County of Honolulu sets forth broad statements of social, economic, environmental, and design objectives and policies which are desired over the long-term. The proposed project is consistent with the following policies and objectives of the General Plan:

III. Natural Environment

Objective A To protect and preserve the natural environment.

Policy 7 Protect the natural environment from damaging levels of air, water, and noise pollution.

V. Transportation and Utilities

Objective B To meet the needs of the people of Oahu for an adequate supply of water and for environmentally sound systems of waste disposal.

Policy 5 Provide safe, efficient, and environmentally sensitive waste-collection and waste disposal services.

Objective C	To maintain a high level of service for all utilities.
Policy 1	Maintain existing utility systems in order to avoid major breakdowns.
Policy 2	Provide improvements to utilities in existing neighborhoods to reduce substandard conditions.

The project will result in much needed rehabilitation and capacity restoration of the sewer lines in the Kalanianaole Highway sewer system to decrease the risk of sewage spills and water pollution.

4. East Honolulu Sustainable Communities Plan

The project site is located in East Honolulu which spans from Kahala to Makapuu Point, the easternmost point of Oahu. The East Honolulu Sustainable Communities Plan helps to implement the objectives and policies of the General Plan by providing relatively detailed development schemes for the communities in East Honolulu. The proposed project does not conflict with the East Honolulu Sustainable Communities Plan's policies and guidelines.

According to the Plan, wastewater in the area was not expected to increase by more than three percent between 1995 and 2000. Wastewater lines in the project area direct flow to the Sand Island Wastewater Treatment Plant (WWTP). The project is consistent with the Plan because it will not cause a need for an increase in the capacity of the Sand Island WWTP. The project will instead decrease the overall wastewater flow in the area by reducing infiltration. The project also supports the East Honolulu Sustainable Communities Plan vision of keeping East Honolulu mainly residential with limited population growth because the project is designed to restore the original design capacity rather than increasing the capacity for development.

The project is also consistent with the East Malama Bay Final Wastewater Facilities Plan, which was mentioned in the East Honolulu Sustainable Communities Plan, as it reduces flow through rehabilitation projects. With the proposed rehabilitation work, sewer lines will experience less infiltration and decrease wastewater flow to the Sand Island WWTP.

5. East Honolulu Public Infrastructure Map

The proposed project will not require the addition of a symbol for a publicly funded facility to the Public Infrastructure Map since underground sewer lines are not a type of public infrastructure that is required to be shown on the map.

6. City and County of Honolulu Special Management Area

Special Management Areas (SMAs) were defined in 1977 by the Hawaii Coastal Zone Management Law (Chapter 205A, Hawaii Revised Statutes). SMAs and its policies and guidelines were established as a way for the state to manage and regulate developments in coastal areas. Each county in the State was mandated to establish land near the shoreline as Special Management Areas (SMA). For the City and County of Honolulu, Special Management Areas are established in Chapter 25 of the Revised Ordinances of Honolulu (ROH). Developments within Special Management Areas require an SMA permit.

As indicated in Chapter 2, the SMA boundary in the project area is located along the median of Kalanianaole Highway. All land makai of the highway (including the eastbound lanes of the highway) are in the SMA. All of the Segments 1 and 2 sewers are located in the SMA while Segment 3 is just outside the SMA boundary.

According to Chapter 25 of the Revised Ordinances of Honolulu (ROH), the “repair and maintenance of underground utility lines” (in this case sewer) is not considered a “development” and therefore does not require a SMA permit. This has been confirmed by a pre-assessment consultation response from the Department of Planning and Permitting (See Chapter 6 and Appendix E).

U. FEDERAL “CROSS-CUTTER” REGULATORY REQUIREMENTS

A portion of the funds for the proposed action may potentially be obtained from the State Revolving Fund (SRF) and American Recovery and Reinvestment Act of 2009 (ARRA) programs. The SRF and ARRA programs require that impacts relative to the following Federal "cross-cutting" authorities be addressed:

- Archeological and Historic Preservation Act, Pub. L. 93-291, as amended
- Clean Air Act, Pub. L. 95-95, as amended
- Clean Water Act, Titles III, IV and V, Pub. L. 92-500, as amended
- Coastal Barrier Resources Act, Pub. L. 97-348
- Coastal Zone Management Act, Pub. L. 92-583, as amended
- Endangered Species Act, Pub. L. 93-205, as amended
- Environmental Justice, Executive Order 12898
- Flood Plain Management, Executive Order 11988 as amended by Executive Order 12148

- Protection of Wetlands, Executive Order 11990 as amended by Executive Order 12608
- Farmland Protection Policy Act, Pub. L. 97-98
- Fish and Wildlife Coordination Act, Pub. L. 85-624, as amended
- Magnuson-Stevens Fishery Conservation and Management Act, Pub. L. 94-265
- National Historic Preservation Act, Pub. L. 89-655, as amended
- Safe Drinking Water Act, Pub. L. 93-523, as amended
- Wild and Scenic Rivers Act, Pub. L. 90-54

The proposed action is not anticipated to have any significant impacts associated with the above Federal cross-cutting authorities. The Federal requirements are generally administered locally through various government agencies. The evaluation of potential impacts of the proposed action with respect to applicable regulations and policies were addressed in the discussions presented in this chapter and other chapters of this document. Comments on the proposed action are solicited from the various agencies administering the regulations during the course of the Chapter, 343 Hawaii Revised Statutes and Title 11, Chapter 200 Hawaii Administrative Rules environmental review process.

CHAPTER 4

ALTERNATIVES CONSIDERED

A. INTRODUCTION

This chapter presents various alternatives that were considered for the proposed Kalanianaʻole Highway Sewer System Improvements project. The alternatives considered and the basis for selecting the best alternative are discussed for the following areas of evaluation:

- No action alternative
- Hydraulic capacity upgrade alternatives
- Sewer line rehabilitation alternatives

B. NO ACTION ALTERNATIVE

A substantial number of sewage spills have occurred in East Honolulu due to problems with the sewer lines in the proposed project. The “no action” alternative was not considered to be a viable option due to the high risk of sewage spills resulting from inadequate capacity to convey existing peak wastewater flows and the poor structural condition of the existing sewer lines. The sewage spills are a hazard to public health and the environment. Sewage backups into homes are a significant hardship on the affected residents. The need for the proposed improvements was previously discussed in detail in Chapter 1.

C. CAPACITY UPGRADE ALTERNATIVES

Some of the key factors that were considered in developing and evaluating the capacity upgrade alternatives included the following:

- Capital costs, operation and maintenance costs, and overall lifecycle costs.
- Reliability and performance in conveying dry and wet weather flows and eliminating sewage spills and backups.
- Ease of operation and maintenance, including difficulties in performing cleaning and maintenance work in easements on private property (i.e., eliminating or reducing the need to access the sewer line along the shoreline by diversion of flow from Segment 1).
- Ease of implementation and impacts during construction, which included consideration of construction occurring along the heavily used Kalanianaʻole Highway.

- Long term environmental and social impacts, including but not limited to noise, odors, and energy usage.

The capacity upgrade alternatives that were developed and evaluated are as follows:

- Alternative 1 - Kahala Wastewater Pump Station Capacity Upgrade
- Alternative 2 - Sewer Cleaning
- Alternative 3 - Wailupe Stream Inverted Siphon Flow Split Modification
- Alternative 4 - Infiltration/Inflow Reduction
- Alternative 5 - Trunk Sewer Realignment Upstream of Inverted Siphon
- Alternative 6 - Relief Sewer from Wailupe Stream to Wailupe Beach Park
- Alternative 7 - Relief Sewer from West Hind Drive to Waialae Country Club
- Alternative 8 - Niu Valley Wastewater Pump Station Force Main Extension and Relief Sewer
- Alternative 9 - Wailupe Wastewater Pump Station and Force Main to Waialae Country Club
- Alternative 10 - West Hind Drive Wastewater Pump Station and Force Main to Sewer Tunnel

Each alternative is described in the following sections. A comparative evaluation on the alternatives based on estimated costs and other non-monetary factors is then presented. It should be noted that all the alternatives are not mutually exclusive and some of the alternatives may help reduce the risk of sewage spills but may not alone fully resolve the capacity problems or provide an adequate factor of safety.

For all the alternatives, it was assumed that the entire length of Segment 2 would be rehabilitated with a CIPP liner. The alternatives focus primarily on only Segments 1 and 2 since Segment 3 does not have a capacity problem other than exhibiting excessive infiltration due to structural defects.

1. Alternative 1 - Kahala Wastewater Pump Station Capacity Upgrade

The Kahala Wastewater Pump Station (WWPS) is currently experiencing a capacity problem as the station is not able to meet its design pumping capacity of 18 million gallons per day (mgd). This alternative assumes that an existing low capacity pump will be replaced with a higher capacity pump to meet the 18 mgd design capacity. Additional

investigations and a detailed analysis will be performed to further analyze the capacity problems at the Kahala WWPS.

2. Alternative 2 - Sewer Cleaning

Alternative 2 involves providing a thorough initial cleaning of the sewer lines to remove existing sediments, grease and other debris, and then keeping the lines relatively free of excess sediments by performing less intensive preventative maintenance cleaning on a regular basis, such as on a five-year cycle. This alternative would restore much of the original capacity of the main trunk sewer lines that have been lost due to inadequate cleaning of the lines.

3. Alternative 3 - Wailupe Stream Inverted Siphon Flow Split Modification

As previously discussed in Chapter 1, all three pipes of the inverted siphon (depressed sewer) under Wailupe Stream are set at the same upstream elevation and are currently used to simultaneously convey flow. This simultaneous operation of all three pipes results in low velocities allowing grit and sediments to accumulate in the inverted siphon lines. Alternative 3 involves modifications at the inverted siphon manholes to adjust the flow split among the pipes to increase the velocity of the flow in one or two of the primary pipes to minimize sediment accumulation. The remaining unused pipe(s) would be kept clean and be used only at higher flows (higher upstream manhole water levels). Periodic flushing once every two years is proposed as part of this alternative.

4. Alternative 4 - Infiltration/Inflow Reduction

Reduction of peak wastewater flow by reducing excessive infiltration and inflow of groundwater and stormwater runoff into the sewer through pipe defects is proposed under this alternative. This alternative involves repairing cracks, holes and other defects with CIPP lining or other methods. The defects would typically be identified by television camera inspection of the sewer lines. This alternative would also involve identifying and removing illicit household drain connections, such as those from roof gutters and outdoor drains. Infiltration and inflow reduction would also include rehabilitation of sewer manholes to reduce leakage through the manhole cover, walls and base.

5. Alternative 5 - Trunk Sewer Realignment Upstream of Inverted Siphon

Sewage spills and backups have occurred in the low-lying Segment 2 area upstream of the Wailupe Stream inverted siphon. Alternative 5 proposes to eliminate the section of the sewer alignment that veers off Kalanianaole Highway by constructing a new sewer segment along Kalanianaole Highway. This would allow the flow to bypass the low-lying area. The homes in the low lying area, however, would need to be provided with a low-pressure pumping system to convey the sewage to the new sewer line due to the higher operating water level at high flows. A low-pressure sewer system is comprised of small pump stations located in individual lots that discharge to small diameter force

mains (pressure lines) typically ranging in size from 1-1/4 to 4 inches. The small force mains can be installed underground along common areas such as along the existing private driveways.

Alternative 5 is illustrated in Figure 4-1. The main disadvantage of this alternative is the need to maintain a large number of individual pump stations.

6. Alternative 6 - Relief Sewer from Wailupe Stream to Wailupe Beach Park

Relief sewers are new additional sewer lines that generally run parallel to the existing line to provide additional capacity. Alternative 6 proposes 3,400 feet of relief sewer to be constructed from the downstream manhole of the inverted siphon to Wailupe Beach Park. This is intended to decrease the water level in manholes downstream of the inverted siphon to reduce the risk of spills on the upstream side. The proposed layout of this alternative is shown in Figure 4-2.

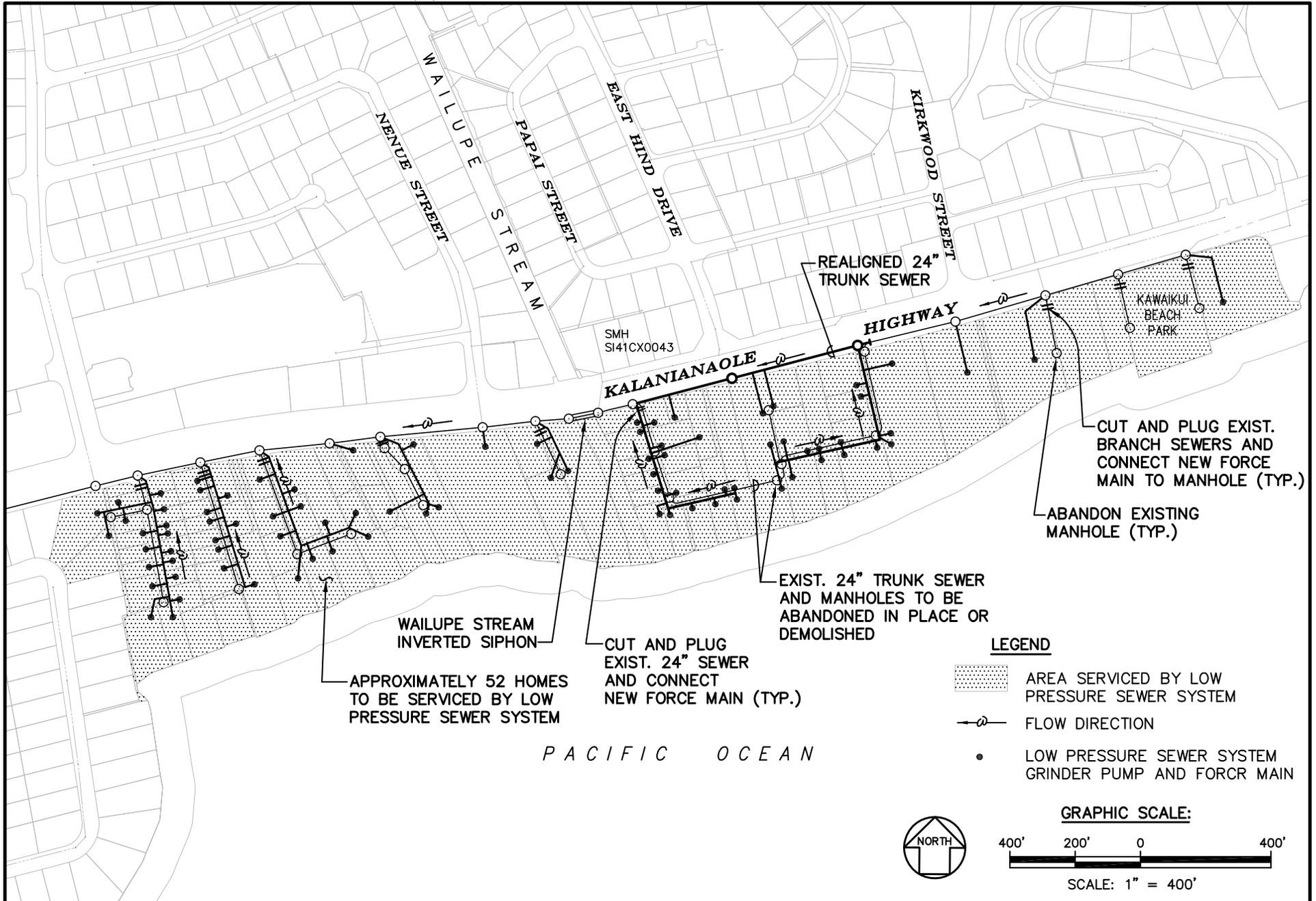
With this alternative, the risk of spills and backups in the low-lying areas would be somewhat reduced. The relief sewer would require minimal maintenance and allow reduced frequency of sewer cleaning due to the added capacity. This alternative, however, will require major construction work within Kalaniana'ole Highway.

7. Alternative 7 - Relief Sewer from West Hind Drive to Wai'ala'e Country Club

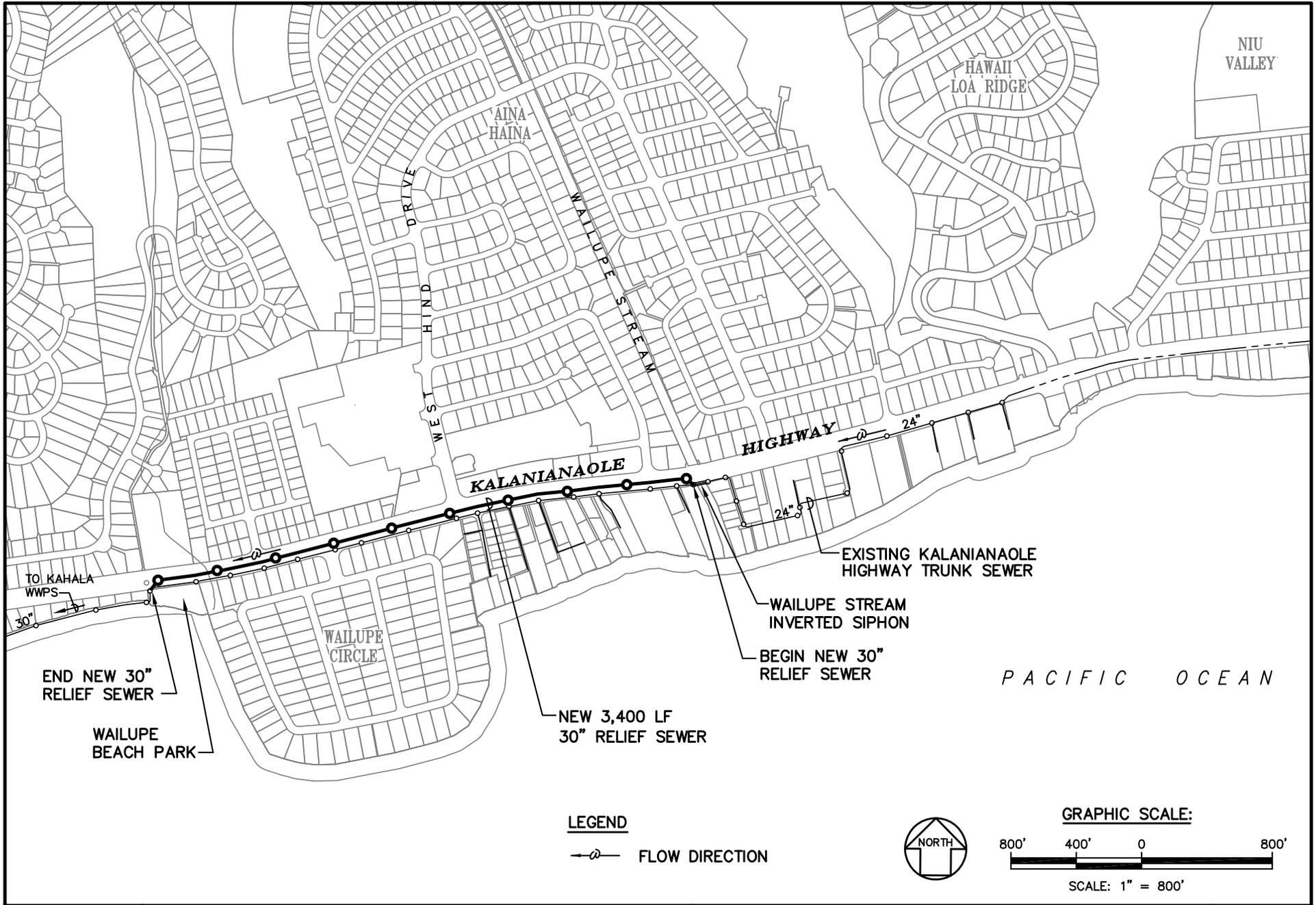
In this alternative, as shown in Figure 4-3, approximately 5,600 feet of 30-inch relief sewer line would be constructed between West Hind Drive and a manhole at the Wai'ala'e Country Club golf course. The relief sewer would require acquisition of an easement through the golf course. This alternative would function similarly to the previous relief sewer alternative but result in a greater decrease of the upstream sewer line water level at high flows. It does so, however, at a substantially higher cost and with more environmental impacts during construction due to its greater length and depth.

8. Alternative 8 - Niu Valley WWPS Force Main Extension and Relief Sewer

Alternative 8, shown in Figure 4-4, involves extending the Niu Valley WWPS force main by approximately 3,500 feet and constructing 1,900 feet of relief sewer to discharge flow from the Niu Valley force main to the sewer manhole located at Wailupe Beach Park. The Niu Valley WWPS flow would bypass the Wailupe Stream inverted siphon. In the past, high flows from the Niu Valley WWPS during large storm events have resulted in spills upstream of the Wailupe Stream inverted siphon. The relief sewer would also convey a portion of the flow by gravity flow from the existing trunk sewer to further reduce the water levels in the upstream sewers.



DATE: 01/30/06 PM: RKA
 SCALE: 1 = 1 OPER: FAI,KA,*ML
 FILE: 2004011-58 REVISED: 04/13/09



LEGEND

→●← FLOW DIRECTION

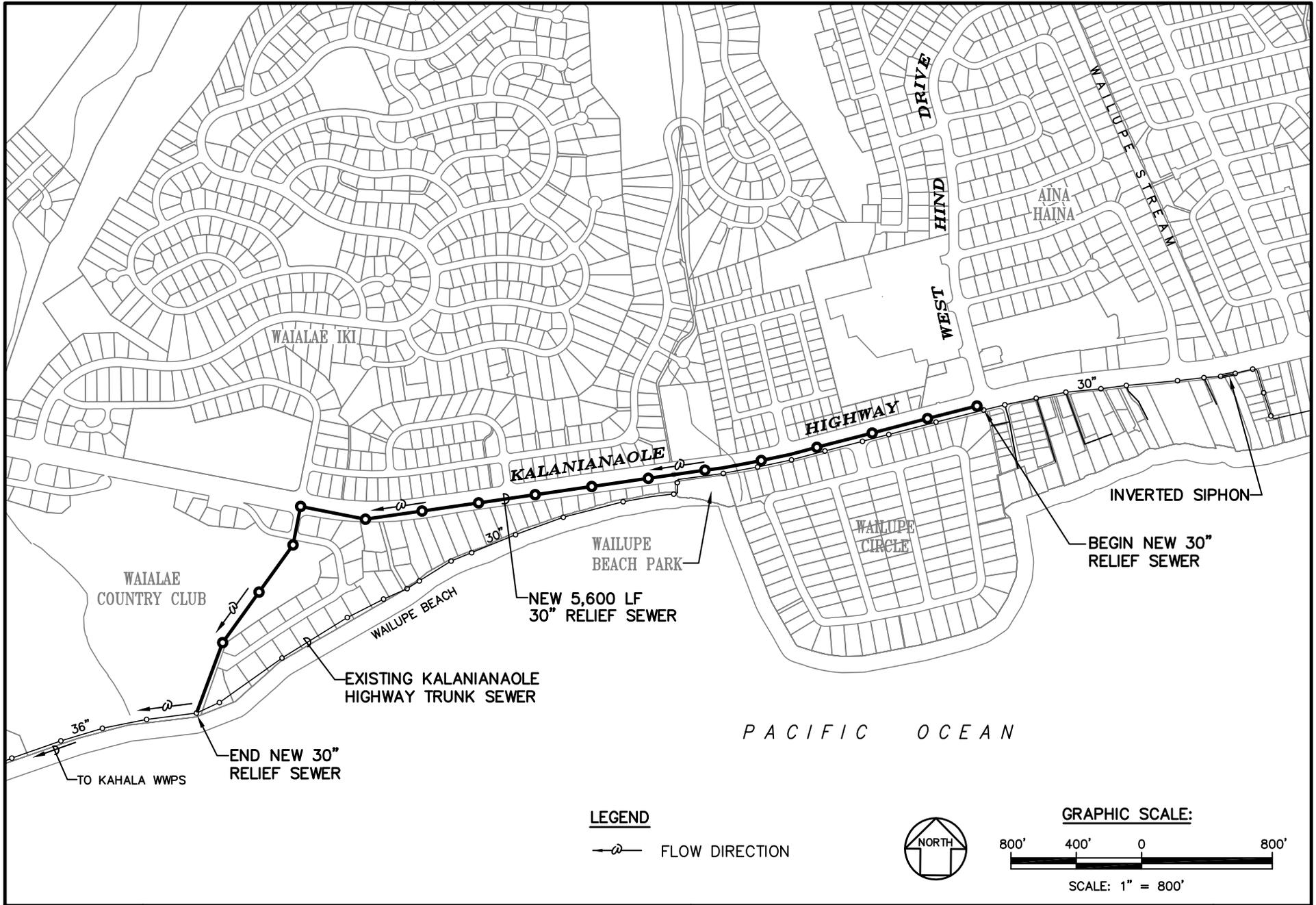


GRAPHIC SCALE:



SCALE: 1" = 800'

DATE: 10/03/08 PM: RKA
 SCALE: 1" = 1' OPER: FAI,KA,*ML
 FILE: 2004011-59 REVISED: 04/13/09



LEGEND

→ FLOW DIRECTION

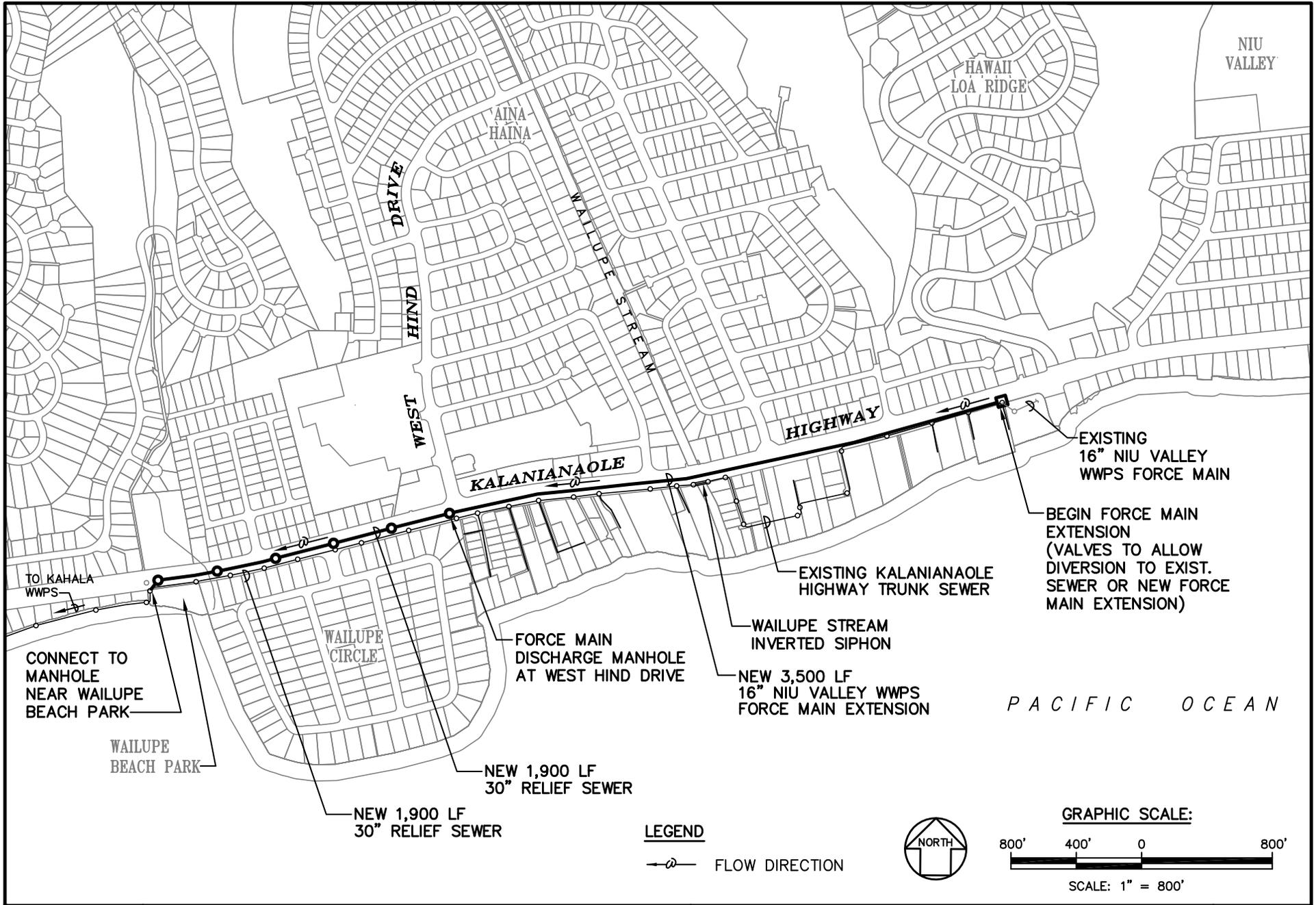


GRAPHIC SCALE:



SCALE: 1" = 800'

DATE: 01/30/06 PM: RKA
 SCALE: 1 = 1 OPER: FAI,KA,*ML
 FILE: 2004011-60 REVISED: 04/13/09



With this alternative, the risk of spills and backups in the low-lying areas will be significantly reduced. There would also be substantial traffic disruptions and inconveniences to area residents during construction due to the length of the new lines.

9. Alternative 9 - Wailupe WWPS and Force Main to Waiialae Country Club

This alternative examines the option of constructing a new wastewater pump station near Wailupe Beach Park to intercept a portion of the Segment 2 flow and pump this flow through a new force main that discharges to the existing trunk sewer at the Waiialae Country Club golf course. This alternative is intended to overcome the capacity limitation of the 30-inch Segment 1 sewer line and minimize the need for cleaning of a portion of the existing line. The layout of alternative is shown in Figure 4-5.

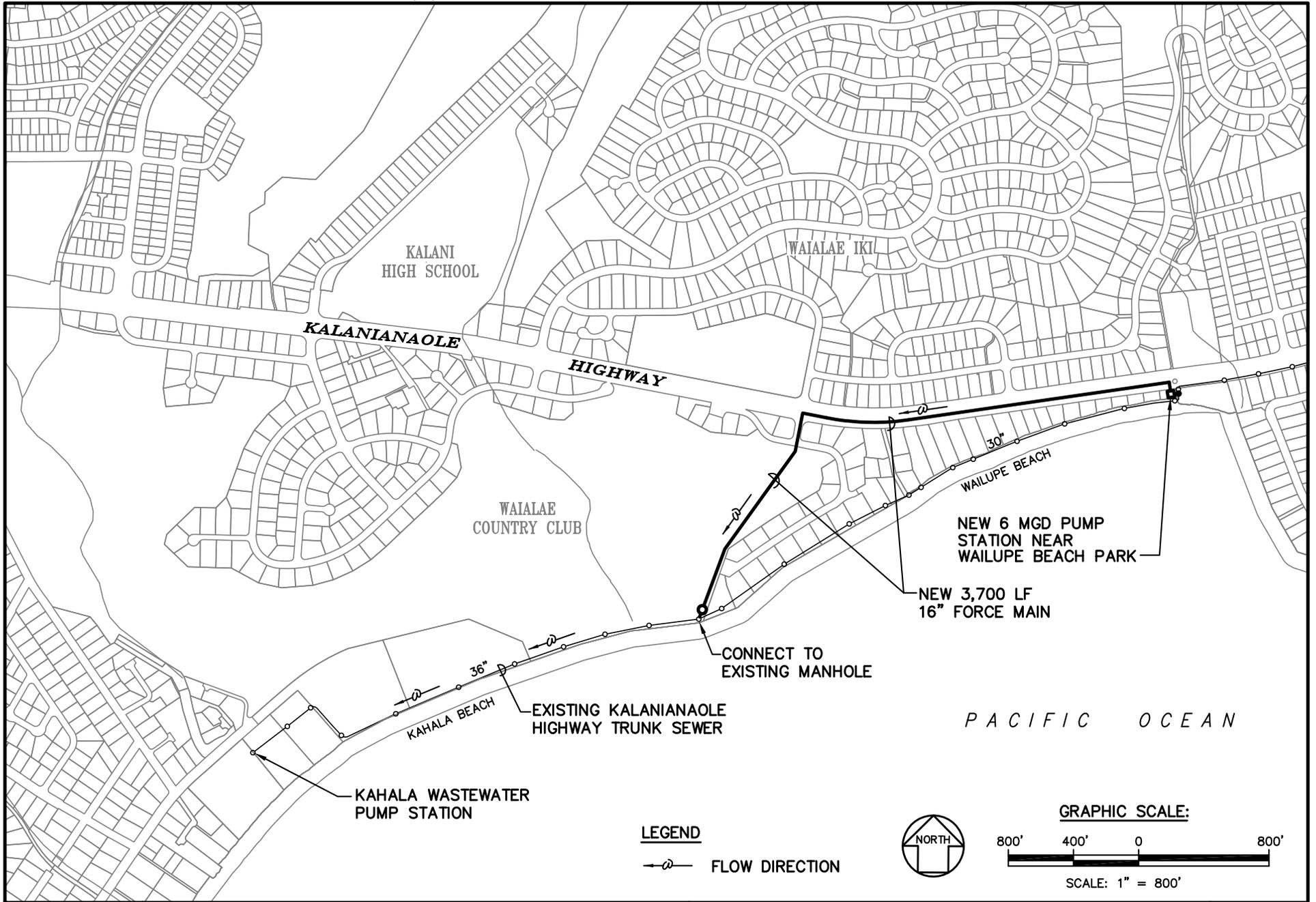
This alternative will aid in the flushing of the existing trunk sewer while providing the required added capacity. The new pump station could be designed to remove grit to reduce sediment accumulation in Segment 1. The construction of a force main along Kalanianaole Highway should be easier and less costly than construction a relief sewer since the force main would be installed at a shallower depth.

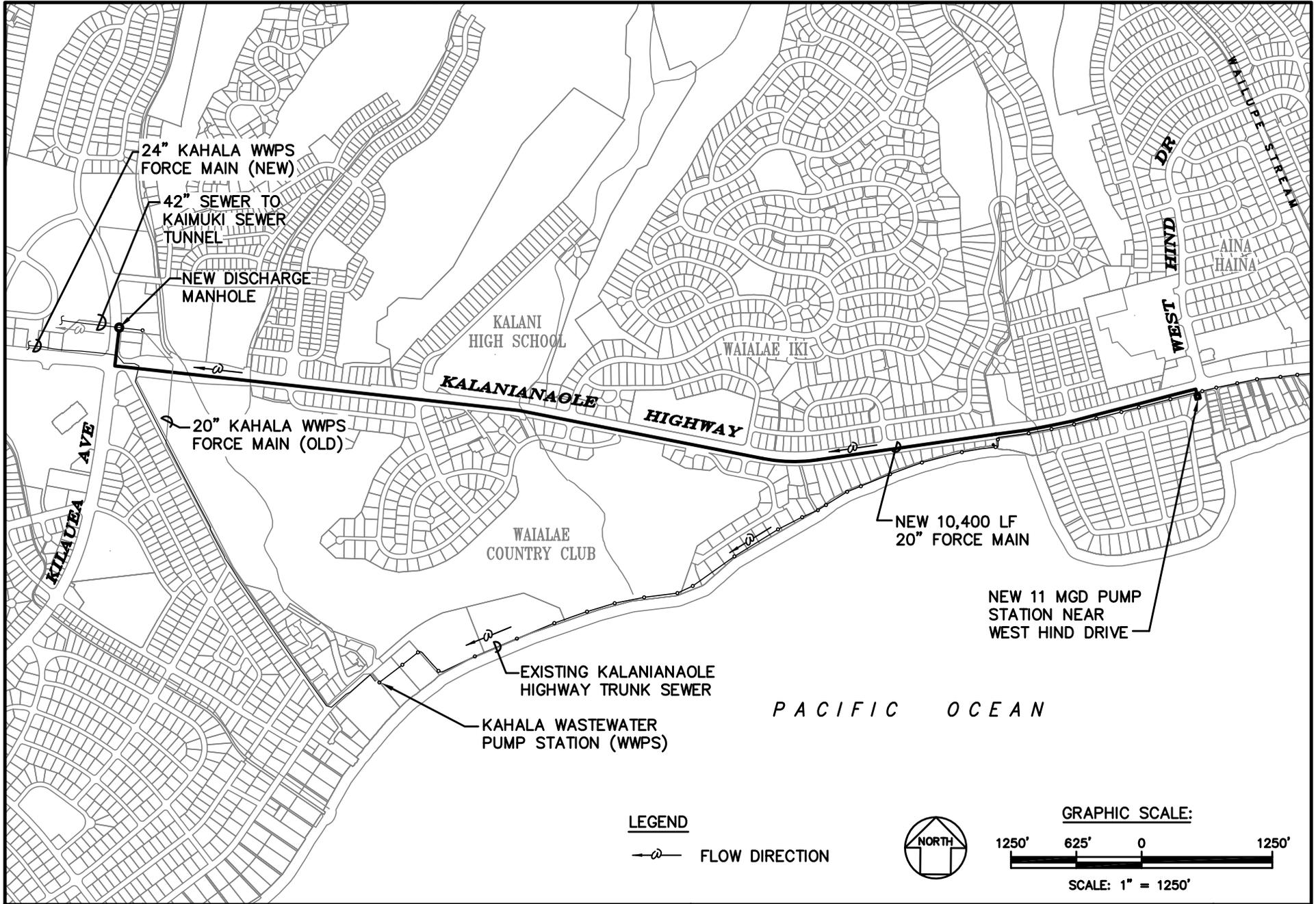
There is limited open area at Wailupe Beach Park for the new pump station. An existing residential parcel would likely be condemned and purchased by the City for the pump station site. The pump station would also result in substantial operation and maintenance costs and additional power consumption. The pump station would also add noise to the existing Kalanianaole Highway corridor. There will also be substantial construction impacts from the construction of the pump station.

10. Alternative 10 - West Hind Drive WWPS and Force Main to Sewer Tunnel

This last alternative involves constructing a new wastewater pump station located near the intersection of West Hind Drive and Kalanianaole Highway, and a new force main that bypasses the Kahala WWPS and discharges directly to the Kaimuki sewer tunnel system. The new pump station would intercept most of Segment 2 flows and provide the required capacity to accommodate high flows. As opposed to the previous Wailupe WWPS alternative, this alternative pump station would be located near West Hind Drive rather than at Wailupe Beach Park to overcome the capacity constraints of the existing trunk sewer between these two points. The layout of this alternative is shown in Figure 4-6.

With Alternative 10, the Kahala WWPS and Segment 1 of the trunk sewer will have substantial surplus capacity due to diversion of the flows directly to the Kaimuki sewer tunnel. Cleaning of the Segment 1 sewer, which has poor accessibility, should not longer be critical to prevent spills. The existing capacity issues at the Kahala WWPS would also no longer be significant.



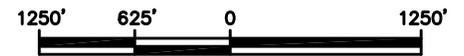


LEGEND

—○— FLOW DIRECTION



GRAPHIC SCALE:



SCALE: 1" = 1250'

This alternative has similar disadvantages as the previous alternative. Construction costs would be higher and construction impacts would be greater due to the more extensive facilities that would be required. Businesses in the Kahala area would be significantly impacted. The pump station would result in greater power consumption, although power consumption should be at least partially offset by power savings at the Kahala WWPS.

11. Evaluation of Capacity Upgrade Alternatives

The various capacity upgrade alternatives vary substantially with respect to cost, effectiveness in reducing spill risks, and non-monetary considerations. A comparative summary of alternatives is presented in Table 4-1. The table lists the various alternatives along with their monetary costs, reliability and performance, ease of operation, ease of implementation, as well as short and long-term impacts.

The preferred capacity upgrade involves the scope of work described in the General Project Description section in Chapter 1. The recommended work is a combination of Alternatives 2 through 4 of the capacity alternatives, which includes thorough cleaning of the existing sewer lines, modifications at the Wailupe Stream inverted siphon, and reduction of infiltration and inflow. Alternative 1, involving the resolving of the Kahala WPS capacity issue will also be implemented under a future project following further investigation of the pump station problems.

Alternatives 1 through 4 representing the preferred capacity upgrade, with an estimated total capital cost of \$5.9 million, were the lowest cost alternatives and determined to be the most cost-effective. The ratings for these alternatives for reliability and performance were good to excellent. For the other non-monetary factors, there were some positive ratings and no significant negative ratings.

The remaining six alternatives (Alternatives 5 through 10) offer varying degrees of spill risk reduction benefits, but at a very high cost (capital costs of \$8.3 to \$38.0 million) with generally negative non-monetary factor ratings. Construction of any relief sewer alternative along or off Kalaniana'ole Highway would be very costly with respect to monetary costs and social impacts. Lack of available easements, congested utility corridors, heavily traveled roadways, inaccessibility through private property, and severe construction impacts on area residents make the new major construction options very undesirable. Given the large number, high cost and high priority of other sewer rehabilitation and capacity upgrade projects facing the City, implementing any of the six high cost projects may be difficult to justify based on the benefits gained.

D. SEWER REHABILITATION ALTERNATIVES

This section evaluates pipe rehabilitation alternatives. The development and analysis of rehabilitation alternatives focused on: 1) the repair of existing defects and deterioration in

**TABLE 4-1
COMPARISON OF CAPACITY UPGRADE ALTERNATIVES**

	Monetary Costs	Reliability and Performance	Ease of Operation	Ease of Implementation	Short-Term Construction Impacts	Long-Term Environmental and Social Impacts
<u>Alternative 1 - Kahala WWPS Capacity Upgrade</u>	<p><u>Low</u> (assuming no major problems)</p> <p>Capital Cost: \$730,000</p> <p>Annual Operating Cost: \$5,000</p> <p>Total Present Worth (PW): \$805,000</p> <p>Annualized PW Cost: \$54,000</p> <p>Ann. PW per ft of Hydraulic Grade Line Reduced*: \$9,000</p>	<p><u>Excellent</u> – Once the capacity problem is found and corrected, the design pumping capacity should be capable of being maintained.</p>	<p><u>Moderate to Excellent</u> – Minimal additional maintenance effort is expected.</p>	<p><u>Good</u> – Construction work is not expected to be extensive.</p>	<p><u>Good</u> – No major disruptions within public access areas are anticipated except for possible force main cleaning.</p>	<p><u>Good</u> – Minimal long-term environmental and social impacts. Will reduce risk of sewage spills, backups into homes, and loss of sewer service that can have significant adverse water quality, social and public health impacts.</p>
<u>Alternative 2 - Trunk Sewer Cleaning</u>	<p><u>Moderate</u></p> <p>Capital Cost: \$2,750,000</p> <p>Annual Operating Cost: \$62,000</p> <p>Total Present Worth (PW):\$3,680,000</p> <p>Annualized PW Cost: \$245,000</p> <p>Ann. PW per ft of Hydraulic Grade Line Reduced*: \$35,000</p>	<p><u>Good to Excellent</u> – Hydraulic calculations show that spills can be eliminated by thorough initial cleaning and maintaining a regular cleaning program. Reliability will depend on diligence in cleaning.</p>	<p><u>Moderate</u> – Requires regular sewer cleaning and keeping track of the sediment buildup in areas with generally difficult access. The ease of cleaning can potentially be improved by more frequent cleaning.</p>	<p><u>Moderate to Good</u> – Cleaning of large diameter sewer on a regular basis will require commitment of more sewer maintenance funds and effort, however, this can be justified by possible elimination of major sewer upgrade projects in the future.</p>	<p><u>Moderate</u> – Sewer cleaning work will generate some noise, odors and traffic disruptions.</p>	<p><u>Moderate</u> – Will reduce risk of sewage spills, backups into homes, and loss of sewer service that can have significant adverse water quality, social and public health impacts.</p>

**TABLE 4-1
COMPARISON OF CAPACITY UPGRADE ALTERNATIVES**

	Monetary Costs	Reliability and Performance	Ease of Operation	Ease of Implementation	Short-Term Construction Impacts	Long-Term Environmental and Social Impacts
<u>Alternative 3 - Wailupe Stream Inverted Siphon Flow Split Modification</u>	<p><u>Very Low</u></p> <p>Capital Cost: \$321,000</p> <p>Annual Operating Cost: \$8,000</p> <p>Total Present Worth (PW): \$322,000</p> <p>Annualized PW Cost: \$29,000</p> <p>Ann. PW per ft of Hydraulic Grade Line Reduced*: \$19,300</p>	<p><u>Good</u> – Modifications of the manholes will increase scouring of inverted siphon pipes and help prevent accumulation of solids and grit.</p>	<p><u>Good</u> – Regular cleaning is recommended for the inverted siphon pipes. Some labor is required for monitoring the degree of sediment accumulation.</p>	<p><u>Good</u> – Work will be confined to upstream and downstream manholes of the inverted siphon. Some flow bypassing will be required. Will require commitment to periodic cleaning of inverted siphon pipes.</p>	<p><u>Very Good</u> – Traffic disruptions will be minimal because both upstream and downstream manholes are located in the Kalaniana'ole Highway shoulder lane.</p>	<p><u>Good</u> – Will facilitate proper operation of the inverted siphon and prevent buildup of solids. Will reduce risk of sewage spills, backups into homes, and loss of sewer service that can have significant adverse water quality, social and public health impacts.</p>
<u>Alternative 4 - Infiltration/Inflow Reduction</u>	<p><u>Moderate</u></p> <p>Capital Cost: \$2,120,000</p> <p>Annual Operating Cost: \$20,000</p> <p>Total Present Worth (PW): \$2,420,000</p> <p>Annualized PW Cost: \$161,000</p> <p>Ann. PW per ft of Hydraulic Grade Line Reduced*: \$53,700</p>	<p><u>Good</u> – Extent of flow reduction is uncertain. Infiltration/inflow reduction will reduce entry of grit and sediments into sewer system.</p>	<p><u>Good</u> – Only periodic follow-up inspections/actions should be necessary to maintain the effectiveness of the flow reduction.</p>	<p><u>Fair to Good</u> – Homeowners may be reluctant to pay for lateral replacement work. Other corrective actions should be capable of being implemented without significant difficulties. Illicit connections involve plumbing code violations that can be readily enforced, but will require additional effort and manpower by City personnel.</p>	<p><u>Good to Excellent</u> – Some traffic disruptions may result from work in the roadway. Other corrective actions will have minimal impacts.</p>	<p><u>Excellent</u> – No significant adverse impacts. Grit entry into sewer system should be reduced. Downstream pumping and treatment requirements and costs will be reduced. Will reduce risk of sewage spills, backups into homes, and loss of sewer service that can have significant adverse water quality, social and public health impacts.</p>

**TABLE 4-1
COMPARISON OF CAPACITY UPGRADE ALTERNATIVES**

	Monetary Costs	Reliability and Performance	Ease of Operation	Ease of Implementation	Short-Term Construction Impacts	Long-Term Environmental and Social Impacts
<u>Alternative 5 - Trunk Sewer Realignment Upstream of Inverted Siphon</u>	<p><u>High</u></p> <p>Capital Cost: \$8,300,000</p> <p>Annual Operating Cost: \$20,300</p> <p>Total Present Worth (PW):\$8,600,000</p> <p>Annualized PW Cost: \$572,000</p> <p>Ann. PW per ft of Hydraulic Grade Line Reduced*: \$95,300</p>	<p><u>Fair</u> – Realigning the trunk sewer would eliminate spills from low-lying manholes. Non-functioning low-pressure sewer pumping systems, however, can result in spills.</p>	<p><u>Fair to Very Good</u> – Low-pressure sewer system will require maintenance. Removal of the 90-degree bends in the area may result in improved flow velocities and less sediment deposition.</p>	<p><u>Poor</u> - Homeowners may oppose use of individual low-pressure sewer systems, particularly if they have not experienced any prior spill problems with the existing sewer. The grinder pumps will not likely have sufficient capacity to handle swimming pool filter backwash flows. Construction of the gravity trunk sewer may be hindered by existing utilities and traffic.</p>	<p><u>Poor</u> – Short segment of trunk sewer (approx. 730 lf) to be installed along Kalanianaʻole Highway. Will require shutdown of at least one lane of eastbound traffic. Low-pressure sewer system will require extensive construction in private property and narrow roads.</p>	<p><u>Poor to Good</u> – The risk of sewage spills, backups into homes and loss of service from surcharged pipes should be substantially reduced. Homeowners, however, will be burdened with monitoring the grinder pumps, which are subject to spills due to malfunctions and power outages. The severity of sewage spill should be lower, which will benefit water quality and public health.</p>
<u>Alternative 6 - Relief Sewer from Wailupe Stream to Wailupe Beach Park</u>	<p><u>Very High</u></p> <p>Capital Cost: \$19,450,000</p> <p>Annual Operating Cost: \$8,500</p> <p>Total Present Worth (PW):\$19,580,000</p> <p>Annualized PW Cost: \$1,300,000</p> <p>Ann. PW per ft of Hydraulic Grade Line Reduced*: \$289,000</p>	<p><u>Fair</u> – Results in lower wastewater levels in the low-lying area during high flows. The relief sewer should perform reliably and would require minimal maintenance.</p>	<p><u>Good</u> – The relief sewer requires no maintenance other than periodic cleaning. The main trunk sewer will still require some periodic cleaning.</p>	<p><u>Poor</u> – Extensive construction of gravity trunk sewer is likely to be hindered by existing utilities and traffic. The use of microtunneling, a trenchless construction method, would facilitate construction.</p>	<p><u>Poor</u> – Long segment of trunk sewer (approx. 3,400 lf) to be installed along Kalanianaʻole Highway. The use of micro-tunneling will still likely require shutdown of at least one lane of eastbound traffic for jacking/receiving pit construction.</p>	<p><u>Fair to Good</u> – The risk of sewage spills, backups into homes and loss of service from surcharged pipes is somewhat reduced and there will be some water quality and public health benefits.</p>

**TABLE 4-1
COMPARISON OF CAPACITY UPGRADE ALTERNATIVES**

	Monetary Costs	Reliability and Performance	Ease of Operation	Ease of Implementation	Short-Term Construction Impacts	Long-Term Environmental and Social Impacts
<u>Alternative 7 - Relief Sewer from West Hind Drive to Waialae Country Club</u>	<p>Extremely High</p> <p>Capital Cost: \$32,690,000</p> <p>Annual Operating Cost: \$14,000</p> <p>Total Present Worth (PW):\$32,740,000</p> <p>Annualized PW Cost: \$2,180,000</p> <p>Ann. PW per ft of Hydraulic Grade Line Reduced*: \$290,000</p>	<p>Excellent – Results in much lower wastewater levels in the low-lying area during high flows. The relief sewer should perform reliably and would require minimal maintenance.</p>	<p>Good – The relief sewer requires no maintenance other than periodic cleaning. The main trunk sewer will still require some periodic cleaning. Flow can be diverted to relief sewer to facilitate trunk sewer cleaning.</p>	<p>Very Poor – Extensive construction of gravity trunk sewer is likely to be hindered by existing utilities and traffic. The use of microtunneling would facilitate construction. An easement through the Waialae Country Club golf course is required.</p>	<p>Poor – Long segment of trunk sewer (approx. 4,300 lf) to be installed along Kalanianaʻole Highway. The use of micro-tunneling will still likely require shutdown of at least one lane of eastbound traffic for jacking/receiving pit construction.</p>	<p>Excellent – The risk of sewage spills, backups into homes and loss of service from surcharged pipes is greatly reduced resulting in water quality, social and public health benefits.</p>
<u>Alternative 8 - Niu Valley WWPS Force Main Extension and Relief Sewer</u>	<p>Very High</p> <p>Capital Cost: \$20,090,000</p> <p>Annual Operating Cost: \$14,800</p> <p>Total Present Worth (PW):\$20,310,000</p> <p>Annualized PW Cost: \$1,350,000</p> <p>Ann. PW per ft of Hydraulic Grade Line Reduced: \$246,000</p>	<p>Fair to Good – Results in lower wastewater levels in the low-lying area during high flows. The system requires that flow be diverted to the extended force main during high flows and that flows are diverted to inverted siphon during normal flows for adequate line flushing. Upgrading the Niu Valley WWPS with new pumps will increase the reliability of the station.</p>	<p>Fair – Requires additional skilled operations personnel and recurring maintenance to maintain the flow diversion system.</p>	<p>Poor – Extensive construction of force main and gravity sewer is likely to be hindered by existing utilities and traffic. The use of trenchless methods would facilitate construction. The pump station would need to be kept in continuous service during the pump station upgrade work.</p>	<p>Poor – Long segment of force main and relief sewer (approx. 5,400 lf) to be installed along Kalanianaʻole Highway. The use of trenchless methods will still likely require shutdown of at least one lane of eastbound traffic. Onsite pump station work will not likely extend beyond property boundary.</p>	<p>Fair to Good – The risk of sewage spills, backups into homes and loss of service from surcharged pipes is somewhat reduced resulting in water quality, social and public health benefits. Upgrading the pump capacity will enable the station to operate in compliance with EPA criteria (one pump on standby at peak flow).</p>

**TABLE 4-1
COMPARISON OF CAPACITY UPGRADE ALTERNATIVES**

	Monetary Costs	Reliability and Performance	Ease of Operation	Ease of Implementation	Short-Term Construction Impacts	Long-Term Environmental and Social Impacts
<u>Alternative 9 - New Wailupe WWPS and Force Main to Waiialae Country Club</u>	<p>Very High</p> <p>Capital Cost: \$17,050,000</p> <p>Annual Operating Cost: \$50,000</p> <p>Total Present Worth (PW):\$17,810,000</p> <p>Annualized PW Cost: \$1,180,000</p> <p>Ann. PW per ft of Hydraulic Grade Line Reduced*: \$237,000</p>	<p>Fair – Results in lower wastewater levels in the low-lying area during high flows. This is dependent on proper functioning of the pumping station.</p>	<p>Fair – Requires operation and maintenance of a new pumping station. Cleaning of upper end of Segment 1 trunk sewer will be less critical. Pumped flow should be periodically discharged to trunk sewer for flushing.</p>	<p>Very Poor – Extensive construction of force main likely to be hindered by existing utilities and traffic. The use of trenchless methods may facilitate construction. Condemnation of residential property likely required for the pump station. Easement through the Waiialae Country Club golf course is required.</p>	<p>Poor – Long segment of force main (approx. 4,300 lf) to be installed along Kalanianaʻole Highway. The use of trenchless methods will still likely require shutdown of at least one lane of eastbound traffic.</p>	<p>Fair to Good – The risk of sewage spills, backups into homes and loss of service from surcharged pipes is somewhat reduced, resulting in water quality, social and public health benefits. The pump station would add to existing noise along the Kalanianaʻole Highway corridor.</p>
<u>Alternative 10 - New West Hind Drive WWPS and Force Main to Sewer Tunnel</u>	<p>Extremely High</p> <p>Capital Cost: \$37,990,000</p> <p>Annual Operating Cost: \$110,000</p> <p>Total Present Worth (PW):\$39,600,000</p> <p>Annualized PW Cost: \$2,640,000</p> <p>Ann. PW per ft of Hydraulic Grade Line Reduced*: \$352,000</p>	<p>Excellent – Results in much lower wastewater levels in the low-lying area during high flows. This is dependent on proper functioning of the pumping station. The combined Wailupe and Kahala WWPSs and force mains would provide significant redundancy and surplus capacity.</p>	<p>Fair – Requires operation and maintenance of a new pumping station. Cleaning of upper end of Segment 1 trunk sewer will be much less critical and sediment accumulation should be reduced. Pumped flow should be periodically discharged to trunk sewer for flushing.</p>	<p>Very Poor – Extensive construction of force main likely to be hindered by existing utilities and traffic. Crossing of Waiialae Avenue at Kilauea Avenue is required. The use of trenchless methods may facilitate construction. Condemnation of residential property likely required for the pump station.</p>	<p>Poor – Long segment of force main (approx. 10,400 lf) to be installed along Kalanianaʻole Highway and across Waiialae Avenue. The use of trenchless methods will still likely require shutdown of at least one lane of eastbound traffic. Businesses in the Kahala area will likely be impacted by the construction.</p>	<p>Good to Excellent – The risk of sewage spills, backups into homes and loss of service from surcharged pipes is greatly reduced, resulting in water quality, social and public health benefits. The new pump station and force main would provide significant redundancy and extra capacity to the Kahala WWPS system. The new pump station would add to existing noise along the Kalanianaʻole Highway corridor.</p>

*Hydraulic grade line refers to the water level in the upstream manhole (where sewage spills typically occur) during high flows.

pipes and manholes caused by corrosion and age, and 2) the prevention of future deterioration through corrosion resistant rehabilitation materials.

As mentioned in Chapter 1, the unlined sewers in Segments 2 and 3 exhibit significant corrosion of the reinforced concrete pipe sections, and cracks and other defects in the vitrified clay pipe sections. The evaluation of alternatives focused on actions to rehabilitate the lines and prevent future deterioration. Increasing the capacity of the trunk sewer was also a consideration in the evaluation since there would be substantial cost savings if construction of a new relief sewer or other capacity upgrade work can be avoided. Alternatives examined for the rehabilitation of sewer pipes included:

- Cured-in-place-pipe (CIPP) liner
- Sliplining
- Pipe Bursting

The following discussion provides a brief description of the rehabilitation technologies and an assessment of the technologies. Each of the technologies would be expected to be capable of rehabilitating the sewer pipes to provide an additional service life of at least 50 years with proper installation.

1. Cured-in-Place Pipe (CIPP)

The preferred alternative for the sewer line rehabilitation for this project is the cured-in-place pipe (CIPP) method. The CIPP method of pipe rehabilitation consists of installing a soft flexible fabric tube impregnated with a thermoset resin as a liner in an existing pipeline and curing the liner by the application of heat. The CIPP rehabilitation process results in a structurally sound pipe with smooth interior surfaces that are jointless and corrosion resistant. The CIPP process has been used on many City projects and there currently are a number of CIPP firms that are represented locally to help ensure competitive bid prices.

Advantages

The CIPP rehabilitation method is applicable to the Kalanianaole Highway Sewer System Improvements project for the following reasons:

- Installing the CIPP lining will significantly increase the structural integrity of the existing line and prevent future deterioration.
- The smoother surface of the CIPP lining results in a lower friction factor that increases capacity. The smoother surface of the CIPP-lined pipe should increase flow velocities to help reduce sediment accumulation.

- Bypassing of flows is not expected to be a major obstacle as the flows are within the range of typical large engine-driven bypass pumps. The bypass lines can be laid down outside the main travelway of Kalanianaole Highway without crossing the highway. The bypass lines can be either buried in shallow trenches or bridged over with ramps when crossing the side streets and driveways.
- The CIPP process itself requires no trenching as service lateral connection opening may be reinstated (cut open) by man entry or the use of a robotic cutter.

Disadvantages

One disadvantage of using CIPP is that it cannot correct existing “sags” in the line caused by ground settlement. Portions of Segments 2 and 3 exhibit some areas with sags, but do not appear to be significant enough to result in excessively sluggish flows. Some of the grit material that may settle due to the sag in the pipe will typically be washed downstream at higher flows. As noted above, the smooth CIPP lining in the sewer should slightly increase flow velocities to help reduce sediment accumulation.

Temporary environmental impacts include odors and noise. These impacts that were discussed in Chapter 3 can be minimized by implementing appropriate mitigation measures.

2. Sliplining

Another rehabilitation alternative considered was sliplining. Sliplining involves inserting, by pulling or pushing, a new smaller pipe into a deteriorated host pipe. The annular space between the existing pipe and new pipe may be grouted for strength and to minimize intrusion of surrounding soil into the annular space and loss of pipe support.

Advantages

An advantage of sliplining is its relative simplicity. One significant advantage is that sliplining can be performed without bypass of flow around the work area. Other advantages of sliplining are similar to the CIPP rehabilitation method.

Disadvantages

The major disadvantage is that the capacity of the pipe will be reduced due to substantial decrease in pipe cross sectional area despite the increased smoothness of the new pipe. Although flow bypassing is not required, large pits over the existing sewer are required to perform the sliplining work. Another disadvantage is that on smaller lines where man entry is not feasible, each service lateral connection is required to be excavated to reinstate the lateral opening.

Sliplining was not recommended for the project since it offers no significant advantages over the CIPP alternative. Sliplining has the significant disadvantage of reducing the cross-sectional area and capacity of the line. Furthermore, most of Segment 2 and 3 sewer lines are located on or near the travelway along Kalanianaole Highway, and large access/installation pits would require shutdown of one or more lanes of traffic for prolonged periods of time.

3. Pipe Bursting

The third alternative considered for sewer line rehabilitation was pipe bursting. Pipe bursting is a trenchless “in-line” method of pipe replacement in which a pipe bursting tool is used to break up the existing deteriorated pipe by the use of radial forces from inside the existing pipe. The pipe fragments of the existing friable pipe are forced outward into the surrounding soil and a new pipe is pulled into place to replace the existing pipe.

Advantages

Depending on the soil conditions, this method may allow increasing the pipe size by one or two pipe sizes.

Disadvantages

One concern with pipe bursting is the possible deviation from the original sewer slope in the rehabilitated line due to non-uniform soil and pipe conditions. The sewers in the proposed project have relatively flat slopes and therefore even slight changes to the slope may result in increased problems with sags in the pipe profile. Unlike CIPP and some of the other pipe rehabilitation methods, pipe bursting would waste the benefits of the existing pipe’s remaining structural integrity. Additionally, portions of the Segments 2 and 3 sewer lines are surrounded by numerous utilities and nearby private residences that may sustain damage from the pipe bursting process.

4. Recommended Sewer Line Rehabilitation Alternative

Based on the discussions above, the preferred alternative for sewer line rehabilitation for the Kalanianaole Highway Sewer System Improvements project is the use of CIPP liner. The City has found CIPP lining to be a cost-effective means to rehabilitate sewers in many similar situations. Rehabilitating Segment 2 and Segment 3 would restore structural integrity of the pipes, reduce the possibility of future failure from corrosion, and slightly increase the capacity of the line.

CHAPTER 5

DETERMINATION

A. DETERMINATION

This assessment for the proposed Kalanianaʻole Highway Sewer System Improvements project shows that no significant impact on the environment will occur and an Environmental Impact Statement is not required. In accordance with the provisions of Chapter 343, Hawaii Revised Statutes, a Finding of No Significant Impact (FONSI) is therefore deemed to be in order.

B. SUPPORTING RATIONALE

Reasons supporting the above determination include:

- 1) **The proposed action does not involve an irrevocable commitment or loss of or destruction of any natural or cultural resources.**

There are no known significant natural or cultural resources associated with the project site. Past development of the project area has already substantially altered the site from its natural condition. Although it is not anticipated that burials or artifacts of historical significance will be affected or uncovered due to the limited extent of excavation work involved, an archaeological monitoring program will be employed as a precautionary measure.

- 2) **The proposed action does not curtail the range of beneficial uses of the environment.**

The proposed project is consistent with land use plans, policies and controls and would not curtail beneficial uses of the environment in the area.

- 3) **The proposed action is in concert with the State's long-term environmental policies, goals and guidelines as expressed in Chapter 343, HRS, and any revisions and amendments thereto, court decisions and executive orders.**

No long-term adverse environmental conflicts are foreseen. The project will have the beneficial impact of reducing the risk of wastewater spills and the resulting adverse water quality impacts.

- 4) **The proposed action does not substantially affect the economic or social welfare of the community or State.**

There will be some positive economic impacts related to short-term construction related activities. The project will have beneficial long-term impacts to the economic and social environment by providing properly functioning wastewater collection infrastructure and reducing sewer system overflows.

- 5) **The proposed action does not have significant adverse effects on public health.**

Short-term impacts associated with construction will have minimal potential for affecting public health. Construction activities will be regulated to minimize noise, dust, odors and exhaust emissions. The project will have the beneficial impact of reducing the potential for wastewater spills and the associated risks to public health.

- 6) **The proposed action does not involve substantial secondary impacts, such as population changes or effects on public facilities.**

The proposed project will not result in an increase of population in the area. The project will not have significant long-term adverse impacts on other public facilities such as roads, electrical power and water system.

- 7) **The proposed action does not involve a substantial degradation of environmental quality.**

The proposed rehabilitation of sewer lines and manholes will be located at or below grade and the existing physical aspects of the project site and surrounding area will be preserved. The project will not result in a significant increase in adverse odor, noise or aesthetic impacts and will reduce the risk of sewage spills.

Short-term construction impacts will be mitigated to meet regulatory requirements through implementation of Best Management Practices for such areas as erosion/runoff control, sewage spill prevention, odor abatement and noise attenuation

- 8) **The proposed action is individually limited, and cumulatively does not have a significant effect upon the environment or involve a commitment for larger actions.**

The project is limited in scope to the proposed cleaning and rehabilitation work on an existing sewer system. The project will eliminate adverse impacts on the environment resulting from sewer line and manhole deficiencies.

- 9) **The proposed action does not substantially affect rare, threatened or endangered species or habitats.**

Based on a review of available information, no rare, threatened or endangered flora or fauna are anticipated to be found within the project site. Best Management Practices will be implemented to minimize the potential for any adverse impacts to adjacent aquatic and terrestrial ecosystems.

- 10) **The proposed action does not detrimentally affect air, water quality, or ambient noise levels.**

Short-term impacts on air, water quality and noise may occur during the construction period, but will be mitigated by requiring implementation of Best Management Practices through the project's plans and specifications. The cleaned and rehabilitated sewer system is not anticipated to result in any long-term increases in noise or odor generation. The project will have the beneficial impact of reducing the risk of wastewater spills and the associated adverse water quality impacts.

- 11) **The proposed action does not affect nor 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 or coastal waters.**

Measures to prevent damage from flooding and to prevent polluted runoff from entering the drainage systems, streams and nearshore waters during flood events will be required to be implemented by the construction contractor. The underground sewer lines are not subject to damage from flooding and will not aggravate flooding problems in the area. The structural rehabilitation of the sewer lines will result in a more robust infrastructure that will be less likely to be damaged or otherwise affected by flooding and other forces of nature.

- 12) **The proposed project does not substantially affect scenic vistas and view planes identified in County or State plans or studies.**

The project site is not a part of a unique or valuable scenic resource. The rehabilitated sewer lines are located underground.

- 13) **The proposed action does not require substantial energy consumption.**

The proposed project will result in substantial energy savings. Repair of sewer defects will reduce the entry of groundwater and stormwater runoff into the sewer system. This will reduce the volume of flow and lower the amount of energy required for pumping the sewage to the Sand Island Wastewater Treatment Plant.

CHAPTER 6

PERSONS AND AGENCIES CONTACTED

A. PRE-ASSESSMENT CONSULTATION

Pre-assessment consultation correspondence and other relevant consultation information associated with the preparation of this environmental assessment are presented in Appendix E. Pre-assessment consultations included: 1) written correspondence with various agencies and community members, 2) informational meeting held at the Aina Haina Elementary School on February 12, 2009, and 3) various follow-up emails, phone conversations and meetings.

The informational meeting at the Aina Haina Elementary School was held to obtain pre-assessment input for this environmental assessment and to fulfill public participation requirements associated with the noise variance application submitted to the State Department of Health. In addition to public officials, recipients of the meeting notice included residents and businesses located near the proposed staging areas or those located along the Kalanianaʻole Highway corridor that would be impacted by the night work noise. The informational meeting notice included a Fact Sheet describing the project and the anticipated impacts.

Parties contacted for pre-assessment consultation input are listed below. Parties that provided formal written comments or other input are indicated by an “*”. Parties that were sent responses to significant comments are marked with a “+”. Included in Appendix E are the following pre-assessment consultation documents: 1) sample copy of the meeting notice and Fact Sheet, 2) copies of correspondence (arranged in order of the agencies/persons listed below), 3) summary of the informational meeting, and 4) summaries of key comments received by email and phone conversations.

1. Federal Government

Department of the Interior, U.S. Fish and Wildlife Service*⁺

U.S. Army Engineer District, Honolulu, Regulatory Branch

National Oceanic and Atmospheric Administration

- Pacific Islands Regional Office
- Pacific Islands Fisheries Science Center

2. State Government

Department of Health, Office of Environmental Quality Control

Department of Health, Environmental Management Division

- Clean Water Branch*⁺
- Wastewater Branch*

Department of Health, Environmental Planning Office

Department of Land & Natural Resources

- Engineering Division*
- Division of Boating & Ocean Recreation*
- Land Division-Oahu District*
- Division of Aquatic Resources
- State Historic Preservation Division
- State Historic Preservation Division, Oahu Burial Council

Department of Business, Economic Development & Tourism, Coastal Zone Management

Department of Transportation*⁺

Office of Hawaiian Affairs*⁺

3. County Government

Department of Environmental Services

Department of Facility Maintenance*⁺

Department of Planning & Permitting*⁺

Department of Transportation Services*⁺

Department of Parks & Recreation*⁺

Honolulu Board of Water Supply*

4. Elected Officials

Senator Sam Slom, 8th Senatorial District

Representative Lyla B. Berg, Ph.D., 18th Representative District

Representative Barbara C. Marumoto, 19th Representative District

Council Member Charles K. Djou, City Council District IV

5. Others

Mr. Robert Chuck, Chair, Kuliouou – Kalani Iki Board No. 2

Mr. Kelley Roberson, Chair, Waialae – Kahala Board No. 3

Mr. Greg Knudsen, Chair, Hawaii Kai Board No. 1

Mr. Edward Halealoha Ayau, Hui Mālama I Nā Kūpuna o Hawai‘i Nei

Ms. Mervina K.M. Cash-Kaeo, Alu Like, Inc.

Mr. Timothy E. Johns, Historic Hawaii Foundation

Ms. Alyssa Miller, Malama Maunaloa

5. **Others (continued)**

Mr. Allan Lum, General Manager, Waialae Country Club
Mr. John Harman, Head Golf Professional, Waialae Country Club
Mr. Dave Nakama, Golf Course Superintendent, Waialae Country Club
Ms. Jenny Randolph-Quiseus, Manager, Kahala Beach Apartments
Mr. John Blanco, Managing Director, Kahala Hotel & Resort
Mr. Brendan Burns, Principal, Aina Haina Elementary School
Mr. Mark Egan, Property Manager, Aina Haina Shopping Center
Mr. Gerald Tom, Niu Valley Shopping Center
Jehovah's Witnesses: Kaimuki Congregation KH3
King's Cathedral & Chapels
The Bayer Estate
Calvary by the Sea Lutheran Church
Grace Chapel of Honolulu
Church of the Holy Nativity
Hawaii Audubon Society

Other landowners/residents of parcels near the project area (letters addressed to either the resident/property manager or owner for multi-family apartment complexes) – 355 letters mailed.

Persons providing comments by email:

Ms. Moe Hinkforth, Parish Administrator, Calvary by the Sea Lutheran Church*
Ms. Annie Deweese, Administration/Admissions, Calvary by the Sea
Montessori School*
Mr. Walter Laskey, Keahia Way Resident*

Persons providing comments by phone:

Mr. Robert Chang, Wailupe Resident*
Mr. Gregg Kashiwa, Wailupe Resident*

B. PARTIES TO BE CONSULTED PRIOR TO PREPARATION OF THE FINAL ENVIRONMENTAL ASSESSMENT

Copies of the draft environmental assessment will be mailed or delivered to the following agencies, organizations and other interested parties listed below. Parties consulted during the pre-assessment phase that are not included on the distribution list will be notified of the availability of the environmental assessment at the Office of Environmental Quality Control website and sent a copy if one is requested.

1. Federal Government

Department of the Interior, U.S. Fish and Wildlife Service
U.S. Army Engineer District, Honolulu, Regulatory Branch
National Oceanic and Atmospheric Administration

- Pacific Islands Regional Office
- Pacific Islands Fisheries Science Center

2. State Government

Department of Health, Office of Environmental Quality Control
Department of Health, Environmental Management Division

- Clean Water Branch
- Wastewater Branch

Department of Health, Environmental Planning Office

Department of Land & Natural Resources

- Engineering Division
- Division of Boating & Ocean Recreation
- Land Division-Oahu District
- Division of Aquatic Resources
- State Historic Preservation Division
- State Historic Preservation Division, Oahu Burial Council

Department of Business, Economic Development & Tourism, Coastal Zone Management

Department of Transportation

Office of Hawaiian Affairs

3. County Government

Department of Facility Maintenance

Department of Planning & Permitting

Department of Transportation Services

Department of Parks & Recreation

Honolulu Board of Water Supply

4. Elected Officials

Senator Sam Slom, 8th Senatorial District

Representative Lyla B. Berg, Ph.D., 18th Representative District

Representative Barbara C. Marumoto, 19th Representative District

Council Member Charles K. Djou, City Council District IV

5. Others

Mr. Robert Chuck, Chair, Kuliouou – Kalani Iki Board No. 2

Mr. Kelley Roberson, Chair, Waialae – Kahala Board No. 3

5. Others (continued)

Mr. Greg Knudsen, Chair, Hawaii Kai Board No. 1
Mr. Edward Halealoha Ayau, Hui Mālama I Nā Kūpuna o Hawai‘i Nei
Mr. Timothy E. Johns, Historic Hawaii Foundation
Ms. Alyssa Miller, Malama Maunalua
Mr. Allan Lum, General Manager, Waialae Country Club
Ms. Jenny Randolph-Quiseus, Manager, Kahala Beach Apartments
Mr. John Blanco, Managing Director, Kahala Hotel & Resort
Mr. Brendan Burns, Principal, Aina Haina Elementary School
Ms. Moe Hinkforth, Calvary by the Sea Lutheran Church
Aina Haina Public Library

CHAPTER 7

REFERENCES

Chang, Robert, Wailupe resident, personal communication on February 20, 2009.

City and County of Honolulu, Department of Planning and Permitting, “East Honolulu Sustainable Communities Plan,” April 1999.

City and County of Honolulu, Department of Planning and Permitting, “Hawaii Census 2000, Community Profiles: General Demographic Characteristics of Neighborhoods (2000),” January 2002.

City and County of Honolulu, Department of Planning and Permitting, “Hawaii Census 2000, Community Profiles: Selected Economic Characteristics (2000).”

City and County of Honolulu, Department of Planning and Permitting, “Interactive GIS Maps and Data.”

Cultural Surveys Hawaii, Inc., “Archaeological Literature Review, Field Investigation, and Cultural Background Study for the Proposed Kalanianaʻole Highway Sewer System Improvements Project, Waialae, Wailupe, Niu, and Kuliouou Ahupuaa, Oahu Island,” prepared for HDR|Hawaii Pacific Engineers, April 2009.

Environmental Communications, Inc., “Draft Environmental Assessment, 5019 Kalanianaʻole Highway After-the-Fact Shoreline Setback Variance,” March 2004.

Fukunaga & Associates, Inc., “Design Alternatives Report for Elelupe Road and Kalanianaʻole Highway Sewer Rehabilitation SMPR No. 36,” prepared for City and County of Honolulu, Department of Design and Construction, March 2005.

Fukunaga & Associates, Inc., “Sewer Rehabilitation and Infiltration and Inflow Minimization Study,” prepared for the City and County of Honolulu, Department of Design and Construction, December 1999.

HDR | Hawaii Pacific Engineers, Inc., “Design Alternatives Report for Kalanianaʻole Highway Relief Sewer and Sewer Rehabilitation, Preliminary Submittal (60 Percent),” prepared for City and County of Honolulu, Department of Design and Construction, February 8, 2008.

HDR | Hawaii Pacific Engineers, Inc., “Design Alternatives Report for Kalanianaʻole Highway Relief Sewer and Sewer Rehabilitation, Prefinal Submittal (90 percent),” prepared for City and County of Honolulu, Department of Design and Construction, February 19, 2008.

- Kashiwa, Gregg, personal communication on October 22, 2008.
- Malama Maunalua, "Malama Maunalua," September 2008. <<http://www.malamamaunalua.org>>.
- Miller, Alyssa, Malama Maunalua, personal communication on October 8, 2008.
- Nadig, Aaron, U.S. Fish and Wildlife Service, E-mail correspondence on October 21, 2008.
- Nadig, Aaron, U.S. Fish and Wildlife Service, personal communication on October 20, 2008.
- National Oceanic and Atmospheric Association, Pacific Islands Fisheries Science Center, Marine Turtle Research Program, Stacy Hargrove, "Special Report on Marine Turtle Activity in the Maunalua Bay Area, Oahu" PIFSC Internal Report IR-08-020, October 22, 2008.
- National Oceanic and Atmospheric Association, Pacific Islands Fisheries Science Center, National Marine Fisheries Service, Tracy Wurth, "Hawaiian Monk Seal Use of Maunalua Bay" PIFSC Internal Report IR-08-019, October 15, 2008.
- Oceanit, "Final Environmental Assessment for new Pier at 292 Wailupe Circle," prepared for Mr. Michael A. Pietsch, July 28, 2003.
- Pacific Disaster Center, "Civil Defense Tsunami Evacuation Zones for Oahu – Map 2: Waikiki to Wailupe", March 2009.
- Pacific Disaster Center, "Civil Defense Tsunami Evacuation Zones for Oahu – Map 3: Wailupe to Hanauma Bay", March 2009.
- Schumacher, Brett, Department of Land and Natural Resources, Division of Aquatic Resources E-mail correspondence on October 1, 2008.
- State of Hawaii, Department of Business, Economic Development and Tourism, "State of Hawaii Data Book, A Statistical Abstract, 2006."
- State of Hawaii, Department of Business, Economic Development, Hawaii Coastal Zone Management Program, "A Participant's Guide to Special Management Area (SMA) Permit Process in the State of Hawaii," 2006.
- State of Hawaii, Department of Health, "2006 State of Hawaii Water Quality Monitoring and Assessment Report," January 11, 2008.
- State of Hawaii, Department of Health, Clean Air Branch, "2007 Annual Summary Hawaii Air Quality Data," October 2008.

- State of Hawaii, Department of Health, Office of Hazard Evaluation and Emergency Response, "Report to Twenty-Third Legislature State of Hawaii 2006: Environmental Response Law and Hawai'i Community Right to Know Act," December 2005.
- State of Hawaii, Department of Health, "Title 11 Hawaii Administrative Rules Chapter 42 Vehicular Noise Control for Oahu," November 6, 1981.
- State of Hawaii, Department of Health, "Title 11 Hawaii Administrative Rules Chapter 46 Community Noise Control," September 1996.
- State of Hawaii, Department of Health, "Title 11 Hawaii Administrative Rules Chapter 54 Water Quality Standards," August 31, 2004.
- State of Hawaii, Department of Health, Safe Drinking Water Branch, "Island of Oahu Underground Injection Control Areas", September 1999.
- State of Hawaii, Department of Land and Natural Resources, Commission on Water Resource Management, "Ground Water Hydrologic Unit Map, Island of Oahu," July 2001.
- State of Hawaii, Department of Land and Natural Resources, Commission on Water Resource Management, "Surface-Water Hydrologic Units," June 2005.
- State of Hawaii, Department of Land and Natural Resources, Commission on Water Resource Management, "Water Resources Protection Plan," June 1990.
- State of Hawaii, Department of Land and Natural Resources, Division of Aquatic Resources, "Atlas of Hawaiian Watersheds and Their Aquatic Resources: Wailupe, Oahu", April 7, 2008.
- State of Hawaii, Department of Land and Natural Resources, Division of Water and Land Development, "Rainfall Atlas of Hawaii," Report R76, June 1986.
- University of Hawaii, Botany Department, "Edible Limu...Gifts from the Sea," 2002, <<http://www.hawaii.edu/reefalgae/publications/ediblelimu/index.htm>>
- U.S. Department of Agriculture, Soil Conservation Service, "Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii," August 1972.
- U.S. Department of the Army Corps of Engineers, Pacific Ocean Division, "Quality Control and Peer Review Plan for Wailupe Stream Flood Damage Reduction Project", October, 17, 2007.
- U.S. Department of the Army Corps of Engineers, Public Notice No. POH-2004-1063, "Application for Department of Army Permit for Modification of Manmade Drainage

Ditch at Kapakahi Stream, Honolulu, Hawaii,” November 28, 2005.
<<http://www.poh.usace.army.mil/pa/PublicNotices/PN20051128%2004-1063.pdf>>.

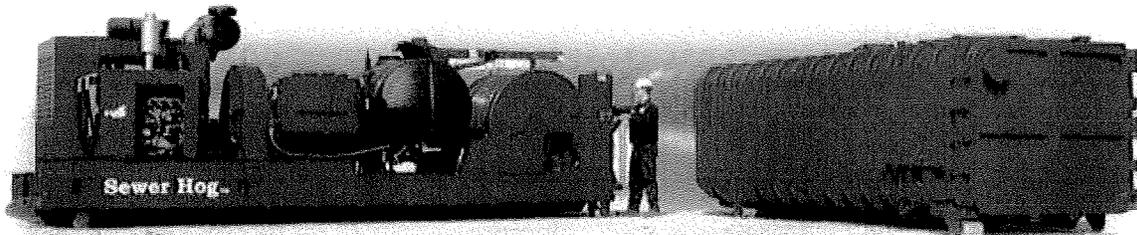
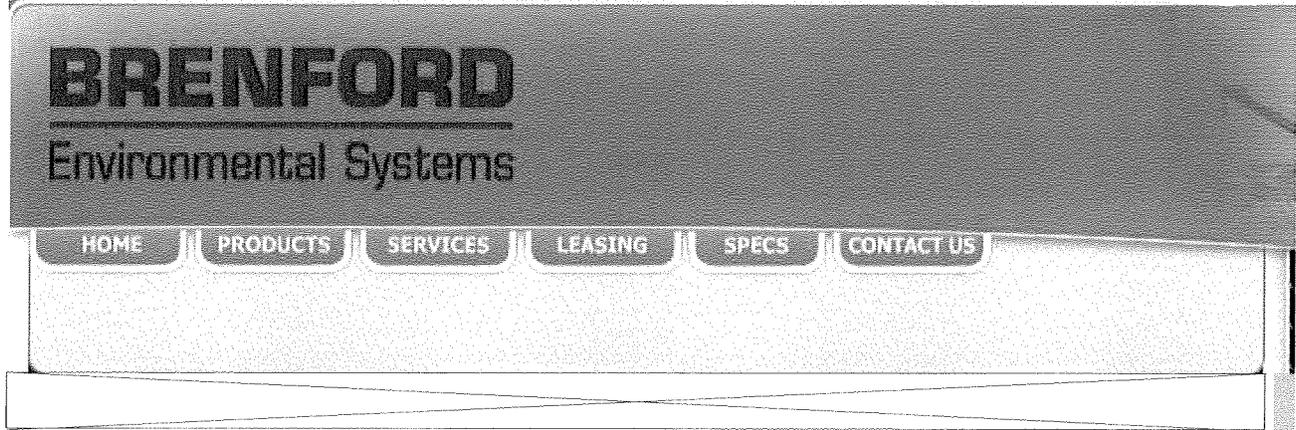
U.S. Department of Homeland Security, Federal Emergency Management Agency (FEMA), Map Service Center, 2008.

U.S. Environmental Protection Agency, Groundwater and Drinking Water, “Technical Factsheet on: ASBESTOS”, November 28, 2006.

Appendix A

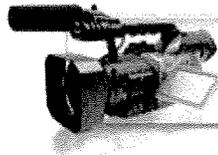
Sewer Cleaning Equipment Literature

"Sewer Hog" Equipment



Brenford's Sewer Cleaning Breakthrough Eliminates the Need for Bypass Pumping

Brenford Environmental Systems introduces the Sewer Hog and the Grit Gator, which when combined represent a revolutionary patented process to the sewer cleaning industry. This patented high speed, closed-loop, non odor emitting system provides safe, efficient, cost effective services to both the municipal and industrial markets. Applications for this new system include the removal and high speed separation of sand and grit from water in large diameter sewer lines, storm drains, ponds, lagoons, API separators, digesters and siphons, as well as other waste stream interruption applications. Brenford helps clients significantly reduce operating expenses and regain capacity by implementing procedures that are simpler, faster, and more effective than traditional methods. Most conventional grit removal methods incorporate the use of truck-mounted vacuum systems, centrifuges, screens, plate and frame filters, or belt presses. Brenford's Grit Gator system operates under positive pressure created by pumping. Brenford's state-of-the-art technology outperforms conventional labor-intensive procedures



[Click here to see Sewer Hog Video](#)

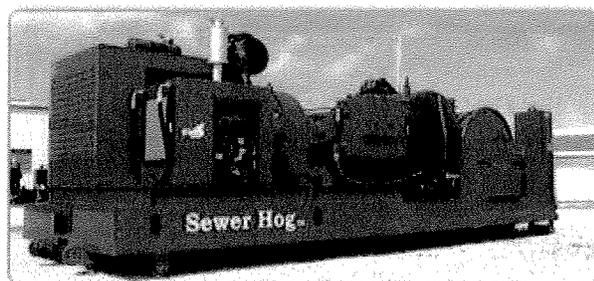
BRENFORD

Environmental Systems

[HOME](#)[PRODUCTS](#)[SERVICES](#)[LEASING](#)[SPECS](#)[CONTACT US](#)

Sewer Hog

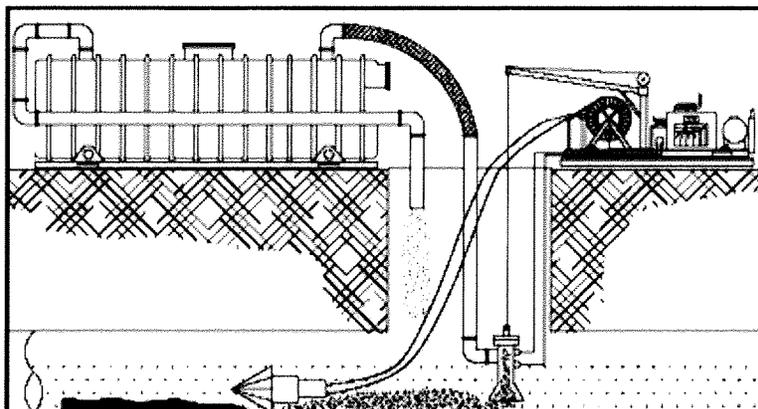
WORLD'S MOST POWERFUL JETTER



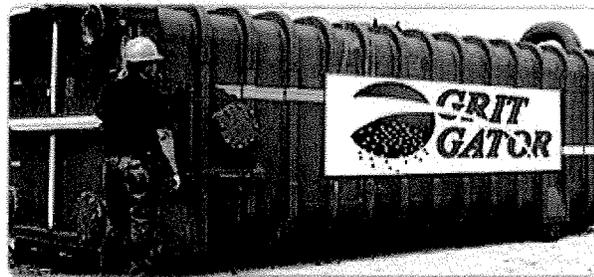
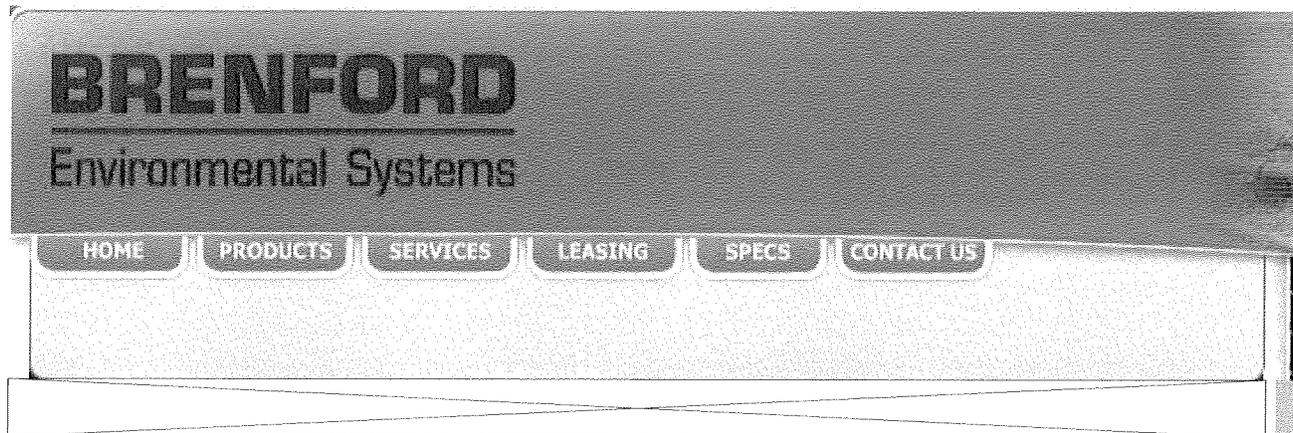
The **SEWER HOG** is, to the best of our knowledge, the largest and most powerful Jetter in the market. The **SEWER HOG/GRIT GATOR SYSTEM** has been used to clean 18" diameter pipe and up. The biggest to date was a CSO tunnel in Atlanta, Georgia that is twenty-two (22') feet in diameter, one hundred thirty feet (130') deep, four thousand feet (4000') long, with 15' of debris.

A 600 hp engine powers the Jetter, generating water at 350 GPM at 2000 psi to a 150 # nozzle via twin 1-1/4" hoses. The intense downward spray generated by the nozzle suspends the materials and the 350 GPM flow forces them down the sewer pipe to the manhole where the 6" down hole pump forces the sand and water up to the **GRIT GATOR** dewatering box via 8" hoses @ 2500 GPM. The sand and grit is captured returning 99% particle free water back to the sewer line. In cases where hydrant water is not available, the decanted water is reused to power the Jetter.

The **SEWER HOG** has the sand removal capability of 5 cubic yards per minute, making the system ideal for cleaning large diameter sewer lines, regardless of the concentration of material in the line. Line segments up to 4000 feet can be cleaned without repositioning the equipment.

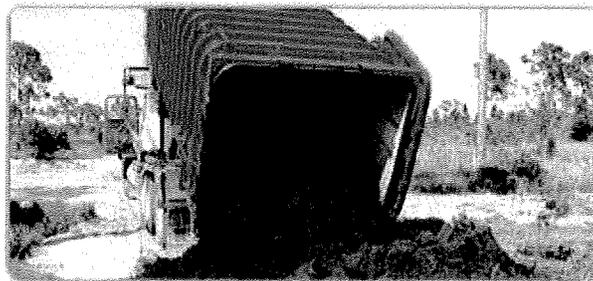


This process is protected under one or more of the following U.S. Patent numbers: #5,068,940; #5,129,957; #5,336,333; and #5,341,539.



The **GRIT GATOR** is an enclosed sealed unit that captures the sand, grit and water pumped from waste collection systems, such as sewers, API separators, digesters and lagoons. The positive pressure created by pumping rather than the traditional vacuum systems, removes and transfers the waste into the **GRIT GATOR**'s surface dewatering box. The separation box is capable of processing over 1500-2500 GPM of sand and water at 80% solid concentration. Ninety-nine percent of the sand and grit are filtered out while the water is simultaneously decanted back to the source. In turn, sand and grit are much drier than traditional cleaning systems.

The **GRIT GATOR** placed in line near the source of the solids generation eliminates solids entering into a pond, lagoon or WWTP for settlement, while reducing costs associated with cleaning, transportation and solidification fees at time of disposal. This superior closed-loop system provides complete containment, thereby, eliminating risks of waste spills and emissions during transportation and thus meeting or exceeding most applicable local, state, and federal emission standards. Filters and baffles can be added to add flexibility to specific projects.



The **GRIT GATOR**'s access hatch is designed to withstand the internal pressures, ensuring a complete sealed system that greatly reduces emissions and spills. This allows the **GRIT GATOR** to process waste at a higher speed than open containers.

Copyright (c) 2007. Brenford Environmental Systems. All rights reserved. - Webdesign by Webzo

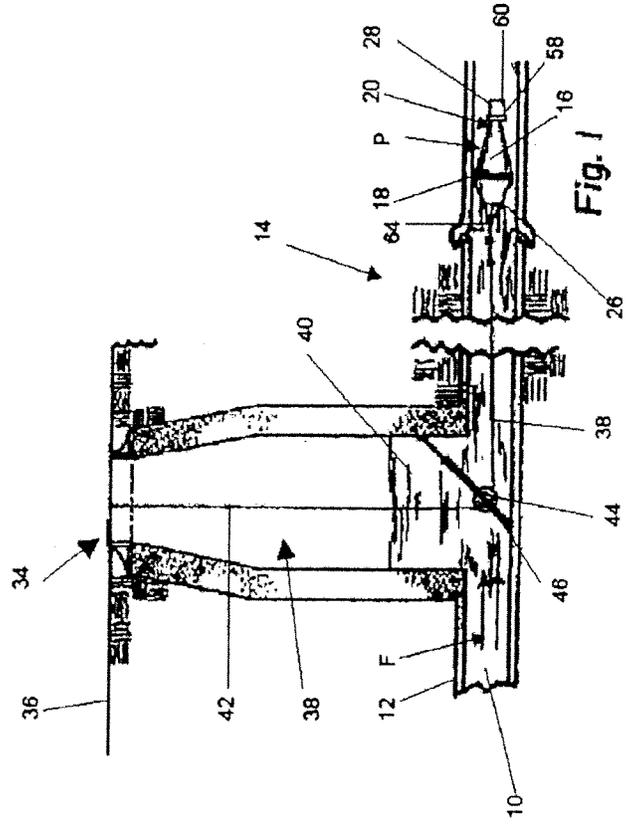
"Jigawon" Equipment

(12) **United States Patent**
Nezat, II

(10) **Patent No.:** US 6,508,261 B1
(45) **Date of Patent:** Jan. 21, 2003

Abstract:

A cleaning plug (P) adaptable to be placed within an interior passageway (10) of a tubular system (14) includes a generally conically shaped element (16) having a first end (18) and an opposite second end (20). The width (22) of the first end (18) fits within the tube (12). The width (24) of the second end (20) may be less than the first end (18). Rigging (26) is connected to the first end (18) to secure the conical element (16). A valve assembly (28) mounted with the second end (20) has a normally closed position (30) preventing appreciable fluid flow and an open position (32) permitting fluid flow (F) through the valve (28) if the flow pressure therethrough is greater than a minimum selected pressure.

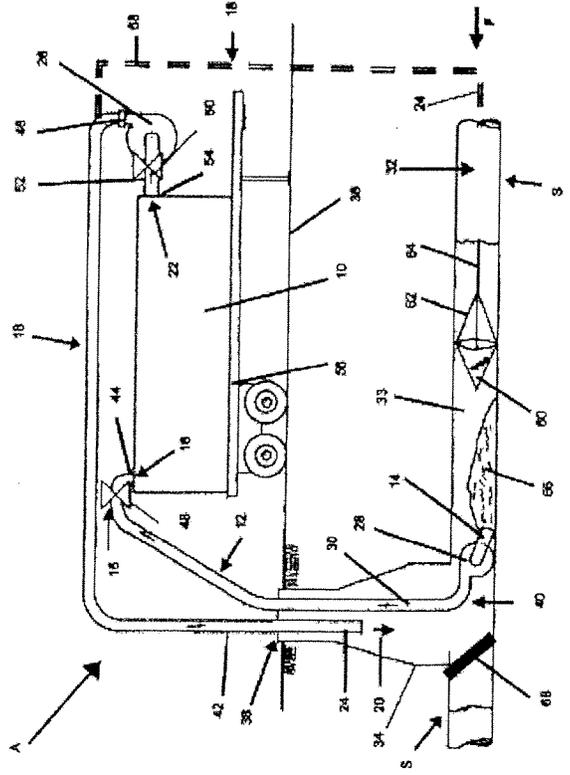


(12) **United States Patent**
Nezat, II

(10) Patent No.: **US 6,764,604 B1**
(45) Date of Patent: **Jul. 20, 2004**

Abstract:

A separation apparatus (A) for separating solids from a slurry of liquid and solids includes a separation tank (10). An intake assembly (12) communicates with the separation tank (10) for conveying the slurry through an entrance end (14) into an inlet (16) formed in the tank (10). An outlet assembly (18) communicates with the separation tank (10) for conveying decanted liquid (20) through an outlet (22) formed in the tank (10) to an exit end (24) of the outlet assembly (18) positioned in a desired location. A pump (26) is adapted to convey the decanted liquid (20) from the separation tank (10) through the outlet assembly (18). The tank (10), intake assembly (12), and outlet assembly (18) form an airtight, compartmented system when the entrance end (14) of the intake assembly (12) and the exit end (24) of the outlet assembly (18) are sealed.



Appendix B

Archaeological Literature Review, Field Inspection, and Cultural Background Study

**Archaeological Literature Review, Field Inspection, and
Cultural Background Study for the Proposed
Kalaniana'ole Highway Sewer System
Improvements Project, Wai'alaie Wailupe, Niu, and
Kuli'ou'ou Ahupua'a,
O'ahu Island**

**TMK: [1] 3-5-023:001 to 004, 038, 039; 3-5-058:001 to 011; 3-5-022:001 to 023;
3-6-001:000; 3-6-002:000; 3-6-003:000, 007 to 010, 012 to 015, 029, 031, 042;
3-7-010:001 to 006; 3-7-011:001 to 007; 3-8-014:017, 019, 034**

**Prepared for
HDR|Hawai'i Pacific Engineers, Inc.**

**Prepared by
Constance R. O'Hare, B.A.,
David W. Shideler, M.A.,
and
Hallett H. Hammatt, Ph.D.**

**Cultural Surveys Hawai'i, Inc.
Kailua, Hawai'i
(Job Code: WAIALAE 3)**

April 2009

O'ahu Office
P.O. Box 1114
Kailua, Hawai'i 96734
Ph.: (808) 262-9972
Fax: (808) 262-4950

www.culturalsurveys.com

Maui Office
16 S. Market Street, Suite 2N
Wailuku, Hawai'i 96793
Ph: (808) 242-9882
Fax: (808) 244-1994

Management Summary

Reference	Archaeological Literature Review, Field Inspection, and Cultural Background Study for the Proposed Kalaniana'ole Highway Sewer System Improvements Project, Wai'alae, Wailupe, Niu, and Kuli'ou'ou Ahupua'a, O'ahu Island (O'Hare et al. 2008)
Date	April 2009
Project Number (s)	WAIALAE 3
Investigation Permit Number	The field inspection component of the archaeological literature review and field inspection was carried out under archaeological permit number 08-14 issued by the Hawai'i State Historic Preservation Division/Department of Land and Natural Resources (SHPD/DLNR), per Hawai'i Administrative Rules (HAR) Chapter 13-282.
Project Location	TMK: [1] 3-5-023:001 to 004, 038, 039; 3-5-058:001 to 011; 3-5-022:001-023; 3-6-001:000; 3-6-002:000; 3-6-003:000, 007 to 010, 012 to 015, 029, 031, 042; 3-7-010:001 to 006; 3-7-011:001 to 007; 3-8-014: 017, 019, 034
Land Jurisdiction	City and County of Honolulu
Agencies	State of Hawai'i Department of Land and Natural Resources / State Historic Preservation Division (DLNR/SHPD)
Project Description	The Kalaniana'ole Highway Sewer System Improvements project includes rehabilitation of older sewer lines with CIPP (Cured-in-Place-Pipe) liners, rehabilitation of manholes with epoxy liners, new manhole frames and covers, and the cleaning of sewer lines.
Project Area	Approximately 14, 000 feet (4.3 kilometers) long with ground disturbance, primarily at selected manholes

<p>Historic Preservation Regulatory Context</p>	<p>The project is subject to Hawai'i State environmental and historic preservation review legislation [Hawai'i Revised Statutes (HRS) Chapter 343 and HRS 6E-42/Hawai'i Administrative Rules (HAR) Chapter 13-284, respectively]. Due to federal funding, this project is a federal undertaking requiring compliance with Section 106 of the National Historic Preservation Act (NHPA), the National Environmental Policy Act (NEPA), and the federal Department of Transportation Act (DTA). This investigation does not fulfill the requirements of an archaeological inventory survey investigation (per HAR Chapter 13-276); however, through detailed historical, cultural, and archaeological background research, and a field inspection of the project area, this investigation identifies the likelihood that historic properties may be affected by the project. The document is intended to facilitate the project's planning and support the project's historic preservation review compliance. Based on findings, cultural resource management recommendations are presented.</p>
<p>Fieldwork Effort</p>	<p>A field inspection was conducted on September 5, 2008 by Constance R. O'Hare, B.A. under the general supervision of Dr. Hallett H. Hammatt. No surface historic features were present. No surface historic properties were noted.</p>
<p>Number of Historic Properties Identified</p>	<p>Based on background research and a field-check, the project area has a relatively high potential for the presence of pre-contact and post-contact burials, mid-nineteenth Māhele-era traditional habitation and agricultural deposits and artifacts, and early historic trash deposits associated with ranch and dairy operations.</p> <p>It is recommended that an archaeological monitoring program (monitoring plan, on-site monitoring & monitoring report) be instituted with an archaeological monitor present on-site during all ground-disturbing activities.</p>

Table of Contents

Management Summary	i
Section 1 Introduction	1
1.1 Project Background	1
1.2 Scope of Work	5
1.3 Environmental Setting	5
1.3.1 Natural Environment.....	5
1.3.2 Built Environment	6
1.4 Methods	8
1.4.1 Background Research	8
1.4.2 Field Methods	8
Section 2 Mythological and Traditional Accounts	9
2.1 Chants and Sayings of the Wai‘alae Coast	9
2.2 Place Names.....	11
2.2.1 Wai‘alae Place Names	11
2.2.2 Wailupe Place Names	13
2.2.3 Niu Place Names.....	16
2.2.4 Kuli‘ou‘ou Place Names.....	17
2.3 Legends Concerning Wai‘alae, Wailupe, Niu, and Kuli‘ou‘ou	19
2.3.1 Kū‘ula, the Fisherman’s God and his son ‘Ai‘ai	19
2.3.2 The Traveling Mullet of O‘ahu.....	20
2.3.3 Kawelo and the Wai‘alae fisherman.....	21
2.3.4 Aku Fishing with Palila	22
2.3.5 Hi‘iaka’s Travels through Southeastern O‘ahu.....	22
2.3.6 Kamapua‘a, the Pig-god, in Southeastern O‘ahu.....	23
2.3.7 The Gods Kāne and Kanaloa along the Wai‘alae Coast	24
Section 3 Background History	26
3.1 Early Post-Contact Period.....	26
3.1.1 Early Historic Trails	28
3.1.2 Hawaiian Battles and Burial Grounds.....	30
3.2 Mid-Nineteenth Century and the Māhele	33
3.2.1 Wai‘alae.....	33
3.2.2 Wailupe.....	35
3.2.3 Niu	36
3.2.4 Kuli‘ou‘ou.....	39
3.3 Late Nineteenth Century to Early Twentieth Century	40
3.3.1 Wai‘alae Land Use	41
3.3.2 Wailupe Land Use	45
3.3.3 Niu Land Use.....	46
3.3.4 Kuli‘ou‘ou Land Use	47

3.4 Mid-Twentieth Century to the Present.....	48
3.5 Interview with Mr. Gregg Kashiwa	56
Section 4 Previous Archaeological Research	59
4.1 Wai‘alae Archaeological Research	59
4.1.1 Non-Burial Reports.....	59
4.1.2 Burials on Kāhala and Wai‘alae Beaches	63
4.2 Wailupe Archaeological Research.....	69
4.2.1 Non-Burial Reports.....	70
4.2.2 Burials in Wailupe	72
4.3 Niu Archaeological Research	74
4.3.1 Habitation/Agricultural Sites and Deposits	75
4.3.2 Ceremonial Sites – Kūlepeamoā Heiau	75
4.3.3 Aquacultural Sites – Kūpapa Fishpond	75
4.3.4 Burial Sites.....	77
4.4 Kuli‘ou‘ou Archaeological Research.....	80
4.4.1 Non-Burial Reports.....	80
4.4.2 Burial Sites.....	81
4.5 Background Summary and Predictive Model.....	82
4.5.1 Wai‘alae Predictive Model	82
4.5.2 Wailupe Predictive Model	83
4.5.3 Niu Predictive Model.....	83
4.5.4 Kuli‘ou‘ou Predictive Model	84
4.6 Recommendations.....	84
Section 5 Results of Field Inspection	85
Section 6 References Cited	91

List of Figures

Figure 1. U.S. Geological Survey map (Honolulu and Koko Head quads), showing location of Kalaniana‘ole Highway Sewer System Improvements project area through the <i>ahupua‘a</i> of Wai‘alae, Wailupe, Niu, and Kuli‘ou‘ou.....	2
Figure 2. Kalaniana‘ole Highway Sewer System Improvements project area (map provided by client)	3
Figure 3. Aerial photograph (2005 U.S.G.S .Orthoimagery), showing location of Kalaniana‘ole Highway Sewer System Improvements project area	4
Figure 4. Soils in the Kalaniana‘ole Highway Sewer System Improvements project area (U.S. Dept. Agriculture, from Foote et al. 1972)	7
Figure 5. 1883 map (survey by George E. G. Jackson) of the Wai‘alae Coast from Koko Head to Diamond Head, showing the <i>ahupua‘a</i> and valleys (from east to west) of Maunalua, Kuli‘ou‘ou, Niu, Wailupe, Wai‘alae Iki, and Wai‘alae Nui (Hawai‘i Land Survey Division, Registered Map No. 1293)	10
Figure 6. 1850-1860 map, Plan of Wailupe, by W. H. Pease (Hawai‘i Land Survey Division, Registered Map No. 115).....	14
Figure 7. 1845 sketch (sepia wash over pencil) of Niu by John B. Dale titled “Burial Cave, Valley of Niu (Koko Head)” (original in J. Welles Henderson Collection; reprinted in Forbes 1992:127); the walled coastal Kūpapa Fishpond of Niu is on the left and the Adams Homestead (coconut tree cluster) is shown between the fishpond and the ridge..	17
Figure 8. 1922 map of Land Court Application No. 578 to Joseph Paikō, Jr. for the land of Kuli‘ou‘ou 1 st (Hawai‘i Land Survey Division)	18
Figure 9. Copper engraving “A View in the Bay at Waohoo” by Inigo Barlow. Made, circa 1786, during the Portlock and Dixon visit to the Wai‘alae Coast (engraving reprinted in Beresford 1968:54); shows men walking across shallow reef in Paikō Peninsula area	20
Figure 10. 1855 map (portion) of southeastern O‘ahu by Lt. La Passe of the French naval vessel <i>Eurydice</i> , showing Wailupe Pond in Wailupe and Kūpapa Pond in Niu; notice large settlement at Wai‘alae (left foreground) with rectangular taro patches; in Wailupe, Niu, and Kuli‘ou‘ou there are only scattered houses and no taro patches (map reprinted in Fitzpatrick 1986:82-83)	27
Figure 11. Map of southeast O‘ahu, showing trails (dashed lines) ca. 1810, and later historic road alignments (solid lines); note that three trails converged near Wai‘alae Stream (map from ‘Ī‘Ī 1959:93; not to scale).....	29
Figure 12. 1927 Land Court Application Map No. 828 (Hawai‘i Land Survey Division) in Wai‘alae, showing location of Land Commission Awards (shaded in gray) and a cemetery site (Tomb of Mahuka); information on coastal LCA parcels added from 1924 Land Application Map No. 665; the location of former lakes and springs (shaded in blue) added from 1903 Bishop Estate Map No. 335, the location of an area marked “graves” (Pu‘u Makani Cemetery) added from 1920 Bishop Estate Map No. 718-B (portions of Bishop Estate maps shown in O‘Hare et al. 2008)	34

Figure 13. 1925 Land Court Application Map No. 656 (Hawai‘i Land Survey Division) to Robert Hind for Wailupe lands, showing location of LCA parcels (shaded in gray) and land owned by the Perry family and Robert Hind; note location of LCA 6175:1 to Kamaha on the *makai* side of the coastal government road (now Kalaniana‘ole Hwy.)37

Figure 14. 1903 map with Grant 4728 to Antonio Perry for Wailupe Fishpond, showing location of Punakou Spring, Puhikahi Spring, Punakou Fishpond, and coastal lot for LCA 2066 to Kalua (Map on file at Hawai‘i Land Survey Division; reprinted in Ogata 1992:Appendix II).....38

Figure 15. 1848 map with LCA 6175, showing three parcels (*‘āpana*) to Kamaka, two on each side of the government road (now Kalaniana‘ole Hwy.) and one directly adjacent to the *Kai* (sea) (Map on file at Hawai‘i Land Survey Division; reprinted in Ogata 1992:Appendix II).....39

Figure 16. 1889 photograph of “Camp Austen” in Wai‘alae, an encampment of the Honolulu Rifles; the photograph was taken from the general location of the Wai‘alae Golf Course, looking towards Wai‘alae Nui and Pālolo (Bishop Museum Archives; photograph reprinted in Scott 1968:679)43

Figure 17. 1935 photograph of the Wai‘alae Country Club, view to the north (photograph reprinted in Hitch and Kuramoto 1981:45).....45

Figure 18. 1920s photograph of the Adams Homestead on the Niu coast (original photograph at Bernice P. Bishop Museum Archives; reprinted in Scott 1968:689).....47

Figure 19. 1933 aerial photo of Wailupe fishpond and the former alignment and conditions of Kalaniana‘ole Highway (Bishop Museum Archives); note buildings of the Hind-Clarke Dairy on the *mauka* side of the highway and Wailupe Fishpond on the *makai* side49

Figure 20. Mid-1930s photograph of Wailupe Fishpond and Hind-Clarke Dairy; checkered fields on left are the site of the future ‘Āina Haina shopping center, built in 1947 (Hind Estate archives; photograph reprinted in Scott 1968: 688).....50

Figure 21. Circa 1950s photo of Wailupe peninsula, formed after the filling of the Wailupe fishpond and developed for residential homes (Bishop Museum Archives); the residential ‘Āina Haina neighborhood is on the *mauka* side of the highway50

Figure 22. 1919 War Department Fire Control map (Koko Head Quad), showing the Kalaniana‘ole Highway Sewer System Improvements project area.....52

Figure 23. 1927 U.S. Geological Survey map (Koko Head Quad), showing the Kalaniana‘ole Highway Sewer System Improvements project area53

Figure 24. 1943 War Department map (Diamondhead Quad), showing the Kalaniana‘ole Highway Sewer System Improvements project area54

Figure 25. 1954 U. S. Army Mapping Service map (Koko Head Quad), showing the Kalaniana‘ole Highway Sewer System Improvements project area.....55

Figure 26. U.S. Geological Survey base map, showing location of previous archaeological project areas and archaeological sites in Wai‘alae and Wailupe Ahupua‘a60

Figure 27. U.S. Geological Survey base map, showing previous archaeology in Niu and Kuli‘ou‘ou in the vicinity of the project area.....76

Figure 28. U.S. Geological Survey base map, showing burials adjacent to Kalaniana'ole Highway from Wailupe to Maunalua79

Figure 29. Segment 1 sewer line west end at Kāhala Wastewater Pumping Station, view to the west86

Figure 30. Segment 1 sewer line, located along Kāhala Beach Apartments (left of sidewalk), view to the west; no excavation and minimal access required86

Figure 31. Segment 1 sewer line, located along Wai'alae Country Club Golf Course, view to the east. Sewer line is to the right of the palm trees87

Figure 32. Segment 1 sewer line located along Wailupe Beach, view to the west. Manhole frame and cover to be replaced87

Figure 33. Segment 1 sewer line, located at Wailupe Beach Park (behind rest station), view to the west88

Figure 34. Segment 2 sewer line and manhole along Kalaniana'ole Highway, view to the east ..88

Figure 35. Segment 2, sewer line and manhole in residential area east of Wailupe Circle, view to the south89

Figure 36. Segment 2 sewer line along Kalaniana'ole Highway near Kawaiku'i Park, view to the east89

Figure 37. Segment 3 sewer line and manhole along Kalaniana'ole Highway sidewalk area, view to the east90

Figure 38. Segment 3 sewer line within Kalaniana'ole Highway, view to the east90

List of Tables

Table 1. Land Commission Awards in the coastal section of Wai'alae near the project area.....35

Table 2. Previous archaeological work in the Wai'alae-Kāhala area61

Table 3. Human Skeletal Remains from Wai'alae Donated to the Bernice P. Bishop Museum ...65

Table 4. Previous Archaeological Studies in Wailupe Ahupua'a.....69

Table 5. Human Skeletal Remains from Wailupe Donated to the Bernice P. Bishop Museum....73

Table 6. Human Skeletal Remains from Niu Donated to the Bernice P. Bishop Museum78

Table 7. Human Skeletal Remains from Kuli'ou'ou Donated to the Bernice P. Bishop Museum82

Section 1 Introduction

1.1 Project Background

At the request of HDR|Hawai'i Pacific Engineers, Inc. (1132 Bishop Street, Suite 1003, Honolulu, HI, 96813-2830), Cultural Surveys Hawai'i, Inc. (CSH) had completed a literature review, field inspection, and cultural background study for the proposed Kalaniana'ole Highway Sewer System Improvements Project in Wai'ala'e, Wailupe, Niu, and Kuli'ou'ou Ahupua'a, Honolulu District, O'ahu Island, TMK: [1] 3-5-023:001 to 004, 038, 039; 3-5-058:001 to 011; 3-5-022:001-023; 3-6-001:000; 3-6-002:000; 3-6-003:000, 007 to 010, 012 to 015, 029, 031, 042; 3-7-010:001 to 006; 3-7-011:001 to 007; 3-8-014:017, 019, 034. The project area is shown on a U.S.G.S. topographic map (Figure 1), a map provided by the client (Figure 2), and an aerial photograph (Figure 3).

Due to federal funding, this project is a federal undertaking requiring compliance with Section 106 of the National Historic Preservation Act (NHPA), the National Environmental Policy Act (NEPA), and the federal Department of Transportation Act (DTA). As a County undertaking, the project is also subject to Hawai'i State environmental and historic preservation review legislation [Hawai'i Revised Statutes (HRS) Chapter 343 and HRS Chapter 6E-8 / Hawai'i Administrative Rules (HAR) Chapter 13-275, respectively]. Consultation will take place with the Department of Land and Natural Resources / State Historic Preservation Division (DLNR / SHPD) over all aspects of this project.

This study will not meet the requirements of an archaeological inventory-level survey per the rules and regulations of the State Historic Preservation Division/Department of Land and Natural Resources (SHPD/DLNR). However, the level of work would be sufficient to address archaeological site types and locations, and allow for future work recommendations. This literature review and field inspection project report details research methods and findings. The goal is to identify, if possible, cultural resources and historic properties and provide recommendations related to the State of Hawai'i historic review process.

The concept behind these types of studies is to provide the landowner (or their representative) with an overview of existing archaeological conditions to facilitate planning and budgeting considerations and to inform regarding possible archaeological or cultural resources constraints to the proposed development.

The project sewer line consists of three segments (see Figure 2). The first two segments (Segment 1 and Segment 2) make up the Kalaniana'ole Highway Trunk Sewer. The trunk sewer was constructed in the mid-1950s and consists of 30-inch and 36-inch reinforced concrete pipe (RCP), 24-inch vitrified clay pipe (VCP), and 8-, 10-, and 16-inch cast iron (CI) inverted siphon pipes under Wailupe Stream. The downstream end of the trunk sewer from Wailupe Beach Park to the Kāhala Pump Station was rehabilitated in 1991 with a cured-in-place-pipe (CIPP) liner. Segment 3 of the project is located in the Niu Valley area and was constructed in the 1970s. This third segment consists of a 10-inch VCP sewer line and an 8-inch VCP branch line. The

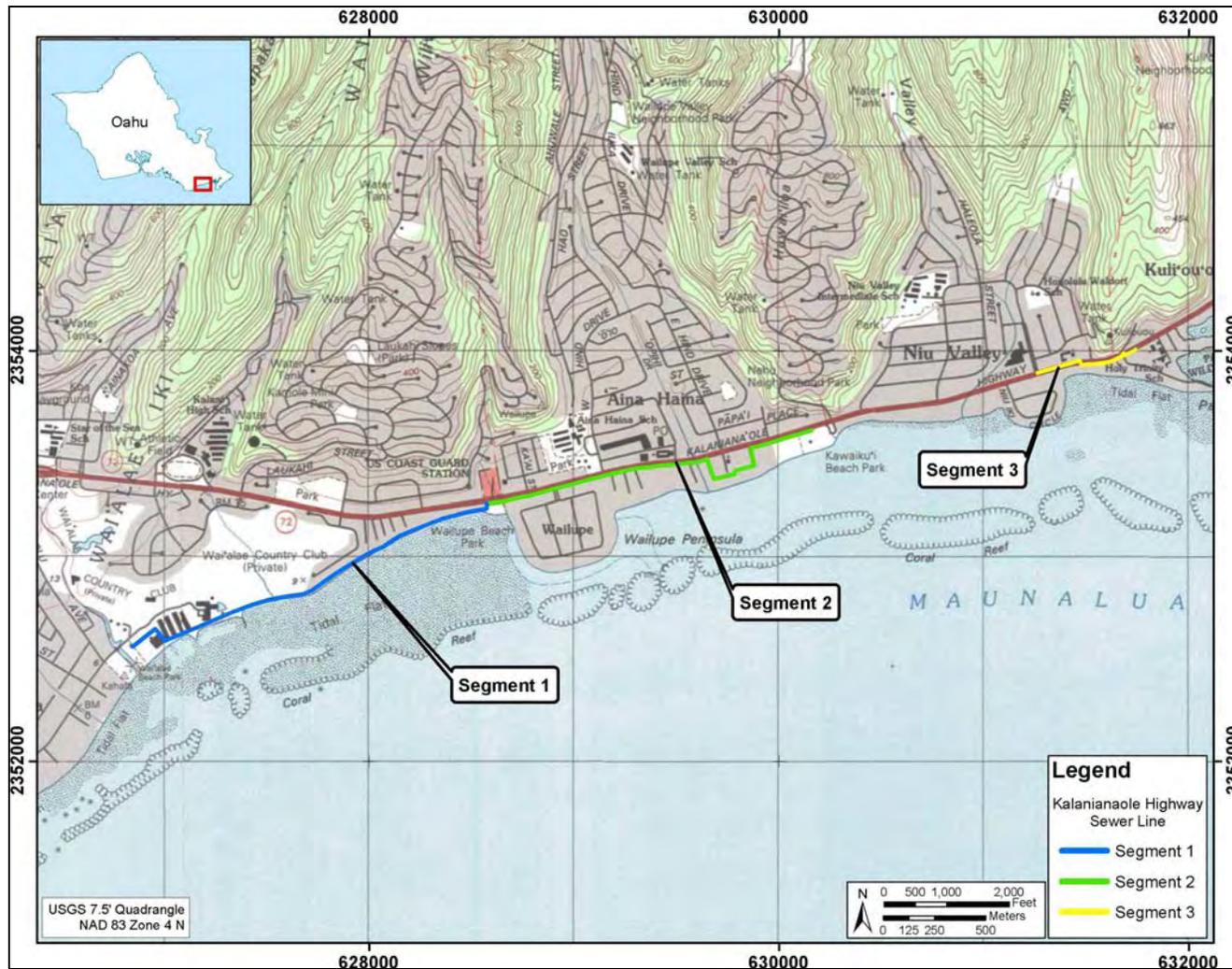


Figure 1. U.S. Geological Survey map (Honolulu and Koko Head quads), showing location of Kalaniana'ole Highway Sewer System Improvements project area through the *ahupua'a* of Wai'alae, Wailupe, Niu, and Kuli'ou'ou

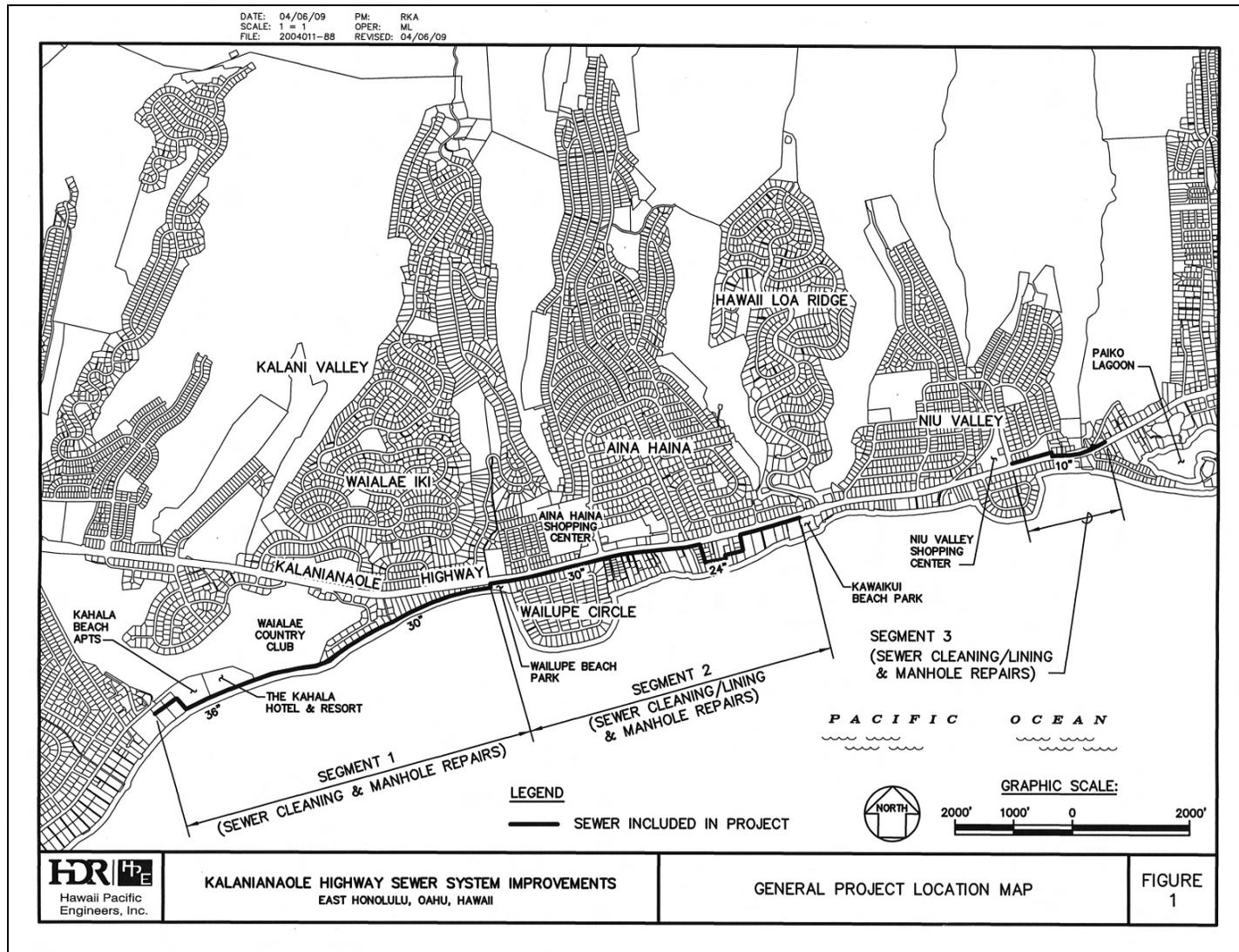


Figure 2. Kalaniana'ole Highway Sewer System Improvements project area (map provided by client)



Figure 3. Aerial photograph (2005 U.S.G.S .Orthoimagery), showing location of Kalaniana'ole Highway Sewer System Improvements project area

Kalaniana'ole Highway Sewer System Improvements project proposes: (1) cleaning of sewer lines in all three segments; (2) rehabilitation of Segment 2 and Segment 3 sewer lines with CIPP liners; (3) rehabilitation of Segment 2 manholes with epoxy liners; and (4) replacement of selected corroded and/or undersized manhole frames and covers.

The project will involve performing shallow excavations generally not more than two to three feet in depth for temporary buried sewage bypass lines at road and driveway crossings. Excavations not generally exceeding four feet will also be performed at sewer manholes that are being retrofitted with larger covers and/or being used for bypassing operations.

1.2 Scope of Work

1. Historical research was conducted, including the study of archival sources, historic maps, Land Commission Awards and previous archaeological reports in order to construct a history of land use and to determine if archaeological sites have been recorded on or near the sewer lines.
2. A limited field inspection of the project area was conducted to identify any surface archaeological features and to investigate and assess the potential for impact to such sites. This assessment identified any sensitive areas that may require further investigation or mitigation before the project proceeds.
3. The present report includes the results of the historical research and the limited fieldwork with an assessment of historic properties and cultural resources based on that research. It includes recommendations for further historic review process work, if appropriate. It also provides mitigation recommendations for archaeologically or culturally sensitive areas that need to be taken into consideration.

1.3 Environmental Setting

1.3.1 Natural Environment

This portion of Kalaniana'ole Highway in the southeast coast of O'ahu is within an area called the Kāhala Plain, which extends seaward from the Ko'olau Mountains. The inland area of the plain is covered with detrital alluvial and colluvial sediments, while the seaward portion has dune sand deposits along the shore.

Median annual rainfall in this section of coastal southeast O'ahu is 500-760 mm (20-30 inches) per year (Giambelluca et al. 1986). The land near the highway is today covered with exotic grasses, *koa haole* (*Leucaena glauca*), or landscaped plants, including *laua'e* (*Polypodium phymatodes*), roses (*Rosa* spp.), citrus (*Citrus nobilis*), Samoan coconut (*Cocos nucifera*), plumeria (*Plumeria acuminata*), and other ornamental plants. Undeveloped inland areas have sparse vegetation, due to being used as pasture for so many years. Along the road and pasture perimeters are 'ilima (*Sida fallax*), cactus (Cactaceae), red pepper (*Capsicum frutescens* var. *conoides*), rubber tree (*Ficus elastica*), and Christmas-berry (*Schinus terebinthifolius*).

Soils in the area consist of (from west to east): Beaches, Jaucas sand, Mamala Stony Silty Clay, 0-12% slopes, Coral Outcrop, Mokuleia Clay Loam, Pamoia Silty Clay, 5-20% slopes

(Figure 4) in Wai‘alaie and Wailupe; and, Mokuleia Clay Loam and Kawaihapai Clay Loam, 0-2% slopes in Niu and Kuli‘ou‘ou. Beaches occur as sandy, gravelly, or cobbly areas, which are washed and rewashed by ocean waves. Beaches consist mainly of light-colored sands derived from coral and seashells. The Jaucas series consists of excessively drained, calcareous soils that occur as narrow strips on coastal plains, adjacent to the ocean. They developed in wind and water deposited sand from coral and seashells. The Mamala series consists of shallow, well-drained soils along the coastal plains, which formed in alluvium deposited over coral limestone and consolidated calcareous sand. Coral outcrop consists of coral or cemented calcareous sand, from coral reefs that formed in shallow ocean water during the time the ocean stand was at a higher level. The Mokuleia series consists of well-drained soils along the coastal plains, which formed in recent alluvium deposited over coral sand. The Pamoia series consists of well-drained soils on uplands, which formed in fine-textured old alluvium. The Kawaihapai series consists of well-drained soils in drainageways and on alluvial fans on coastal plains, which formed in alluvium derived from basic igneous rock in humid uplands (Foote et al. 1972).

1.3.2 Built Environment

The Kalaniana‘ole Highway Sewer System Improvements Project is divided into three segments. The first two segments make up the Kalaniana‘ole Highway Trunk Sewer in the Wai‘alaie/Wailupe area, and the third is a tributary sewer line in Niu/Kuli‘ou‘ou. Segment 1 is located along the coastline between Wai‘alaie Beach Park and Wailupe Beach Park and consists of 6,400 feet of 30- and 36-inch diameter lines of the downstream portion of the Kalaniana‘ole Highway Trunk Sewer. The line was first constructed in the 1950s and later rehabilitated with the cured-in-place-pipe method in the early 1990s. Segment 2 is located along the east-bound lanes of Kalaniana‘ole Highway between Wailupe Beach Park and Kawaihau Beach Park in the Hawai‘i Loa ridge area. It consists of approximately 6,000 feet of 24- and 30-inch diameter lines of the upstream portion of Kalaniana‘ole Highway Trunk Sewer. At Wailupe Stream, three inverted siphons (depressed sewers) cross under the stream. Just east of Wailupe Stream, the sewer line turns toward the ocean and traverses through a residential area before returning to Kalaniana‘ole Highway. The third segment is a tributary sewer line to the Kalaniana‘ole Highway Trunk Sewer. Segment 3 is located along the west-bound lanes of Kalaniana‘ole Highway in Niu Valley between Halemaumau Street and just east of Paikō Drive, consisting of approximately 1,700 feet of a 10-inch diameter sewer and 54 feet of an 8-inch diameter branch line.

The three sewer trunk segments mainly traverse through previously developed areas, but also cross areas with less development, such as the sections through parks and golf courses. The area on which Kalaniana‘ole Highway was built on the Wai‘alaie coast was once a high dune that extended back from the shore for 100 m (meters). There is evidence that the dune on the *mauka* (inland) side of the road was leveled, and the sand excavated was then used to fill in the *makai* (seaward) side of the road (Erkelens and Athens 1994:13).

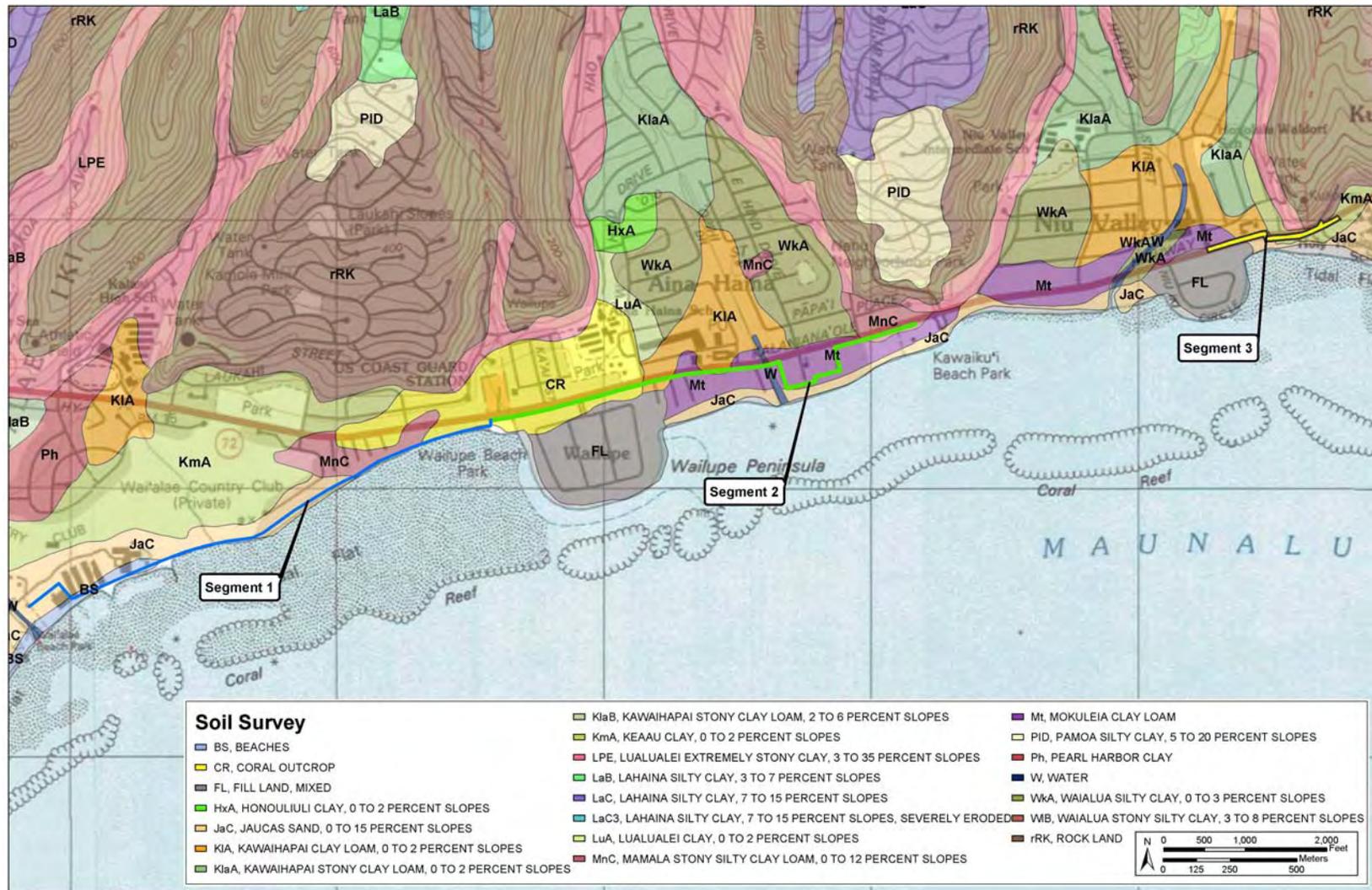


Figure 4. Soils in the Kalaniana'ole Highway Sewer System Improvements project area (U.S. Dept. Agriculture, from Foote et al. 1972)

1.4 Methods

1.4.1 Background Research

Historical background research included a study of archival and published sources at the University of Hawai'i-Mānoa Hamilton library, the Hawai'i State Public Library, the Bernice P. Bishop Archives and Library, and the Cultural Surveys Hawai'i's library. Historic maps and photographs were collected from the Hawai'i State Survey office, from published books, and from the Bishop Museum photographic collection. Archaeological reports concerning Wai'ālae, Wailupe, Niu, and Kuli'ou'ou were reviewed at the State Historic Preservation Division library at Kapolei. Land Commission Award testimony was downloaded from the waihona 'āina online database (www.waihona.com). All of these sources were consulted in order to construct a history of land use and to assess the potential for the presence of subsurface cultural deposits and human burials within the project.

1.4.2 Field Methods

A field survey of the project was conducted on September 5, 2008 by Constance R. O'Hare, B.A. under the general supervision of Hallett H. Hammatt, Ph.D. This consisted of driving along trunk segments adjacent to the route along Kāhala Avenue and Kalaniana'ole Highway in Segments 1, 2, and 3 and walking along public access areas that crossed residential areas and beach parks in Segments 1 and 2. The field inspection component of the archaeological literature review and field check was carried out under archaeological permit number 08-14 issued by the Hawai'i State Historic Preservation Division/Department of Land and Natural Resources (SHPD/DLNR), per Hawai'i Administrative Rules (HAR) Chapter 13-282. The field effort required one-half person-day to complete.

Section 2 Mythological and Traditional Accounts

2.1 Chants and Sayings of the Wai‘alae Coast

Each small geographic area in the islands had a Hawaiian name for its own wind, rain, and seas. The name of the winds of O‘ahu are listed in a chant concerning a powerful object called the wind gourd of La‘amaomao. When the gourd was opened, a specific wind could be called to fill the sails of a canoe and take the person in the desired direction. From west to east along the southeast coast of O‘ahu (as shown on an 1883 map of the Wai‘alae Coast; Figure 5), through the *ahupua‘a* of Kuli‘ou‘ou, Niu, Wailupe (Kekaha), and Wai‘alae to Diamond Head (Lē‘ahi), the winds are.

Puuokona is of Kuli‘ou‘ou,	<i>He Pu‘uokona ko na Kuli‘ou‘ou,</i>
Ma-ua is the wind of Niu,	<i>He Maua ka makani o Niu,</i>
Holouhā is of Kekaha,	<i>He Holouha ko Kekaha,</i>
Māunuunu is of Wai‘alae,	<i>He Maunuunu ko Wai‘alae</i>
The wind of Lē‘ahi turns here and there, . . .	<i>Huli ma ‘ō ma ‘ane‘i ka makani o Leahi,</i>

[Hawaiian text from *Ke Au Okoa*, Nov. 14, 1867; English translation in Nakuina 1990:43]

In a chant for the high chief Kūali‘i, paramount chief of the Hawaiian Islands from 1720 to 1740 (Cordy 2002:19), the lands under his authority are listed as though someone is traveling around the island of O‘ahu. The chant is also a play on words, as a portion of the definition of the place name also appears in the stated action (e.g. the egg of the mudhen (‘*alae*) in Wai‘*alae*):

Chant of Kūali‘i:

There my hair is anointed—at Waikiki;	<i>Kiki kuu oho ilaila—o Waikiki;</i>
The egg of the mud-hen is broken—at Waialae;	<i>Kike ka hua o ka alae—o Waialae;</i>
This is a woman with flowing hair—Wailupe;	<i>He wahine oho lupe keia—o Wailupe;</i>
Let us climb to get coconuts—at Niu;	<i>E pii kau i niu—o Niu;</i>
This is a woman with catemenia*—Koko;	<i>He wahine heekoko keia—o Koko;</i>
The bird of kaula is singing—at Kuliouou;	<i>Ouou ka manu o Kaula—o Kuliouou;</i>

[*catemenia=menstrual blood; Fornander 1917, *History of Kualii*, Vol. IV:401]

The meanings of some of these lines are explained in traditional Hawaiian *nane* (riddles).

Kike ka hua a ka ‘alae. Break the egg of the ‘*alae* bird.
 Answer: Wai‘alae. A play on the last letters of Wai‘alae and “alae” bird.
 [Judd 1930:90]

He wahine oho lupe keia This woman has trailing hair.
 Answer: Wailupe. A play on the words “lupe” and “oho” hair [Judd 1930:90].

Ouou ka manu o Kaula. *The birds of Kaula are chirping.*
 Answer: Kuliouou. “Ouou” is the sound a bird makes. This is a play on the last four letters of Kuliouou (a district on Oahu) and “ouou” (chirping) [Judd 1930: 91].

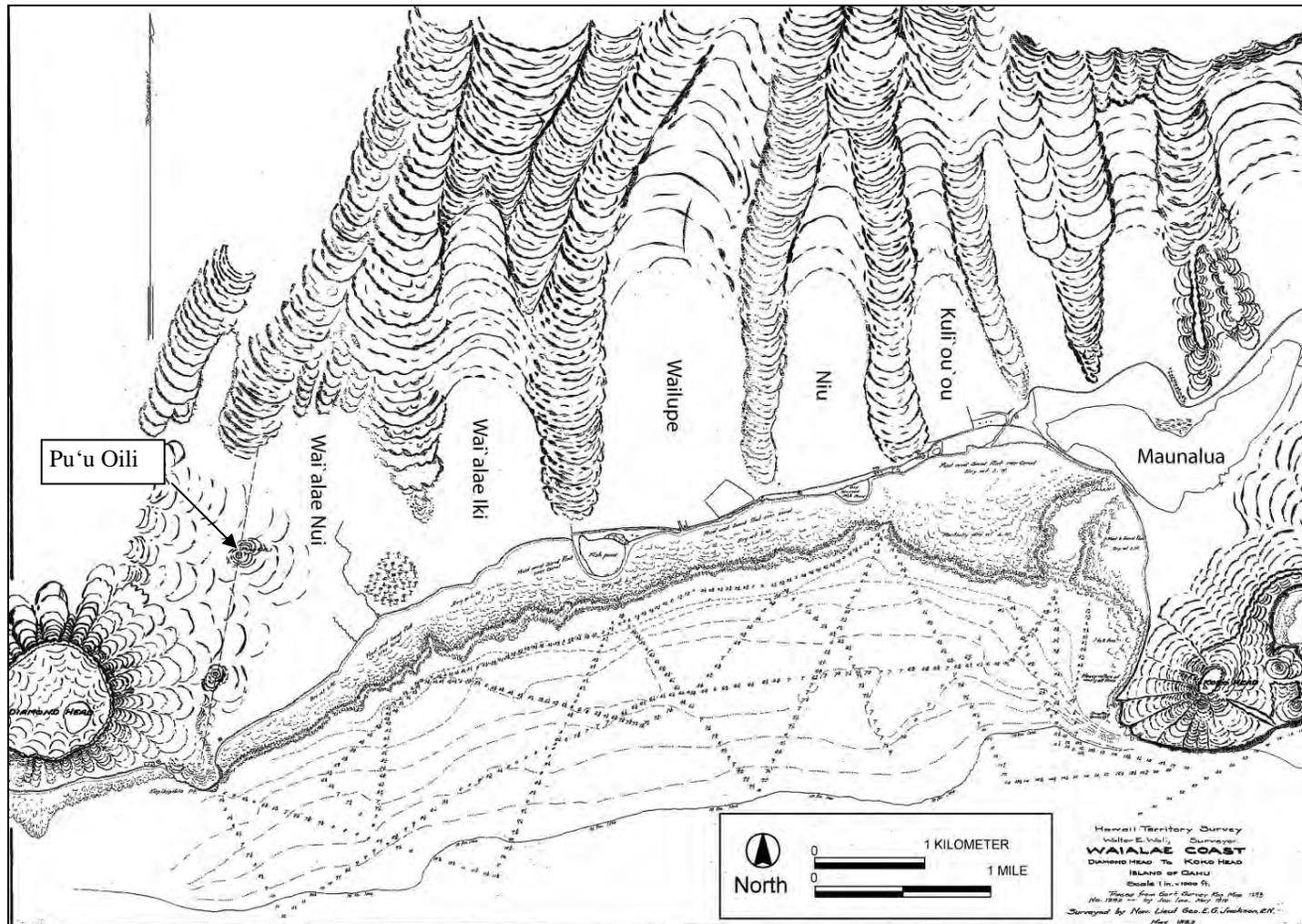


Figure 5. 1883 map (survey by George E. G. Jackson) of the Wai'alaie Coast from Koko Head to Diamond Head, showing the ahupua'a and valleys (from east to west) of Maunaloa, Kuli'ou'ou, Niu, Wailupe, Wai'alaie Iki, and Wai'alaie Nui (Hawai'i Land Survey Division, Registered Map No. 1293)

The word “*Kaula*” probably refers to the small islet of Ka‘ula off Ni‘ihau, which was famous for its birds (Pukui and Elbert 1986:136).

Wai‘alae is named for a freshwater spring (Office of Hawaiian Affairs 2007), referenced in the saying:

Huihui ka mapuna o Waialae. Refreshing is the water spring of Waialae.

Niu is also the answer to a second riddle:

Puoa ka lau o ka niu: The leaves of the coconut are still unopened.

Answer: Niu. Niu means coconut, also a district name [Judd 1930:91].

2.2 Place Names

Place name translations presented without attribution in this subsection are from *Place Names of Hawai‘i* (Pukui et al. 1974), unless indicated otherwise. The researchers for this book based their interpretations not only on literal (phonetic) translations of the words, but also on oral traditions and historic documents. In this work, the place names of geographic features and *ahupua‘a* names are translated; however, ‘*ili* (small land division) names are not usually presented.

Thomas Thrum (1922) also published a short paper on place names in the 1922 edition of Lorrin Andrews *A Dictionary of the Hawaiian Language*, based only on the phonetic translations of the place names. This work does have a large number of translated ‘*ili* names. Because there are no oral or written documents to confirm Thrum’s interpretations, Mary Pukui (Pukui et al. 1974:136) cautioned that Thrum’s translations were sometimes “unreliable.” Thrums’s translations will be presented here since it is our only source for many place names, but Pukui’s cautionary note for these interpretations should be kept in mind.

2.2.1 Wai‘alae Place Names

The *ahupua‘a* takes its name from a spring called **Wai‘alae** (“water of the mudhen”), once located near Kalaniana‘ole Highway. The mudhen, or Common Moorhen (*Gallinula chloropus*) is a bird that lives near freshwater ponds, marshes, and taro fields. A resident in 1920 recalled of Wai‘alae:

Many people lived along the shores and they worked at farming and fishing. Plants grew. There were taro patches, tobacco, sweet potatoes, bananas and sugar cane. Paki was Waialae-nui’s konohiki [manager] of fishing; Kamamalu was Waialae-iki’s konohiki of fishing. There were ever so many people on the shore when these chiefs came to spend a while with the common people.

Here your scout looked at everything that he was told of. There was the pool that Kamamalu used to bathe in. I went to see its beauty for myself.

There are two springs, one is on the summit of Waialae-nui and the other is on Waialae-iki. These appear to be good sites, there is much water, but its beauty on the time of the konohikis is gone. Now the kapu [tabu] is freed and the kapu

places are trodden underfoot [J. K. Mokumaia, *Ka Nūpepa Ku'oko'a* June 18, 1920; English translation in HEN Hawaiian Newspaper Archives].

Another story is told of one of the springs, probably the spring at Wai'alae Iki near the coast:

Waialae Springs. From which Waialae derived its name. It supplied water for the chiefs from olden times. The location had been lost for many years. During a tour of the island by Kamehameha III, the King became thirsty and inquired of an old couple who were living at Waialae where he could get some water to drink. It happened that the ancestors of these old people were the keepers of this water hole, and the duty descended to them. They said that the only reason they stayed there was so that when the King stopped there they might carry out their duty and reveal the location to him. This hole was covered with pohuehue [morning glory] and under the pohuehue was a large slab of stone covering the water [HEN: Vol. I, p. 1108, Edgar Henriques Collection, Bishop Museum Archives].

The *ahupua'a* of Wai'alae extends along the sea for approximately 2.5 miles. The eastern boundary at the coast is adjacent to Wailupe Fishpond and the western boundary is at Black Point, although older maps sometimes show the border extending all the way to the western slope of Diamond Head. From east to west along the coast is The Kāhala Hotel Beach (dredged in the 1960s during the construction of the Kāhala Hilton), the Wai'alae Beach Park, Kāhala Beach, Lae o Kūpikipiki'ō (Black Point), Ke'ahamoe, and Ka'alāwai Beach. There were once several ponds near the coast. Some pond names that are found in Māhele testimony are **Loko** (pond) **Kaluamo**, **Malokohana**, and **Lelopu** (or Loloupu).

Pukui et al. (1974:62) assert that **Kāhala** is named for the amberjack fish (*kāhalai'a*; *Seriola dumerilii*), a deep water fish (Titcomb 1972:85). Clark (1977:38) believes that an alternative origin of the name is from *kāhala*, a type of net made of strong cords used to catch sharks, as sharks are common along Black Point, the western end of the Kāhala coast.

Kūpikipiki'ō is a promontory that was formed when lava from an active Diamond Head flowed over the reef. The Hawaiians called it Kūpikipiki'ō, "the raging sea" or "rough sea," but today it is called Black Point after the dark color of the rocks (Pukui et al. 1974:125; Clark 1977:39). In the center of the point was a cove called **Ke'ahamoe**, which was a favorite fishing spot and a good area to collect *limu* (seaweed). The beach west of Black Point is **Ka'alāwai**, which means "the water basalt" or "the watery rock" (Pukui et al. 1974:60; Clark 1977:39). Clark (1977:39) thinks that this area may have been named for the freshwater springs in the sea near the shore. These springs bring up fresh water near the western shore of the point, water that could have been collected for drinking by Hawaiians. Two amateur archaeologists found several foundation stones near the point in 1906, and believed it was the remains of a *heiau* (Hawaiian temple). At this beach the '*anae-holo* (mullet) could once be found in the thousands, during their yearly migration from their home in Pearl Harbor around the south and east coasts of O'ahu to Lā'ie on O'ahu's north shore (Clark 1977:39).

Wai'alae is divided into two *ahupua'a*, Wai'alae Nui and Wai'alae Iki; the boundary between the two runs along **Kapakahi** Gulch and Stream. Pukui et al. (1974) do not give a meaning for this place name, but *kapakahi* is the Hawaiian word for "crooked," which may be a descriptive

term for the configuration of the gulch (Pukui and Elbert 1986:131). Thrum (1922:644) translated this name as “one-sided.” In Māhele testimony, the boundary of one claim is stated to be at the *muliwai* (river mouth) of **Kahawi-iki**. This may be a descriptive term, rather than a name. It could be an erroneous spelling of *kahawai-iki*, meaning “small stream.” The stream referred to is probably Kapakahi Stream. **Keawanui** (meaning uncertain) was the name of a valley on the side of Kapakahi (Frank 1958:22).

The western boundary of Wai‘alae Nui is separated from Pālolo Ahupua‘a by **Mau‘umae** Ridge. Mau‘umae is described as an *‘ili* situated on the easternmost aspect of the *ahupua‘a* of Pālolo, at the present Wilhelmina Rise. The name Mau‘umae is given to this area “where Kāne and Kanaloa are said to have wrestled and trampled down the grass so that it withered” (Pukui et al 1974:150), hence, the literal translation of Mau‘umae, meaning “wilted grass” (Pukui and Elbert 1986: 243). One small hill along the Wai‘alae/Pālolo boundary is labeled as **Pu‘u ‘Ō‘ili** (meaning “heart”; Pukui et al. 1974:168) on an 1883 map of the Wai‘alae Coast (see Figure 5). The highest point in the *ahupua‘a* is **Pu‘u Lanipo** (2621 feet high) in the Ko‘olau Mountains. To the west is a second peak (*pu‘u*) (2200 feet high) called **Kainawa‘anui**. Pukui et al. (1974) do not give the meaning for Pu‘u Lanipo in their *Place Names of Hawai‘i*, but in their *Hawaiian Dictionary* (Pukui and Elbert 1986:193), they give the meaning of *lanipō*, as “dark, lush, as of plants, rain.”

The eastern boundary of Wai‘alae Iki is separated from Wailupe Ahupua‘a by **Wiliwili** Ridge (or Wiliwilinui), named after the *wiliwili* tree (*Erythrina sandwicensis*). The light wood from this tree was used by the Hawaiians to make surfboards, canoe outriggers, and net floats (Pukui and Elbert 1986:385). Frank (1958:22) says that there was a large flat ridge named **Kamilomilo** with pine trees on it between Kapakahi Valley and the border with Wailupe. Whether this is a third ridge or is an alternate name for Wiliwili Ridge is unknown, as the Kamilomilo label could not be found on any historic maps. This ridge is also named for a tree, the *milo* (*Thespesia populnea*) tree; the wood was used by Hawaiians to make calabashes and parts of the trees were used for dye, medicine and other used (Pukui and Elbert 1986:24). An area called **Keahia** (“the obscure”; Thrum 1922:649) was seaward of Kamilomilo (Frank 1958:22). On a knoll along the ridge separating Wai‘alae and Wailupe was a *heiau* called **Kaunuakahekili** (“meaning the altar of Kahekili”; Pukui et al. 1974:95), near the *mauka* end of Halakau Street at approximately 880 feet in elevation. The *heiau* had been completely destroyed by the 1930s (McAllister 1933:71).

2.2.2 Wailupe Place Names

Wailupe is the name of the *ahupua‘a*, the beach, a fishpond (now a filled-soil peninsula), a gulch, a stream, a spring, and a valley (Figure 6). The name literally means “kite water.” Pukui et al. (1974:225) explain that in ancient Hawaiian tradition, there were prescribed places to fly kites, and that “this was one of them.” Frank (1958:220) says that the land was named “for a kite-flying woman (*he wāhine ho‘olele lupe*).” Beckley (n.d. Hawai‘i State Archives) suggests that the *ahupua‘a* was named for a spring called Wailupe. She associates Wailupe Spring with the legend of a *mo‘o* (spirit) called Lupe, and translates the name as “water of Lupe” (see Section 2.3.7 for legend). In a list of the winds of the Wai‘alae coast (Nakuina 1990:43), Wailupe is called **Kekaha** (“the place”).

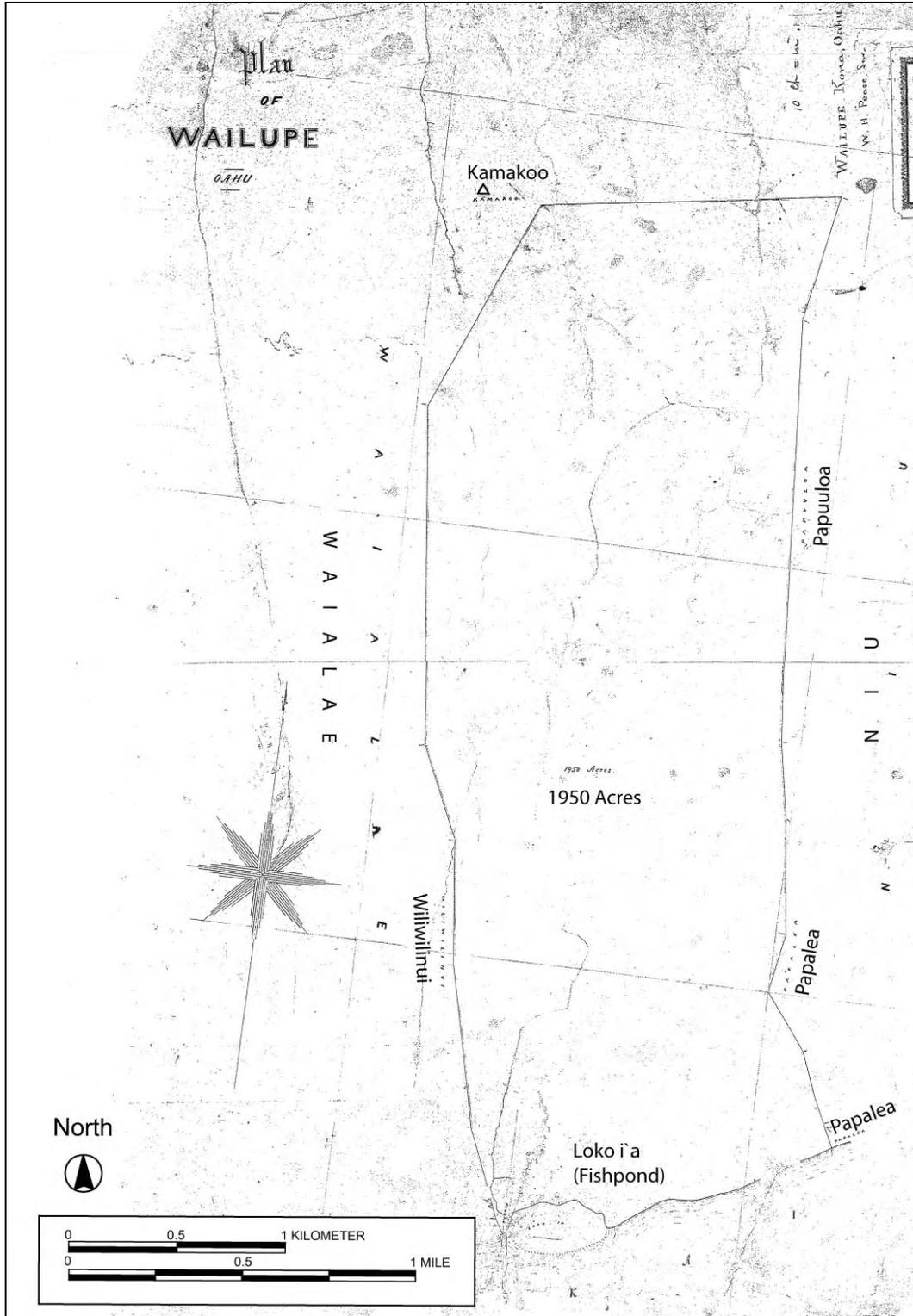


Figure 6. 1850-1860 map, Plan of Wailupe, by W. H. Pease (Hawai'i Land Survey Division, Registered Map No. 115)

The *ahupua'a* extends from the sea up to the Ko'olau Mountain range, and from the *ahupua'a* of Wai'alae Iki at Wiliwilinui Ridge on the west to the border of Niu Ahupua'a on the east. On a circa 1850-1860 map (see Figure 6), the ridges that separate Wailupe and Niu are labeled **Papalea** and **Papu'uloa**, but on all subsequent maps they are called **Hawai'ilea** and **Hawai'iloa** Ridges. Frank (1958:22) says that the upper ridge between Wailupe and Niu was called **Maunaloa**. At the Ko'olau Mountains, the *ahupua'a* is bordered by the *mauka* boundary of Waimanalo Ahupua'a. The remnants of **Kawauoha** Heiau (still standing in 1907, but completely destroyed by the 1930s) was "just above **Pu'u Hua**, at the foot of [the] hill Hawaii Loa (Thrum 1907:45)." One peak, called **Kamakoo**, is shown on the 1850-60 map (see Figure 6) near the northwestern *mauka* border of the *ahupua'a*.

There are three gulches shown on historic maps, the main **Wailupe** Gulch, which follows the lower Wailupe Stream and a branch to the northwest. The north east branch follows **Laulaupoe** Gulch, which is named for a round (*poe*) type of leaf package (*laulau*) used for food and for presentations. Above the 'Aina Haina subdivision, there is a third gulch called **Kulu'i**, which is named for a type of tree/shrub (amaranth; *Nototrichium* spp.). On early maps, a second small stream is shown on the western boundary of the *ahupua'a* called **Waiali'i** (probably "water of the chiefs"; Pukui and Elbert 1986)

The ocean front consists of a narrow beach that disappears under high water in some areas, with wide, shallow coral and mud flats offshore. There is only one cut in the reef, the Wailupe Boat Channel. At the western corner of Wailupe Peninsula is Wailupe Beach Park, adjacent to the west side of the former Wailupe Fishpond. The Hawaiian term for the pond was **Loko Nui o Wailupe**, "big pond of Wailupe." Just *mauka* of the fishpond (*makai* of the main trail, now covered by Kalaniana'ole Highway) was a spring called **Puhikani**. There was a second spring, which fed a fishpond of the same name, on the west side of Wailupe Pond called **Punakou**, which means "kou tree spring." In the mid-nineteenth century Boundary Commission Testimony (BCT 3:10) for the *ahupua'a* of Wailupe, the small pond connected to Wailupe Pond was called **Kaualua**, probably an alternate name for Punakou Pond. The boundary between Wai'alae and Wailupe was marked by a rock called **Pukoakahalauaola**, which was just west of Punakou Pond (BCT 3:7, 10). The rock may have been a coral block, as the Hawaiian word *pūko'a* means "coral head" (Pukui and Elbert 1986:352).

At the eastern edge of the *ahupua'a* is Kawaiku'i Beach Park, named after a freshwater spring in this area that was the only source of drinking water for the coastal residents. **Kawaiku'i** means "the united water." Clark (1977:35) says that there are two explanations for this name. One explanation is based on location; the spring was located near the coast, and thus salt and fresh water "united" at the spring. The second explanation is based on oral history. Wailupe residents once came to wash their clothes on flat rocks near the spring, and to gather a favorite edible seaweed, called *limu 'ele'ele* ("dark limu"; *Enteromorpha prolifera*), which only grows at the ocean's edge where salt and fresh water combine. Thus the population of the *ahupua'a* congregated or "united" at this spot, which led to its name. The fine, dark green, filamentous *limu 'ele'ele* was used to flavor meat and fish stews and was also used as a medicine, as a poultice for boils (Krauss 1974:10). Land Commission testimony for this same area refers to a **Papalea** Spring in the *'ili* of Papalea. This may be an alternate name for Kawaiku'i Spring. The eastern corner of the *ahupua'a* abuts **Kamoana** Fishpond. In an oral history interview (see

Section 3.5), a long-time resident stated that the entire beach area from Wailupe Pond to Paikō Peninsula (within Wailupe and Niu Ahupua'a) was called **Pa'a Ha'a**.

2.2.3 Niu Place Names

Niu literally means “coconut” (Pukui et al. 1974:166). Frank (1958:22) stated that it was named for a woman who husked coconuts (*He 'o niu kana hana*). Niu is variously described as an *'ili* in the *ahupua'a* of Waikīkī or an *ahupua'a* in the district of Kona. It extends from the border with Wailupe on the west to the border with Kuli'ou'ou on the east, and from the sea to the Ko'olau Mountains. As noted previously, the ridges that separate Wailupe and Niu are labeled Papalea and Papu'uloa on a circa 1850-1860 (see Figure 6) map, but on all subsequent maps they are called Hawai'ilea and Hawai'iloa Ridges. Frank (1958:22) says that the upper ridge between Wailupe and Niu was called Maunaloa. Niu is divided into two valleys, separated by **Kūlepeamo** (“flapping of chicken”) Ridge. On the west is **Pia** (“arrowroot”) Valley and on the east is **Kupaua** (“upright clam”) Valley. The two streams of these valleys merge into Niu Stream near the coast. There was also a temple, **Kūlepeamo Heiau**, at the foot of Kūlepeamo Ridge. Parts of it were still standing in the 1930s (McAllister 1933:70). An ancient trail once led from the coast in Niu inland up to the Ko'olau Mountains, and then down again to the windward side of the island. According to the description (Sterling and Summers 1978:274), the trail went through the valley of **Kailili-iki**. This is probably an alternate name for either Pia or Kupaua Valley.

On the coast, at the dividing point between Wailupe and Niu, was a well called **Wai Ku'i a Kamehameha**, which was dug through the pahoehoe at a place called **Papa'alaea** (also called Papalea), where fresh water gushed into the sea. The water originated from a large inland cave called **Kaluai pani'o**, 100 feet inland near the *pali* (cliff) of Niu (Frank 1958:22-23). One such cave can be seen on an 1845 sketch of the Wai'alae coast (Figure 7). In an oral history interview (see Section 3.5), a long-time resident stated that the beach area of Niu was called **Pa'a Ha'a**. At the eastern border of Niu was a place called **Kanau**, near the beginning of Paikō Peninsula. At this place was a *puhi* (possibly a spring) called **Ke Puhi o Kanau** (*Aia ke puhi i Kanau*) (Frank 1958:23). A large fishpond along the coast was called **Kūpapa** or Niu Pond. Kūpapa Pond was once part of a large tract of land that Kamehameha I used as a summer home (*Honolulu Advertiser* March 22, 1953, cited in Sterling and Summers 1978:275). This probably explains the origin of the name Wai Ku'i a Kamehameha for the nearby well. Adjacent to the east side of the pond was a spring. The traditional name of the spring is not known, but on 1930s maps, it was called **Lucas Spring**, named for the Lucas family, who owned the land. Currently the coastal area west of Kūpapa pond is called Niu Beach. The area is generally a mudflat, but the residents have constructed a private pier to a sand pocket offshore to provide a protected swimming place (Clark 1977:35).

The meanings of most of these place names are unknown. Some of the root words are related to the type of feature; the word *wai* (water) is used for the well. Wai Ku'i a Kamehameha and the beach called Kānewai, the word *papa* (flat) is used for an area of pahoehoe and may be related to Papa'alaea and the pond Kūpapa, and the words *ka lua* (the pit) are used for a cave. The other root words have several alternative meanings or may refer to a person, such as the Wai Ku'i a Kamehameha (“the well of Kamehameha”) and Ke Puhi o Kanau (“the hole of Kanau”).



Figure 7. 1845 sketch (sepia wash over pencil) of Niu by John B. Dale titled “Burial Cave, Valley of Niu (Koko Head)” (original in J. Welles Henderson Collection; reprinted in Forbes 1992:127); the walled coastal Kūpapa Fishpond of Niu is on the left and the Adams Homestead (coconut tree cluster) is shown between the fishpond and the ridge

2.2.4 Kuli‘ou‘ou Place Names

Kuli‘ou‘ou means “sounding knee” referring to a type of drum attached to the knee (*pūniu*). The ethnographer Mary Pukui (cited in Sterling and Summers 1978:271) said: “The knee to which the drum is attached is the kuli-ouou: (kuli: knee; ouou: the sound of a drum when struck).” Kuli‘ou‘ou is variously described as an *‘ili* in the *ahupua‘a* of Waikīkī or an *ahupua‘a* in the district of Kona. It extends from the border with Niu on the west to the border with Maunaloa on the east, and from the sea to the Ko‘olau Mountains, as shown on a 1922 Land Court (LCAP) map (Figure 8). At the north central boundary is the highest 2200 feet high peak, **Pu‘u o Kona** (“hill of leeward”). The *ahupua‘a* was watered by one stream, which gave its name to Kuli‘ou‘ou Valley. At the head of the valley, at approximately 100 feet elevation, was a peak called **Pu‘u o Ahi**. On later (post-1927) historic maps, a peak labeled Kuli‘ou‘ou is shown on the Niu/Kuli‘ou‘ou border near the coast, but this may be an historic triangulation station for surveyors, instead of a traditional name for a peak.

East of the area called Kanau (at the coastal Niu/Kuli‘ou‘ou border) was a ridge and a spring called **Kānewai** (“water of Kāne”) in Kuli‘ou‘ou. According to Thrum (1907: 45), there were two *heiau* in Kuli‘ou‘ou, both in a land section called **Wailele** (“waterfall”; Pukui and Elbert 1986:379). **Ahukini Heiau** (“altar of many blessings”) had been destroyed “ten years before,”

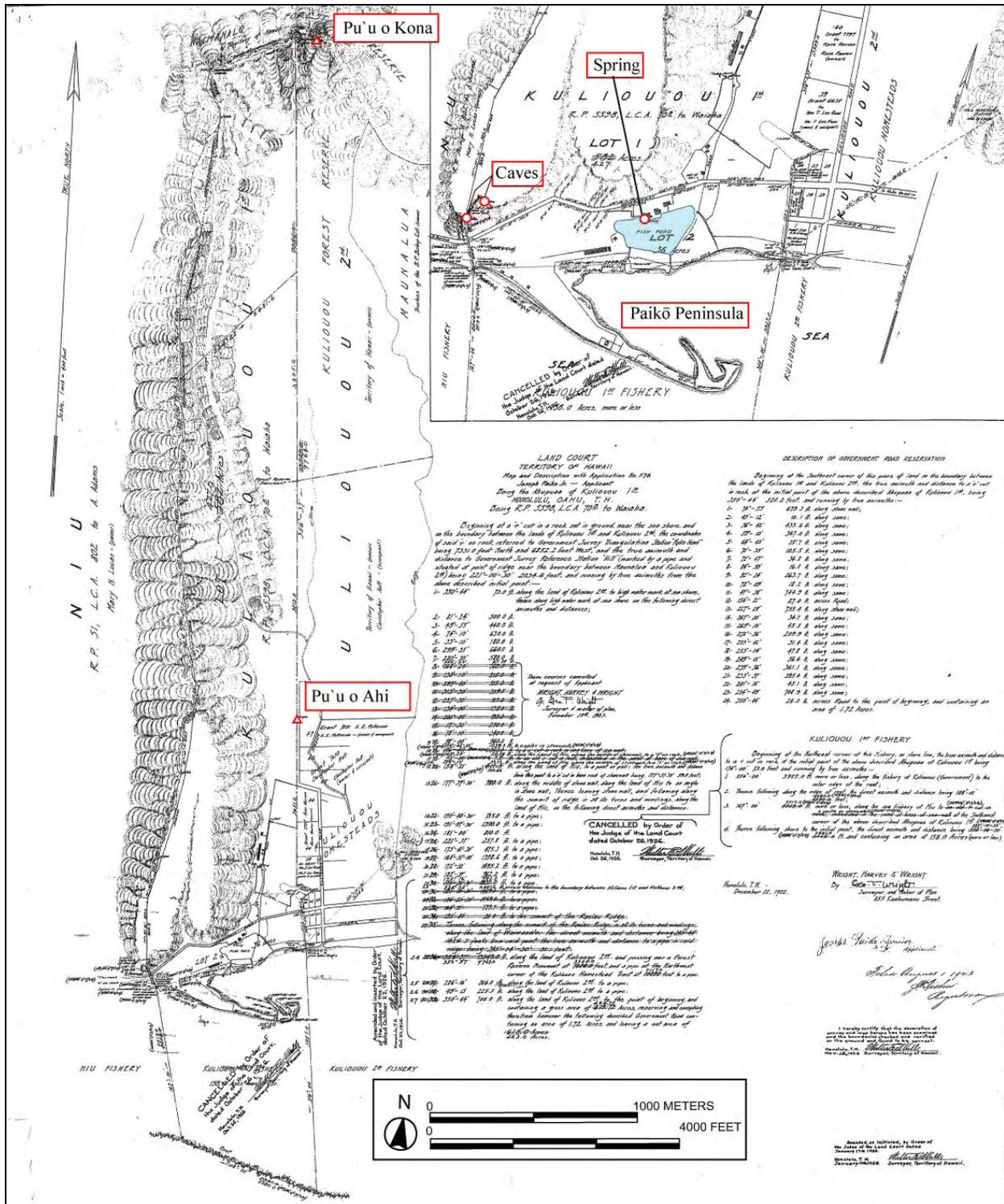


Figure 8. 1922 map of Land Court Application No. 578 to Joseph Paikō, Jr. for the land of Kuli'ou'ou 1st (Hawai'i Land Survey Division)

thus around 1896 and in 1906; there were only a few remnants of Kauiliula Heiau. One Hawaiian language scholar has suggested that the meaning of this name is kau'ili'ula – “place of reddened skin” (Frances Frazier, cited in Takemoto et al. 1975:54). In the 1930s, McAllister (1933:70) could not definitely relocate either heiau, but he did find a terrace (Site 50) at the head of Kuli'ou'ou Valley (in Kuli'ou'ou 1st) that might have been the remains of one of the heiau.

Seaward of Kānewai Ridge was a long beach called **Nukuohano** (Frank 1958:22-23). It is possible that the term *nuku* in this place name refers to a coastal point (*nuku*=point). Along the coast is a fishpond, a long peninsula, and a lagoon, all called **Paikō**. Local residents also refer to the peninsula as **Sand Point**. There is a spring on the north side of the pond. Erkelens and Athens identify this spring as Kānewai Spring (1994:16). The pond and/or the spring may also be the “pool” called '**Elelupe**, referred to in the claimant's brief for LCAp 578.

. . . to which the king [Kamehameha III] retired with his court in the summer . . . and it was to the pool of Elelupe that the king sent his servants for water. The pool was tabu by the king, and no one but the king dared touch or pollute that water [Wright 1925].

The word '*ele* means “a water hole, dark spring covered with growth” (Pukui and Elbert 1986:40), and the place name 'Elelupe refers to a legend about a *mo'o* (spirit) named Lupe, discussed in Section 2.3.7 of this report.

Paikō is not a traditional Hawaiian word; these places were named in the late nineteenth century for the owner of the land, Manuel Paikō (Pico), a Portuguese immigrant who became a prominent businessman and land investor. An engraving (Figure 9), made during the 1786 Portlock and Dixon visit to O'ahu, shows men walking out on the reef near Paikō Peninsula. In 1974, Paikō Lagoon was declared a wildlife sanctuary. At the tip of the peninsula is an area called **Stubenberg's Island**, which was named for Arthur F. Stubenberg, the owner of this area from 1948 to 1973 (Clark 1977:35).

2.3 Legends Concerning Wai'alae, Wailupe, Niu, and Kuli'ou'ou

There are few traditional stories set within the *ahupua'a* of Wai'alae, Wailupe, Niu, and Kuli'ou'ou, but these lands are mentioned in passing in several legends.

2.3.1 Kū'ula, the Fisherman's God and his son 'Ai'ai

Kū'ula, the god presiding over the fish of the sea had a son named 'Ai'ai. He was the first to teach the Hawaiians how to make various fishing lines and nets, the first to set up a *ko'a kū'ula*, a rock shrine on which the fishermen would place their first catch as an offering to Kū'ula, and the first to set up *ko'a ia*, fishing stations where certain fish were known to gather. Leaving his birthplace in Maui, 'Ai'ai traveled around the islands, establishing *ko'a kū'ula* and *ko'a ia*.

Aiai then came to Oahu, first landing at Makapuu, in Koolau . . . Aiai next moved to Maunalua, then to Wai'alae and Kahalaia. At Kaalawai [beach west of Black Point] he placed a white and brown rock. There in that place is a hole filled with *aholehole*, therefore the name of the land is Kaluahole [Nakuina 1998a:241].

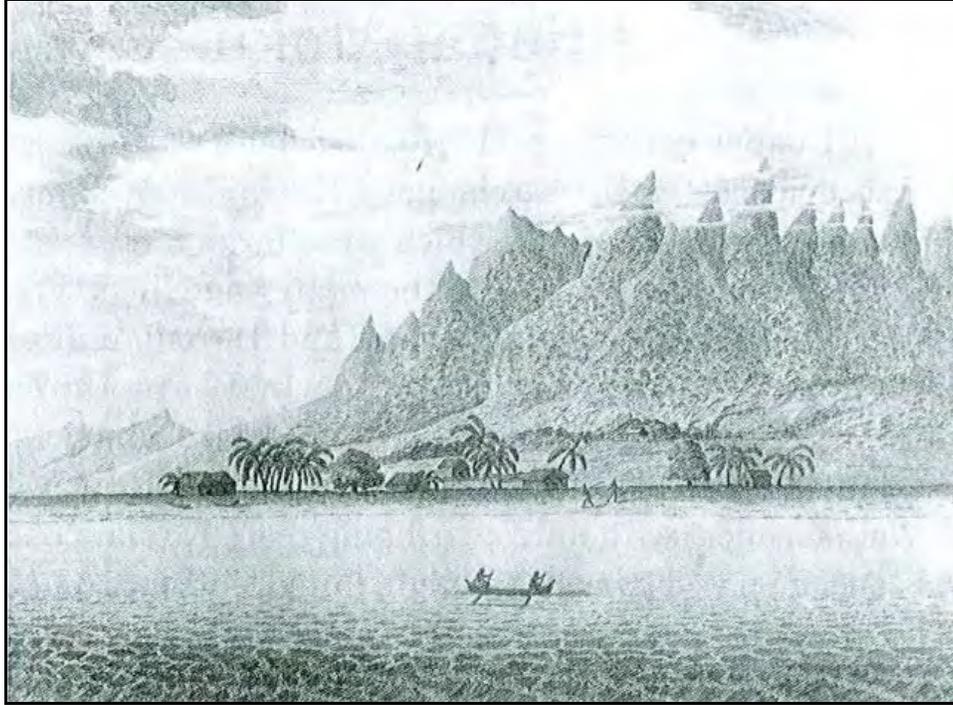


Figure 9. Copper engraving “A View in the Bay at Waohoo” by Inigo Barlow. Made, circa 1786, during the Portlock and Dixon visit to the Wai‘alae Coast (engraving reprinted in Beresford 1968:54); shows men walking across shallow reef in Paikō Peninsula area

2.3.2 The Traveling Mullet of O‘ahu

The marine resources of Wai‘alae are also emphasized in the stories of the *‘anaeholo*, the traveling mullet of O‘ahu. Each year they leave their main habitat in Pearl Harbor and travel in large schools counter-clockwise around the island, till they reach Lā‘ie on the north shore and go no further. They stay a few weeks, then turn around and follow the same route home. During these times, the Hawaiians exploited the opportunity and caught large numbers of the mullet in nets (Titcomb 1972:64). One of the better places to catch the *‘anae-holo* was the Wai‘alae coast especially just west of Wai‘alae at Ka‘alāwai, near Black Point. M. K. Nakuina (1998b:271) translated the following account:

The home of the *anae-holo* is at Honouliuli, Pearl Harbor, at a place called Ihuopalaai. They make periodical journeys around to the opposite side of the island, starting from Puuloa and going to windward, passing successively Kumumanu, Kalihi, Kou, Kalia, Waikiki, Kaalawai and so on, around to the Koolau side, ending at Laie, and then returning by the same course to their starting point.

In one version of this story, the wife of the chief at Lā‘ie grew sick and begged her husband for some of the sweet mullet of ‘Ewa from her brother Kaihuopala‘ai (the Hawaiian name for the west loch of Pearl Harbor). The husband traveled to ‘Ewa and Kaihuopala‘ai agreed to send fresh *‘ama‘ama* (mullet) to his sister. Kaihuopala‘ai told the husband to travel back to Lā‘ie along the

Kona coast and the 'ama'ama would be sent after him. The husband thought that he meant that he would send a messenger with the fish after him.

When the husband of Kaihukuuna reached Kapukaki, (now known as Red Hill), he stopped to rest, anxiously scanning the country behind him to see if he could see the messenger with the fish. He could see no one, and so he hurried on; resting at Kahauiki (Fort Shafter), and then at Kou, Honolulu, Waikiki, Kaalawai, at each halting place looking backward to discover the bearer of the fresh amaama.

When, finally, he arrived at Niu an aged couple who lived near the beach asked the tired wayfarer to stop with them and partake of uwala [sweet potatoes], roasting in an imu [oven]. Glading [*sic*] accepting their invitation, he was just sitting down to eat when the elemakulekane,--the old man,--looking out at the sea, cried in amazement. The ocean was teeming with fish as far as the eye could see [Henriques 1916].

The fish followed the husband all the way back to Lā'ie, and after that followed the same migration in October every year.

2.3.3 Kawelo and the Wai'alaie fisherman

A famous Wai'alaie fisherman was the teacher of the Hawaiian hero, Kawelo.

A pau ke ao ana i ke kaua, ao iho la o Kawelo i ka lawaia. O Maakuakeke he kumu lawaia a Kawelo, no Waialae.

I ke kakahiaka nui, ala ae la o Kawelo a hele aku la mai Waikiki aku, a Kaluahole, Kaalawai, hiki i Waialae, paha aku la o Kawelo penei:

After Kawelo had mastered the art of warfare, he took up fishing. Maakuakeke of Waialae was the fishing instructor of Kawelo.

Early in the morning Kawelo would get up and start out from Waikiki going by way of Kaluahole, Kaalawai, and so on to Waialae where he would chant out:

<i>E Maakuakeke,</i>	Say, Maakuakeke,
<i>Hoa lawaia o Kawelo nei la,</i>	Fishing companion of Kawelo,
<i>E ala. ua ao, ua malamalama,</i>	Wake up, it is daylight, the sun is shining,

[Fornander 1918, Legend of Kawelo, Vol. V:6-7]

The two got into a canoe; Kawelo was so strong that with one stroke, he paddled from Wai'alaie past Mamala (Honolulu) Bay, with the second stroke the canoe moved to Pu'uloa in 'Ewa, and with the third stroke they arrived at Wai'anae, where they went fishing for the supernatural parrotfish named Uhumakaikai.

2.3.4 Aku Fishing with Palila

Another hero known for his great strength also visited the Wai‘alae coast. Palila had a large war club with magical properties. He could throw the club a long distance, and would travel with the club in the air. He made a circuit of the island of O‘ahu, fighting all challengers and came to Kaimukī in Pālolo Valley.

A puni Oahu nei la Palila, hele aku la ia a ka piina o Kaimuki, a iho aku la i Waialae, malaila aku a Wailuipe, a Maunalua, e noho ana o Kahului, he lawaia no laila. Kahea mai la o Kahului ia ia nei, hele aku la kela a kokoke, noho iho la laua a ahiahi, . . .

After Palila had completed the circuit of Oahu, he went along to the rise at Kaimuki and then down to Waialae; from this place he proceeded to Wailupe and then on to Maunalua where Kahului, a fisherman of that place, was living. Upon seeing him Kahului called, so Palila went to Kahului and they sat down and began to talk on various matters [Fornander 1918, Legend of Palila, Vol. V:146-147].

Palila noticed the men of O‘ahu preparing for *aku* (bonito or skipjack, *Katsuwonus pelamis*) fishing. When asked if he too would be joining in, Kahului woefully informed Palila that his canoe was too large and there were not enough paddlers. Then, Palila told Kahului he desired to join the fishermen, and the two men together would have enough strength to paddle the large canoe. They gathered small fish that evening with a throw net and slept soundly on their mats.

The next morning Kahului awoke and noticed all the other *aku* fishers were gone. He shouted to his friend Palila that everyone had left and there was no one to help them launch the large canoe! Kahului moved to the front of the canoe and before he had lifted, it was pushed into the deep water. He pulled himself into the canoe and began to steer, but Palila’s strength was too much for the paddles, which kept breaking. Finally, Palila used his war club as a paddle. The two men reached the fishing ground and the *aku* leaped from the waves. Palila kept paddling while Kahului began to fish. A Kahului was unable to catch any fish, Palila decided he would try his hand at fishing. Baiting his war club, he dropped it into the waves. The *aku* swarmed the bait and Palila threw them into the canoe. Time and time again he did this. Unaware of the large catch Palila had amassed, Kahului apologized to his friend for the shortened fishing time. Upon turning around, Kahului was surprised. “‘Never have I had so many *aku*!’ he cried joyously. ‘This is a great day, my friend. I shall tell my grandchildren how I went fishing with Palila!’” (Pukui and Curtis 1951:135).

2.3.5 Hi‘iaka’s Travels through Southeastern O‘ahu

Hi‘iaka, sister of Pele, the Hawaiian volcano goddess, traveled through Wai‘alae and Wailupe. Hi‘iaka, with her traveling companions Wahine‘ōmao‘o and Lohiau, had defeated several monsters in the uplands of Kaimukī in Pālolo Valley. They descended to the coast to meet up with the chief Kaulanakalā, who had agreed to carry them in his canoe to Molokai.

. . . huli akula kēia i kai o Wai‘alae a ‘ike akula kēia i ka wa‘a o Kaulanaokalā e holo a‘e ana, a laila, ha‘alele lākou nei i Kaimukī a hele akula no lākou nei a

hala 'o Wai'alaе, a hala 'o Wailupe, a hō'ea lākou nei i Maunalua, a hala ia wahi i hope, hō'ea lākou nei i Niu, i Kuli'ou'ou; i nānā aku ka hana o lākou nei, e lawai'a mai ana kekahi mau wāhine, 'o ka pāpa'i me ka 'ōhune kā lāua i'e e ulawai'a ana.

. . . [Hi'iaka] turned to look seaward of Wai'alaе and saw Kaulanaokalā's canoe sailing along. They departed Kaimuki and traveled past Wai'alaе, past Wailupe, and reached Maunalua. When that area had fallen behind them, they arrived in Niu, then Kuli'ou'ou. They looked about, and saw some women fishing for 'ōhune [goby] fish and crabs [Ho'oulumāhie 2006a:295; Ho'oulumāhie 2006b:317].

Hi'iaka requested some fish from the local women, but they answered rudely, telling her that she should collect her own fish. In response to this rudeness, Hi'iaka offered the following *mele* (chant):

<i>He makani Holo'uha</i>	A Holo'uha, a wind that comes to nothing
<i>Ko Ka'eleke'i Paukū</i>	Blows at Ka'eleke'i of Paukū
<i>Pau wale ho'i ke aho i ke noi 'ana</i>	Breath is wasted on a request
<i>'O ka lā ho'i ē.</i>	Like asking for the sun.

Nathaniel Emerson's version of the Hi'iaka story has a slightly different translation of this *mele*, with some suggestions for its interpretation. Hi'iaka talked to a woman working in the ponds catching fish and crabs, asking her to share a portion of her catch. The woman rebuffed Hi'iaka and advised her it would be better for Hi'iaka to do her own fishing. Hi'iaka would not let this insult go unpunished and uttered to the woman:

<i>He makani holo uhā (a)</i>	Here's a blast shall posset the blood,
<i>Ko Ka-ele-kei a Pau-kua (b)</i>	As the chant of kahuna the back.
<i>Pau wale ke aho i ka noi ana,</i>	Our patience exhausts with delay;
<i>O ka loa ho'i, e!</i>	We're famished from the length of the way.

(a) *Makani holo-uha*. The allusion is to a cold wind that chills the naked legs of the fisherfolk.

(b) *Pau-kua*, a place-name, meaning consumed in the back – a clear reference to the fact that the kahuna's black art very frequently made its fatal ravages by attacking first the back [Emerson 1993:186-187].

When the chant was completed, Hi'iaka and her friends turned away, and when they were out of sight, the women fell dead.

2.3.6 Kamapua'a, the Pig-god, in Southeastern O'ahu

Wailupe is briefly mentioned in the tale of Kamapua'a, the famous pig-god of ancient times. Olopana, chief of O'ahu, ordered all his men to dress in their feather capes and feather helmets, to wage war with Kamapua'a, in response to Kamapua'a's attack on Makali'i. Kamapua'a made his preparations and was ready and waiting for Olopana:

A hiki o Olopana me kona poe kanaka ma Kaluanui, aohe o Kamapuaa. Nolaila, huli mai la o Olopana ma na pali Koolau a hiki i Kailua. A malaila ae a Maunalua, a Wailupe, a Waikiki, a Ewa, a Waianae, noho iho la o Olopana i laila, no ka mea, aia i laila o Kamapuaa. Hele mai la o Kamapuaa a Wahiawa noho i laila, mahiai.

When Olopana and his men arrived at Kaluanui, Kamapuaa was not to be found. Olopana then came searching for him along the cliffs of Koolau until he arrived at Kailua; and from this place to Maunalua, Wailupe, Waikiki, Ewa, and Waianae, where Olopana staid [*sic*], for Kamapuaa was living at this place. After getting to the top of the cliff, Kamapuaa had come to Wahiawa and at this place he started farming [Fornander 1919, Legend of Kamapuaa, Vol. V:320-321].

2.3.7 The Gods Kāne and Kanaloa along the Wai‘alae Coast

The god Kāne and his brother Kanaloa often traveled around the Hawaiian Islands. When they grew tired they looked for the ‘*awa* plant and for some fresh water to mix with the pounded root to make a slightly narcotic drink. When the gods were in a dry area, Kanaloa complained to his brother that there was no water. The powerful god Kāne would strike the earth with a staff and water would gush up from the hole. There are many springs in the Hawaiian Islands attributed to the god Kāne. Several of these were on the Wai‘alae coast.

According to some rough notes made by the ethnographer Emma Beckley [Emma Kailikapuolono Metcalf Beckley Nakuina] (Beckley n.d. Hawai‘i State Archives), the gods were at Hanauma in Maunalua, traveling west. When they reached Kuli‘ou‘ou, Kanaloa took some ‘*awa* from the sacred grove at the base of Kuli‘ou‘ou Ridge. This grove was watched over by a *mo‘o*, a supernatural creature that could change form (a form like a crocodile) called Lupe. Thus the spring was called ‘Elelupe, the ‘*ele* of Lupe. The word ‘*ele* means “a water hole, dark spring covered with growth” (Pukui and Elbert 1986:40). This is probably the same spring Frank (1958:22) called Kānewai (“the water of Kāne”). Kanaloa took some of the ‘*awa* he got from Lupe’s ‘*awa* grove and traveled to Wailupe. There he again demanded water from his brother. Kāne struck the coral shelf and the water gushed up. Beckley calls this Wailupe Spring, and gives a different translation for Wailupe than most other ethnographers. She says Wailupe means “water of Lupe” since the spring was made for water to mix with the ‘*awa* from Lupe’s sacred grove. This spring is probably one of the two springs, Punakou or Puhikahi, at the coast near Wailupe Pond.

Kāne left his sleeping brother the next morning and walked to Wai‘alae where he met the goddess Ka-‘alae-nui-a-Hina, who could take the form of an ‘*alae* bird. A boy and his sister, named Keahia, whose parents had been lost at sea lived with their grandmother on the border of Wai‘alae and Wailupe. They had to walk far inland to Wai‘alae Stream to get water, and Hina pleaded with Kāne to create a spring in Wai‘alae for them. Kāne struck the earth and Wai‘alae Nui Spring (near the northern border of the Wai‘alae Golf Course) was created.

As a continuation of this legend, Beckley then tells the story of Keahia. When she grew up, Keahia married a chief who was a descendant of the priests of Kuli‘ou‘ou and she bore a daughter named Wai‘alae Iki. This was also the name of a second spring, “a spring of joy” in

Wai‘alae. One day, Wai‘alae Iki went to Wai‘alae Stream to bathe and sat down on a rock to dry her hair. Under the rock was an evil demi-god, who could take the form of a *puhi* (an eel). The eel-man pressed Wai‘alae Iki to marry him, but she spurned his advances. The eel-man caused Wai‘alae Iki’s grandparents to get sick. Her grandparents lived at the sacred grove near the *heiau* (possibly Ahukini or Kauiliula Heiau) at Kuli‘ou‘ou, at the head of the valley. Keahia’s *kahu* (guardian) realized that the sickness was caused by the eel-man, and instructed Keahia how to kill him to save her relatives. He told her to go to Wai‘alae Stream as usual and stand to the left of a particular stone. Her *kahu* went with her to the stream, carrying a calabash and a magic ‘*ohe* (bamboo knife). When the girl stood on the left side of the stone, the eel made to seize her and she cut off his head with the ‘*ohe* and placed it in the calabash. The *kahu* told her to carry the calabash to Kuli‘ou‘ou and not for any reason to put it down, or her grandparents would die.

She took the *mauka* trail, and when she got to Wailupe she heard the gurgling of the stream, and almost put down the calabash to drink as the *puhi* had cast a spell to make her very thirsty. She remembered the words of her *kahu* and continued to walk east. In Niu, she came across a man lying on the ground groaning of the heat. In pity, she put down the calabash and started to run back to Wai‘alae Stream for water. She quickly realized that she had put her grandparents and her self in danger, and she called on the *mo‘o* of Kuli‘ou‘ou for help. The *mo‘o* surrounded the calabash so the evil *puhi* could not escape. The eel-man turned into a coconut tree that grew from the calabash, growing so fast it quickly reached the sky. The *puhi* threw down a coconut to kill the girl, but the *mo‘o* protected her. This is why a coconut appears to have two eyes and the nose of an eel, as it was the transformation of the evil *puhi*.

Section 3 Background History

3.1 Early Post-Contact Period

Accounts of early western visitors to the southeast coast of O'ahu suggest that the area from Waikīkī to Maunalua Bay, including Wai'alaie, Wailupe, Niu, and Kuli'ou'ou was well-populated and that food resources were more than sufficient. Anchoring his ship, the *King George*, in Maunalua Bay in 1786, Captain Nathaniel Portlock reported:

Soon after our arrival, several canoes came off and brought a few cocoa-nuts and plantains, some sugar-cane and sweet root; in return for which we gave them small pieces of iron and a few trinkets [Portlock 1789:69].

The captain attempted to find a fresh water source, but was unsuccessful, instead paying the natives to bring water to the ships in calabashes. A *kahuna* (priest) visited the ship, advising Portlock to sail his ship west to the Waikīkī shore, where the king, Kahekili, was residing. Portlock decided to remain on the southeast coast of O'ahu.

The old man informed me, that his [Kahekili's] residence was in a bay around the West point [Black Point], and importuned me very much to carry the ships there, as that place, he said, afforded many fine hogs and vegetables. Indeed, I had some reason to think that the inhabitants on that part of the island were more numerous than in King George's Bay [Maunalua Bay], as I observed most of the double canoes came round the West point; but as the people now brought us plenty of water, I determined to keep my present situation, it being in many respects an eligible one; for we hitherto had been favoured with a most refreshing sea breeze, which blows over the low land at the head of the bay; and the bay all around has a beautiful appearance, the low land and vallies being in a high state of cultivation, and crowded with plantations of taro, sweet potatoes, sugar cane, &c., interspersed with a great number of cocoa-nut trees, which renders the prospect truly delightful [Portlock 1789:73-74].

During the first half of the nineteenth century, glimpses of the southeast coast of O'ahu are provided in accounts of missionary visitors. Gilbert F. Mathison, walking through the area in 1822, noted a fishing village containing about 100 huts near Maunalua fishpond in Maunalua Ahupua'a, east of Kuli'ou'ou Ahupua'a; he also reported "occasional huts, scattered here and there together with several fine groves of cocoa-nut trees" as he continued traveling westward along the coast. At one spot, his party stopped to eat a watermelon from an agricultural field (Mathison 1825:387). This indicates that introduced dryland crops, such as melons, pumpkins, squash, cabbages, sweet potatoes, and Irish potatoes were probably already being grown in this area in the early 1800s (Kuykendall 1965:313, 319).

A settlement at Wai'alaie and scattered houses around Wailupe and Kūpapa ponds can be seen on a map of the southeast coast of O'ahu made by Lt. La Passe (Figure 10), aboard the French naval vessel *Eurydice*, which visited the island in 1855. Details on the map (reprinted in Fitzpatrick 1986:82-83) are difficult to see, but there is clearly a settlement within a coconut grove in the general area of Wai'alaie. Rectangles, probably representing taro fields, are also



Figure 10. 1855 map (portion) of southeastern O’ahu by Lt. La Passe of the French naval vessel *Eurydice*, showing Wailupe Pond in Wailupe and Kūpapa Pond in Niu; notice large settlement at Wai’alaie (left foreground) with rectangular taro patches; in Wailupe, Niu, and Kuli’ou’ou there are only scattered houses and no taro patches (map reprinted in Fitzpatrick 1986:82-83)

shown back from the coast, near Wai'alaie Spring. The coconut grove can be seen more clearly on the 1883 map of the "Wai'alaie Coast" by George Jackson (see Figure 5).

Little mention is made of the population of the Wai'alaie coast in early visitors' logs, but it was probably well populated with native Hawaiians. There were even some foreigners residing there, as John Papa 'Ī'ī noted in 1812. As Kamehameha I was preparing to make a trip to Hawai'i in the ship *Apuakehau*, they anchored at Hanauma to wait for the favorable winds to Moloka'i. 'Ī'ī noted: "The *Apuakehau* anchored for two days at Kawaihoa, waiting for Mr. Solomon, a *haole* man who lived at Niu, and who had been asked to take the ship to Hawai'i. He was a carpenter who also knew navigation" ('Ī'ī 1959:109).

In 1826, the missionary educator Levi Chamberlain took a tour of the island of O'ahu, traveling through the southern coast of O'ahu westward from Makapu'u. He recorded a settlement of eighteen houses at Maunalua, with three additional settlements between Maunalua and Wai'alaie (Chamberlain 1826). These settlements were probably at Kuli'ou'ou, Niu, and Wailupe. At Wai'alaie he stopped at a settlement with a schoolhouse.

In 1828, Chamberlain (1956) made a second tour of southeastern O'ahu, this time traveling eastward from Waikiki. He arrived at Wai'alaie, reporting a school with at least 30 scholars. The next stop was at Niu, on land owned by a Captain Adams.

At a quarter before 9 o'clock we arrived at the pleasant settlement of Wai'alaie, distant on a straight line from Waikiki in a N.E. direction, about 4 miles, but much farther following the circuitous path along the sea shore. This place is rendered agreeable by a grove of cocoanut trees and a number of branching kou trees, among which stand the grass huts of the natives, having a cool appearance, overshadowed by the waving tops of the cocoanuts, among which the trade winds sweep unobstructed.

At 11 o'clock we took our leave of the scholars [of the Wai'alaie school] and the people who had assembled to witness the examination, and walked towards Wailupe the next settlement. On our way thither we were overtaken by a shower and got wet. On our arrival we examined a small school, and after partaking of some refreshment kindly provided by the head man, we set forward for Niu a place belonging to Cap. Adams, pilot of Honolulu [Chamberlain 1956:28-29].

When Chamberlain reached Maunalua, the "last important settlement on the South side of the island," he again visited at a schoolhouse with about 30 scholars (Chamberlain 1956:29).

3.1.1 Early Historic Trails

Chamberlain probably traveled along the coastal trail of southeast O'ahu. John Papa 'Ī'ī documented the early nineteenth century (circa 1810) trails that extended from Honolulu along the southeast coast of O'ahu. Three trails met at the spot where Wai'alaie Stream empties into the ocean, in the area of Wai'alaie Park. One inland trail led directly from Honolulu, generally following the current alignment of Wai'alaie Avenue, which was later improved and is now part of Kalaniana'ole Highway.

The second (middle) trail led from the Waikīkī Beach, and crossed on the flat land between Diamond Head Crater and Kaimukī Hill, and the third paralleled the coastline, passing *makai* of Diamond Head, as shown in Figure 11, which represents 'Ī'ī's recollection of the Honolulu area around the year 1810:

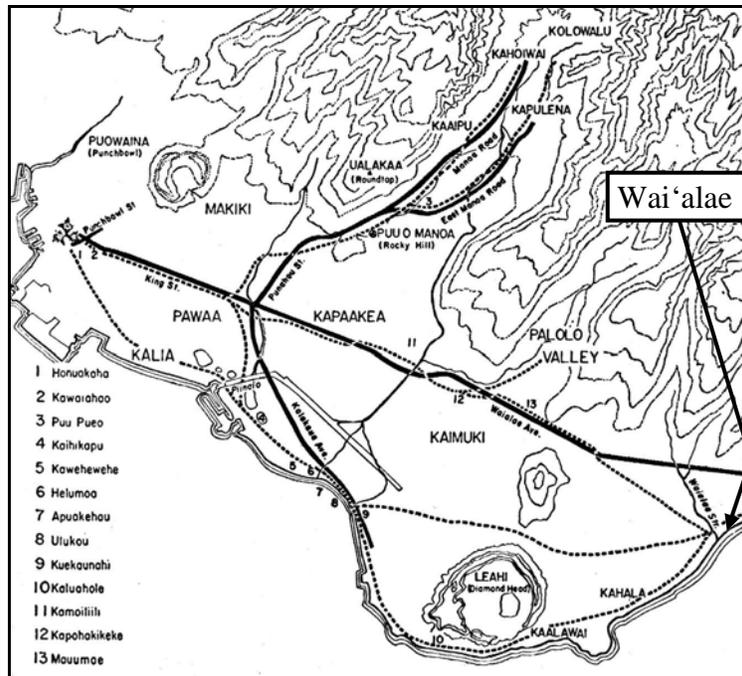


Figure 11. Map of southeast O'ahu, showing trails (dashed lines) ca. 1810, and later historic road alignments (solid lines); note that three trails converged near Wai'alae Stream (map from 'Ī'ī 1959:93; not to scale)

The trail from Kawaihāho [**middle trail**] which led to lower Waikiki went along . . . the sandy beach of Ulukou to Kapuni, where the surfs roll in; thence to . . . above Leahi [Diamond Head], and on to the place where the Waialae Stream reached the sand. The trail that ran through Kaluahole [**lower trail**] went to Kaalawai, up, over, and down into Kahala, to meet the other trail at the place where the [Wai'alae] stream met the sand. There they met the *mauka* trail [**upper trail-Wai'alae Ave**] that came from Ululani's place in Pawaa to Kapaakea, then up to Kamoiliili, and to Kapohakikeke, where it left the trail that went up to Palolo, and continued on to Mauumae, above Kaimuki where a pole later stood to serve as a mark for ships. From there it went down to, and along the upper side of, the taro paths of Waialae to join the other trails at the sand and go along Keahia and on to Maunalua, to the sea of Koko, to Makapuu, and so on ['Ī'ī 1959:92, 94].

A second trail was within Niu *Ahupua'a*, leading from the leeward side of the island at Niu to Waimanalo on the windward side of the island. A 1922 article in the Hawaiian language newspaper *Ka Nūpepa Kū'oko'a* described a *mauka-makai* trail that crossed Niu from the coast to the uplands:

The narrow trail began at Niu and led through the valley of Kailiili-iki till it went up a Koolau mountain and down into Waimanalo. It was said that the Hawaiians traveled on this trail from Waimanalo to Niu, and from Niu to Waimanalo. The population was large in these places in centuries past It was about seventy-five years ago that the Hawaiians stopped using the trail . . . they thought that when they got to the top of Kilohana the descent would be steep, but when they got up by the mountain trail they found that the ropes they brought were of no use. They said that the other side of the mountain toward Waimanalo was very steep, yet the descent was very good and they had no trouble getting down to the ground below [translation in Sterling and Summers 1978:274].

3.1.2 Hawaiian Battles and Burial Grounds

In 1795, Kamehameha invaded the island of O'ahu in his quest to conquer and unify all of the Hawaiian islands under his rule as *ali'i nui* (high chief). His army, transported in a great flotilla of the large canoes called *peleleu*, left Hawai'i, touched on Maui and Molokai, and finally made land in O'ahu.

It is said that his army numbered sixteen thousand warriors, some of them armed with muskets, and that so great was the number of the canoes that they almost blackened the channels through which they passed. . . . Kamehameha landed with the main body of his forces in the neighborhood of Honolulu, his canoes extending along the beach from Waialae to Waikiki [Kalākaua 1990:405-406].

Reverend Desha (2000:407) says that Kamehameha spent four days at the beach, organizing his forces. At the Wai'alaie side were three armies, called Huelokū, Hunalele, and Kaikaoa, which numbered three *lau* (twelve hundred). From Waikīkī to Kunawai (lower Nu'uaniu) were the 2400 warriors under the direct supervision of Kamehameha. After the fourth day, Kamehameha and his forces moved inland, fighting the O'ahu forces from Punchbowl up to the Nu'uaniu Valley, where the remaining demoralized forces of the O'ahu chiefs attempted to escape over the Nu'uaniu Pass.

After a trip to the "Sandwich Islands in the late nineteenth century," E. S. Baker (reprinted in Thrum 1877) recounted places of interest in the Hawaiian Islands. He stated that the first battle of Kamehameha's invasion took place near the beach at Wai'alaie, and the numerous bones found in the sand along the Wai'alaie coast are the remains of the slain warriors.

COCO HEAD. The ride to this southernmost point of Oahu, ten miles from the hotel, must be performed on horseback. The road lies past the telegraph station, and through several native villages and coconut groves. This is an extinct crater, and is flanked by a beautiful cove, where tropical fishes are usually found. Returning, take the road along the beach and around Diamond Head, thus traversing the battle ground of Waialae, where Kamehameha fought his first battle with the King of Oahu, a sanguinary fight, in which thousands of warriors were slain, whose bodies were buried in the sand near the beach; this battle was fought in 1790 or '91 [Thrum 1877:34].

Passages in an 1865 book, an 1877 book (relating a visit to Hawai'i in 1872), and an 1899 book also point to the "battle-field" beyond Diamond Head, on a wave-eroded beach. In fact the 1899 account suggests that the burial ground was underwater at high tide.

Beyond the volcano [Diamond Head] is a very ancient burying-ground on the seashore, and as we rode over it, bones were often seen [Anderson 1865:203].

. . . on both sides of Diamond Head – an extinct crater – a mile or two beyond Waikiki are plains glorious to gallop over, but between them again and the hills are tracts of barren lava, stones, and cacti. On this further plain, close to the shore, is an ancient native cemetery, or, some say, battlefield, and there one can dig up bones and skulls out of the sand enough to stock every museum in Europe. Our naturalists enjoyed life at this spot hugely, returning triumphantly laden with skulls, like Indians from the war-path [Campbell 1877:390].

If you care to walk by the beach past Diamond Head, you will cross an old battlefield, and if the tide is right, there may be rich treasure-trove in the shape of bleached and whitened bones [Craft 1899:139-140].

An 1890 tourist guide directs visitors to a large burial ground past a "headland" (Diamond Head or Black Point) on the beach near the Wai'alaie coconut grove, near the present-day Wai'alaie Country Club.

The tourist should go out through the Park and round Diamond Head, in itself a beautiful ride. On the other side of the headland is the scene of Kamehameha I's battle with the Oahu chiefs. A large number of warriors fell and were buried in the sand. Skulls and bones can still be found in abundance simply by scraping the sand away. Many have been taken away and placed in museums in the United States and in Europe. Close to the battle field is the cocoanut grove of Wai'alaie, the finest on the Island of Oahu [Whitney 1890:19].

Others have disputed the origins of these burials, as early historians, such as Samuel Kamakau, recount only a few skirmishes in the coastal areas. The major battles took place along the slopes of Punchbowl or in the upland areas of Nu'uaniu. An 1862 account of the area suggests a different interpretation.

On the eastern face of the headland [Black Point or Diamond Head], in the sands of the seashore, beyond the reach of ordinary high water, an immense trench is found, in which lie innumerable human bones piled in indiscriminate confusion, and in every degree of disorganization; some few of them being perfect in structure, and bleached by the sun, where disinterred by the northeast wind, forming interesting ethnological specimens. Are these the remains of the victims of war in the earlier battles of Kamehameha, who landed at Wiakiki [*sic*], and Kalanikupule, the king of Oahu, for the possession of this island? Or do they mark the resting-place away from the homes of the panic-stricken people, of thousands who were suddenly swept away by some epidemic pestilence?

Further along the shore, the few hamlets of *Waialae* are seen nestled in a pretty grove. And a short distance beyond, the grass huts of *Waialupe* [*sic*] cluster near the high hill of Mauna Loa, from the southern foot of which a ridge extends still farther southwardly to the bold and lofty cape name *Coco Head*, the eastern boundary of the beautiful bay of Waialae, of which Diamond Head, already described, forms the western [Baxley 1865:124].

In 1866, Mark Twain visited the Hawaiian Islands. In a horse ride around O'ahu, he and his party came across this burial ground.

Presently we came to a place where no grass grew—a wide expanse of deep sand. They said it was an old battleground. All around everywhere, not three feet apart, the bleached bones of men gleamed white in the moonlight. We picked up a lot of them for mementoes. . . . All sorts of bones could be found except skulls; but a citizen said, irreverently, that there had been an unusual number of “skull hunters” there lately—a species of sportsmen I had never heard of before [Twain 1966:59].

Nothing whatever is known about this place—its story is a secret that will never be revealed. The oldest natives make no pretense of being possessed of its history. They say these bones were here when they were children. They were here when their grandfathers were children—but how they came here, they can only conjecture. Many people believe this spot to be an ancient battleground, and it is usual to call it so; and they believe that these skeletons have lain for ages just where their proprietors fell in the great fight. Other people believe that Kamehameha I fought his first battle here [Twain 1966:61].

This story is pretty enough, but Mr. Jarves' excellent history says the Oahuans were intrenched in Nuuanu Valley; that Kamehameha ousted them, routed them, pursued them up the valley and drove them over the precipice. He makes no mention of our bone yard at all in his book.

There was a terrible pestilence here in 1804, which killed great numbers of the inhabitants, and the natives have legends of others that swept the islands long before that; and therefore many persons now believe that these bones belonged to victims of one of the epidemics who were hastily buried in a great pit. It is by far the most reasonable conjecture, because Jarves says that the weapons of the Islanders were so rude and inefficient that their battles were not often very bloody. If this was a battle, it was astonishingly deadly, for in spite of the depredations of “skull hunters,” we rode a considerable distance over ground so thickly strewn with human bones that the horses' feet crushed them, not occasionally, but at every step [Twain 1966:62].

It is still uncertain whether this burial ground was near the eastern slope of Diamond Head, around Black Point, or further east along Kāhala Beach. As previously noted, although modern maps have the western boundary of Wai'alae Nui at Black Point, older maps show the boundary all the way to Diamond Head. Thus, when the visitors are referring to the “Wai'alae Beach,” they may be referring to all of the area between Wailupe Fishpond and Diamond Head crater.

From the 1899 account, the dune burials seem to have been on a rapidly eroding beach. The cemetery may even have been completely submerged at high tide. Thus, post-1900 accounts of this burial ground may be lacking because the beach has completely eroded away in the last 100 years.

3.2 Mid-Nineteenth Century and the Māhele

Detailed documentation of mid-nineteenth century settlement in Wai‘alae Nui, Wai‘alae Iki, Wailupe, Niu, and Kuli‘ou‘ou are first provided in records of the Māhele. The Organic Acts of 1845 and 1846 initiated the process of division of Hawaiian lands, thereby introducing private property into Hawaiian society. In 1848, the crown, the Hawaiian government, and the *ali‘i* (royalty) received their land titles.

3.2.1 Wai‘alae

The ‘*ili* of Wai‘alae Iki was awarded to Abner Pākī, the father of Bernice Pauahi Bishop, while Wai‘alae Nui was given to Victoria Kamāmalu, granddaughter of Kamehameha. The award for Kamāmalu also included a *lele* of Wai‘alae Nui within Wai‘alae Iki. A *lele* is also called a “jumpland,” as it is not contiguous to the main award. The *lele* of Kamāmalu seems to have contained most of the wetland taro lands around Wai‘alae Spring.

Subsequently in the *Māhele*, Land Commission Awards (LCA) were given to commoners and others who could prove residency on and use of the *kuleana* parcels they claimed. In Wai‘alae Iki and Wai‘alae Nui, 55 awards were claimed and 37 were awarded. Some of these awards are shown on a 1927 Land Court Application (LCAp) map (Figure 12). Of particular interest are 9 coastal lots, which would be along or *makai* of the present alignment of Kalaniana‘ole Highway. Information on these nine awards with a coastal lot is presented in Table 1. The *kuleana* awards for Wai‘alae indicate numerous taro *lo‘i* (irrigated fields) along the inland springs, *kula* land used for dryland crops, the rights to mountain and sea fishery resources, claims for fishponds, and houselots near the taro fields and along the coast. All but one of the awards contains more than one ‘*āpana*, or lots, which could be non-contiguous. Coastal parcels were usually used for house lots, *mauka* lots near streams, ‘*auwai* (irrigation ditches), and springs were used for *kalo* (taro) patches, and *kula* land was used for dry land cultivation of sweet potatoes and other dry land crops, or as pasture.

Of special interest in these awards are mentions of grave sites, *pa‘āina* (fences or walls), ‘*auwai* (irrigation ditches), fishponds, fishery rights, the ownership of specific important trees (such as coconuts, *hau*, *kou*, orange trees, etc.), and upland forest resource rights. Lulea (LCA 1989) mentions that he also received land for a *kula* of Mahuka, who was his *makuakane* (father). This is probably a reference to a land marked “Mahuka Tomb Site” shown on the 1927 LCAp 828 map (see Figure 12). Kauwahikaua (LCA 5625) states that one inland lot is adjacent to Loko Malokohana and Loko Lolopu and the coastal lot is adjacent to the *muliwai* of Kahawiiki, which is probably the mouth of Kapakahi Stream. Kupaniki (LCA 3100), states that his ‘*āpana* 2 is bounded by Loko Kaluamo in the ‘*ili* of Kaluaomoo. One possible translation of the name “Kalua o Mo‘o” would be “the pit of the *mo‘o*.” As *mo‘o* (lizard spirits) often dwell within streams and ponds, this would be an appropriate name for a fishpond. The LCA claim for Kupaniki, which is close to an historic grave site, does not mention any graves in his testimony.

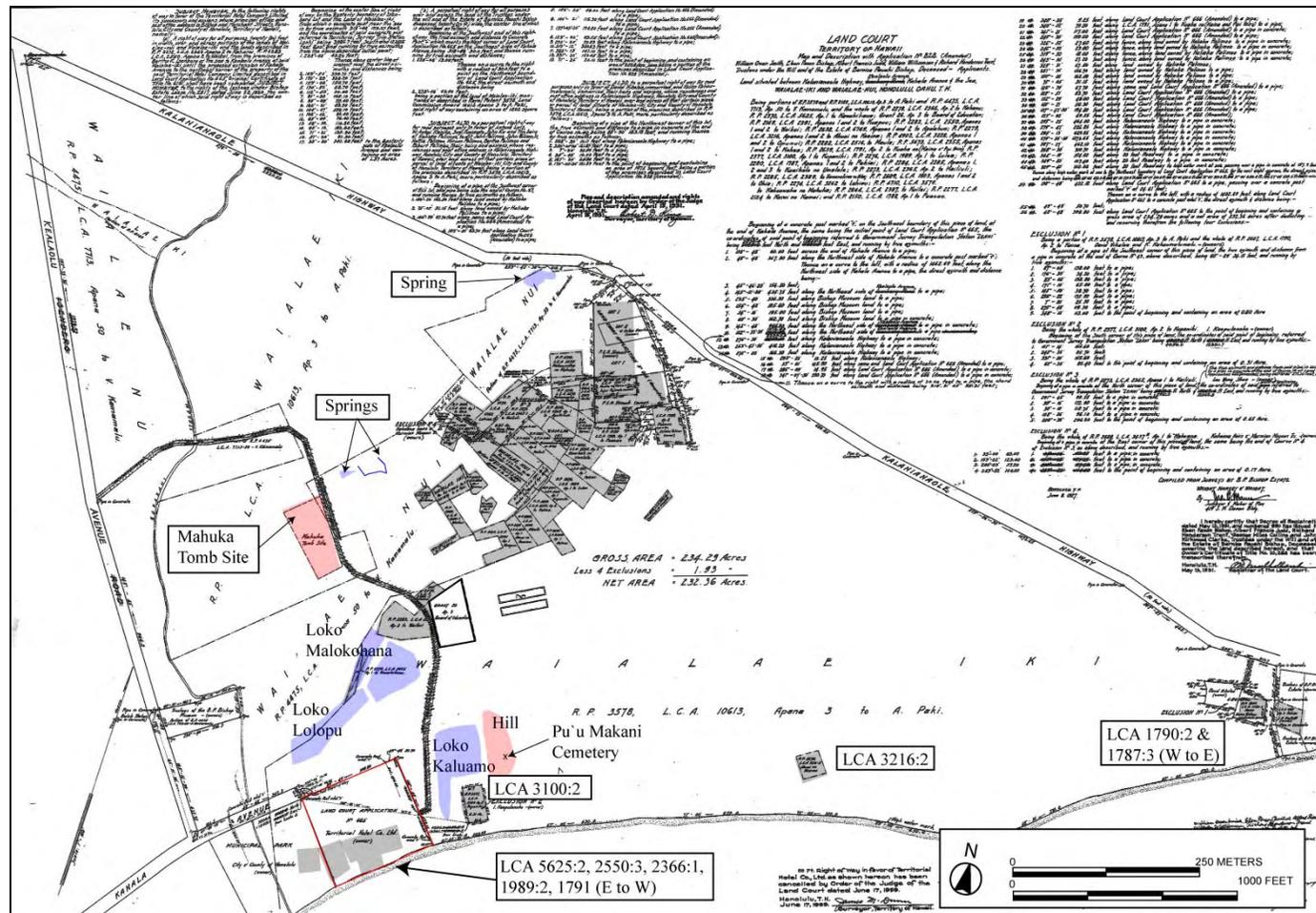


Figure 12. 1927 Land Court Application Map No. 828 (Hawai'i Land Survey Division) in Wai'alae, showing location of Land Commission Awards (shaded in gray) and a cemetery site (Tomb of Mahuka); information on coastal LCA parcels added from 1924 Land Application Map No. 665; the location of former lakes and springs (shaded in blue) added from 1903 Bishop Estate Map No. 335, the location of an area marked "graves" (Pu'u Makani Cemetery) added from 1920 Bishop Estate Map No. 718-B (portions of Bishop Estate maps shown in O'Hare et al. 2008)

Table 1. Land Commission Awards in the coastal section of Wai'alaie near the project area

LCA	Claimant	'Ili	Land Use*
1787	Pakiai	Keahua, Kuaihee	3 lots, 5 <i>lo'i</i> , 1 water course, 1 dryland mountain taro, 1 <i>kula</i> , and 1 coconut tree
1790	Kaina	Kaulu, Keahia	2 lots, 3 <i>lo'i</i> , 1 dryland mountain taro, 1 <i>kula</i> , and 1 houselot
1791	Kuaha	Kaulu, Naioliilii	2 lots, 3 <i>lo'i</i> , 1 watercourse, a dryland mountain taro, 1 <i>kula</i> , 1 house, coffee, lemon, cherimoya, and orange trees, sisal, and 1 fish pond
1989	Lulea	Aloalo, Makalii	2 lots, 7 <i>lo'i</i> , 2 water courses, 2 <i>kula</i> , and 1 house
2366	Kahanu	Punoiwi, Makalii	1 lot, 5 <i>lo'i</i> , 2 water courses, 1 <i>kula</i> , 1 house, 1 <i>kou</i> tree, rights to trees in <i>kuahiwi</i> [high places; mountains] and fishing rights
2550	Waikui	Punoiwi	3 lots, 9 <i>lo'i</i> , 2 <i>kula</i> , 2 houses, 3 <i>kou</i> trees, and 3 coconut trees
3100	Kupaniki	Kaiwipona, Kaluamoo	2 lots, 4 <i>lo'i</i> , 2 water courses, 3 <i>kula</i> [3 <i>māla</i> of sweet potatoes], 1 house, 1 coconut tree, and 1 <i>hau</i> tree; names Loko Kaluamo
3216	Ahuai	Keokea, Pukoaki	2 lots, 4 <i>lo'i</i> , 1 water course, 2 dry land mountain taro, 1 <i>kula</i> , a house, and 1 fishery
5625	Kauwa-hikaua	Lolopu, Makalii, Peleleu	2 lots, 13 <i>lo'i</i> , 1 pond, 1 water course, 1 <i>kula</i> , and 1 house; names Loko Malokohana, Loko Lolopu, and Kahawi-iki <i>muliwai</i>

Information compiled from waihona 'āina database or from Nagaoka (1985); note claimant names may vary between documents

3.2.2 Wailupe

The *ahupua'a* of Wailupe was awarded half to a *konohiki* (land manager) named Kamaha (LCA 6175), and half to the King. For his half, the king accepted “the large Fish pond [Wailupe Pond] and one acre of Kula land in the Ili of ‘Wailupe’ Oahu” (Barrère 1994:204). Kamaha was awarded the remainder of the land and all of the smaller fishponds.

In Wailupe, 57 claims were made and 37 were awarded, as shown on a 1925 LCAp 656 map (Figure 13), indicating that there was substantial settlement in the area. LCA claims were mainly for *kula* lands with sweet potato, coconut, orange, *hala*, *ipu*, and *pili* grass with no mention of taro being grown. Lots averaged 1.5 acres with two *kula* patches. The majority of lots were adjacent to major streams within the valley.

Land records of the 1840-50s for Wailupe detail several shoreline shallow reefs with walls built around them or modified brackish water swamps behind sand berms, including the larger Wailupe Pond. Most of the lower valley floors were cultivated in *'uala* (sweet potato) with *kula* land (dry land fields) being closer to the coast due to the broad, flat land (Ogata 1992). Dryland

fields usually cultivated dry land kalo (taro), *ipu* (gourd), and *ipu haole* (watermelon). Habitation structures were more prevalent along the shoreline with scattered dwellings more inland.

By 1925, most of the land adjacent to Kalaniana'ole Highway had been subdivided into small residential lots owned by Westerners. This includes two lots on the *mauka* side of the highway (labeled Perry/Hind property), which originally were two 'āpana awarded to Opunui (LCA 1851). Only two LCA claimants had parcels *makai* of the highway, LCA 6175 to Kamaha (shown in close-up inset on Figure 13), and LCA 2066 to Kalua, shown on a 1903 grant map (Figure 14), giving title of Wailupe Pond to Antonio Perry. This map has several other interesting features, showing the location of other small unnamed fishponds (which were awarded to Kamaha as part of LCA 6175), an inlet from Wailupe Pond to Punakou Pond, Punakou Spring, and Puhikahi Spring. Kamaha was the *konohiki* (land manager); he and Kalua (LCA 2066) are mentioned in several other awards as the donors of lands or as witnesses, indicating that they were important men in Wailupe.

Opunui (LCA 1851) stated that he had seven sweet potato gardens, one taro garden, an *ipu* (gourd) garden, and one houselot. Kalua (LCA 2066) stated that he had a garden where watermelon was grown, a pond for liberating fish, and a taro *lo'i*. The parcel “for liberating fish” must be the one on the *makai* side of the highway in the area of the small ponds northeast of Wailupe Fishpond. Kamaha (LCA 6175), whose award was for half of Wailupe Ahupua'a, notes that he was given land by the king including the *pu'u one* (small sand berm fishponds) along the coast. A small map with the LCA 6175 claim (Figure 15) shows three lots owned by Kamaha adjacent to the government road, 'Āpana 1, *makai* of the road, 'Āpana 2, *mauka* of the road, and 'Āpana 3, adjacent to the seashore.

One other claim of interest in Wailupe is LCA 2280-B to a man named Kalua. It is unknown if this is the same Kalua who was awarded LCA 2066. LCA 2280-B, which was not awarded, claimed a coconut grove near the *unu* (shrine or altar) of Kawauoha. This may be the same as Kawauoha Heiau, which was first listed as a *heiau* by Thomas Thrum (1907:45). This can not be confirmed, however, as the claim was not awarded to Kalua, and thus its location is not shown on any LCA maps.

3.2.3 Niu

In Niu, only four claims were made (LCA 802, 1836, 1840, and 2212) during the Māhele. LCA 1836, 1840, and 2212 were denied; only LCA 802 to Alexander Adams was awarded; thus Adams was awarded the entire *ahupua'a*.

Alexander Adams (1780-1870) was born in Scotland and went to sea at the age of twelve. He came to Hawai'i in 1811 on the American ship *Albatross* of Boston, under Captain Nathan Winship, an early pioneer in the sandalwood trade. He took up residence on O'ahu, and with the help of John Young, he was placed in command of the “Little Fleet” of Kamehameha I, consisting of 9 square-rigged vessels and 15 smaller craft. In 1816, Adams sailed the king and the crew of the brig *Ka'ahumanu* to Kaua'i to expel the Russian adventurers under the command of George Anton Scheffer. He was instrumental in allowing Kamehameha II to allow the American missionaries to remain. In 1823, he became the pilot for the port of Honolulu, a post he retained until 1844. Adams married three times, twice to a daughter of John Harbottle, harbor

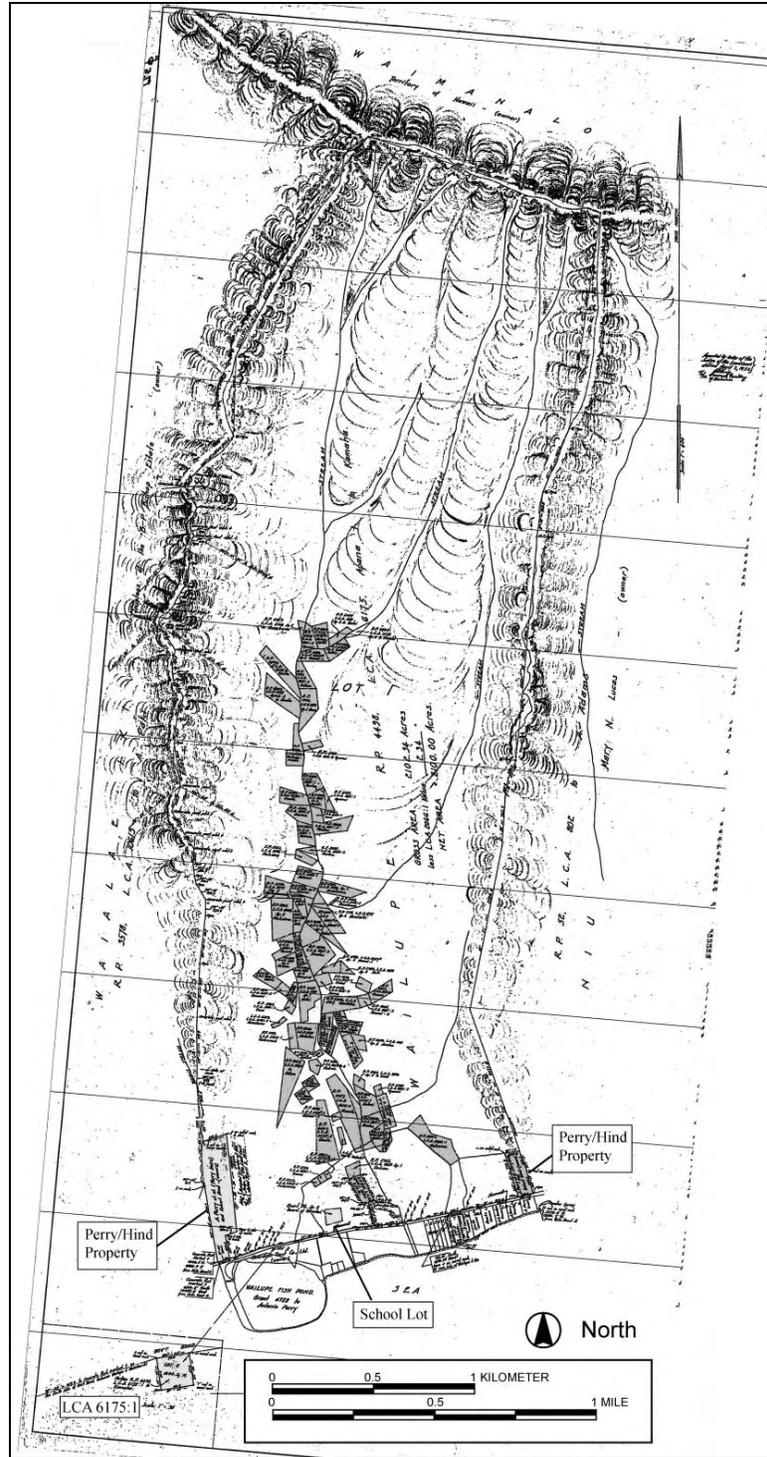


Figure 13. 1925 Land Court Application Map No. 656 (Hawai'i Land Survey Division) to Robert Hind for Wailupe lands, showing location of LCA parcels (shaded in gray) and land owned by the Perry family and Robert Hind; note location of LCA 6175:1 to Kamaha on the *makai* side of the coastal government road (now Kalaniana'ole Hwy.)

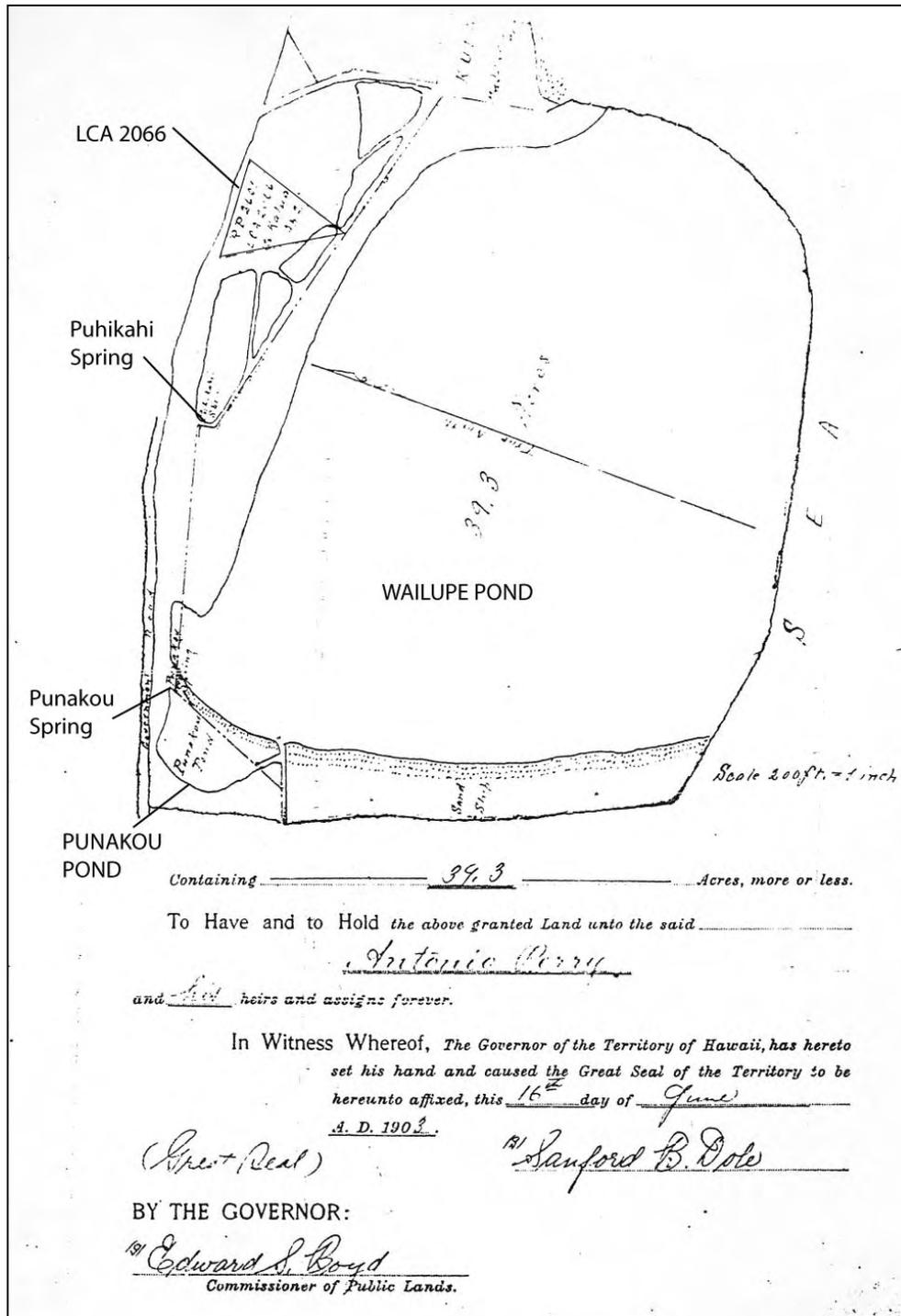


Figure 14. 1903 map with Grant 4728 to Antonio Perry for Wailupe Fishpond, showing location of Punakou Spring, Puhikahi Spring, Punakou Fishpond, and coastal lot for LCA 2066 to Kalua (Map on file at Hawai'i Land Survey Division; reprinted in Ogata 1992:Appendix II)

supporters. When Ke'eaumoku died in 1804, his lands passed to his daughter Ka'ahumanu. Following the death of Kamehameha I in 1819, Ka'ahumanu passed governance of Maunaloa, and possibly Kuli'ou'ou as well, to Kalola, a co-wife of Kamehameha. At some point, Ka'ahumanu took back control of Maunaloa and Kuli'ou'ou. At her death in 1832, Kuli'ou'ou passed to Keoni Wawaenui, also known as John Bigfeet. He had been a retainer of Kamehameha and was given the valley for his services (Takemoto et al. 1975:16).

Subsequently, in the Māhele of 1848, Kuli'ou'ou was divided into roughly equal halves with the eastern half adjacent to Maunaloa known as Kuli'ou'ou 1st and the western half adjacent to Niu known as Kuli'ou'ou 2nd (see Figure 8). The eastern half was designated Crown Land. In the Māhele, only two claims were submitted (LCA 70B and 4496) for Kuli'ou'ou to the Board of Commissioners. The claim for LCA 4496 was denied. The entire western half of Kuli'ou'ou (Kuli'ou'ou 2nd) was successfully claimed by Wai'aha, the daughter of Keoni Wawaenui as LCA 70B. Subsequently Kuli'ou'ou 2nd was leased to a Portuguese named Pico, after whom Paikō peninsula and lagoon are named. Pico became owner of these lands which remained in his family into the twentieth century, when the land was sold in small parcels.

3.3 Late Nineteenth Century to Early Twentieth Century

Handy and Handy (1972:483), on their work on traditional Hawaiian agriculture, *Native Planters in old Hawai'i*, note that Pālolo Valley (to the west of Wai'alaie) was “the last valley with extensive wet-taro lands.” E. S. Craighill Handy (1940) carried out a field survey on O'ahu in the 1930s, recording the general location of abandoned agricultural terraces and terraces still in use for the cultivation of traditional Hawaiian crops. During this time, taro was still cultivated along streams and by freshwater spring on the Wai'alaie coast, and other crops, especially sweet potatoes, were grown wherever the soil was adequate.

Handy (1940:74) noted that Wai'alaie had three moderate-sized gulches with streams of constant flow, but he could not find any agricultural terraces for irrigated taro patches (*lo'i*) in these areas during his field surveys. Abandoned taro terraces could still be seen near Wai'alaie Spring, on the flat lands near the Wai'alaie coast.

For Wailupe, Handy (1940:74), noted:

Wailupe Stream formerly had a larger volume than at present, and there may have been *lo'i*. John K. Clarke says that the ground below the mouth of the gulch is too porous to hold water and that the stream seeps away underground. He has never seen any sign of terraces nor heard of taro grown in this area.

Handy could not find any terraces in Niu or Kuli'ou'ou Valley either, but in Niu he noted that that there were two “sizeable” gulches [Pia and Kapaua] that might once have supported agriculture. He noted of the streams in Niu and Kuli'ou'ou:

They [streams in Niu] are dry today, but marshy land on the flats above the highway seems to indicate springs or underground flow and the probable present of terraces in the old days.

All the land [in Kuli'ou'ou] is now dry, and I am told that it is too porous to hold water even were water available for terraces. Presumably in earlier times there was a steady flow from the [Kuli'ou'ou] stream leading down from the verdant gulch or from springs.

3.3.1 Wai'ala'e Land Use

An 1881 book (Nicholson 1881:156) on the history and economy of Hawai'i lists 50 sugar plantations on the islands, including the Niu Plantation, which was owned by J. White, in Wai'ala'e. From the name, it is probable that this company extended into Wailupe and Niu Ahupua'a. A medical student on O'ahu in 1881 (Briggs 1926:40) states that there were 70 sugar plantations on the islands in that year, eight on O'ahu, including the Niu Sugar Plantation. Little is known about this sugar company. In his *Hawaiian Annual*, first printed in 1878, Thomas Thrum presented a table of the sugar plantations in the islands each year. The Niu plantation is first listed in the 1881 annual (Thrum 1881:57) in Wai'ala'e, operated by J. C. White. It is not listed in any subsequent editions of the annual, suggesting that it was a short-lived, possibly unsuccessful venture. Dorrance and Morgan (2000) in their history of sugar companies of Hawai'i do not even mention this plantation.

Chinese immigrants moved into southeastern O'ahu early to raise rice in former taro lands or to set up rural farms. They raised poultry, vegetables, pineapple, and watermelons, or worked at the fish ponds or on the ranches. In the 1920s and 1930s, the Lam family had a farm in Wai'ala'e. One daughter, Amy Young remembered:

We all worked from early morning until dusk. We had many hens, chickens, and ducks. . . . There were hundreds and hundreds of chickens and ducks to be killed and dressed!

We grew papayas, vegetables, sweet potatoes—mostly for our own use [Char and Char 1988:9].

One crop that did not succeed was large-scale pineapple cultivation. Chung Kun Ai, founder of City Mill, tried to grow pineapples in the 1920s in the uplands of Wai'ala'e. He leased some land from the Waialae Agricultural Co. through the agency of Castle and Cooke Co. He wrote in his autobiography:

We next secured from the Bishop Estate two pieces of barren land at Waialae and Wailupe. We spent \$9,000 to build a road into our Waialae Valley land and to put up shacks for our laborers. Again, after a few months, most of our young pineapples plants wilted, and those that had escaped wilting were blighted by the strong cold wind of winter. We had to chalk up another dead loss [Ai 1960:218].

3.3.1.1 Wai'ala'e Ranch

In the 1850s Captain John Ross leased 300 acres in Wai'ala'e from the Kamehameha family for a ranch. He was famous for his prize beef cattle and his parties. Little is known about John Ross; historic accounts are confusing as there were several men named John Ross in the early history of Hawai'i. An article on the early cattle industry of Hawaii mentions a Captain John Ross, an employee or associate who worked with John Parker, founder of the Parker Ranch on

Hawai'i. The article states that “Ebon Low is authority for the information that Captain John Ross took one of three shipments of steers from the Parker Ranch to Tahiti.” This is evidently the same man as the owner of Waiālae Ranch, as a 1850s-1870s photograph (reprinted in Grant 2000:xxvii) identifies Captain John Ross, Sam Parker, who was the son of John Parker, and Ebon Low, a cousin of Sam Parker who worked as a *paniolo* (cowboy) on the Parker Ranch, as three men at a workday party at the ranch.

The long-term lease to Wai‘ālae Ranch was purchased from the Bishop Estate in 1887 by Daniel Paul Rice Isenberg, who used the land to raise horses and beef cattle, and as a dairy, which later became part of the Honolulu Dairymen’s Association and even later part of Meadow Gold Dairy (Hitch and Kuramoto 1981:36). Ethel Damon, descendant of early missionary families on Kaua‘i relates some of the contemporary views of the Waiālae Ranch from letters between the children of the Isenberg and Cooke families. As soon as Paul Isenberg reached his majority, he took all of his inheritance to develop the ranch in Wai‘ālae.

The land had never really been utilized to its full capacity and young Paul Isenberg went into it with high hopes, plowing extensively for alfalfa fields, installing large pumps for irrigation and purchasing valuable cattle and blooded race horses [Damon 1931:788].

The cattle/horse ranch was not very successful, as the market for fine horses was low; however, in the early days the ranch was the scene for many festive occasions, especially when one of Isenberg’s horses was racing at Kapi‘olani Park.

His [Isenberg’s] birthday chanced to fall on the eleventh of June, Kamehameha Day, that most joyous of all Hawaiian holidays and preeminently the day of jockey races in Honolulu. Rarely did it pass without a luau at the Waiālae Ranch, a convivial Hawaiian feast which decked its guests with flowers and song. . . . Never was he more at home than when jovial King Kalakaua would come out to Waiālae for the evening, as he not infrequently did, and the festivities could be crowned with a luau [Damon 1931:790-791].

Isenberg expanded the house on the beach that John Ross had built, adding several rooms, a porch and a large beachfront *lanai*. In the early 1920s, the estate was sold to Frederick G. Schattauer, the ranch manager, and two men associated with the Bank of Hawai‘i. They continued to run the ranch as a dairy, but were losing money on the enterprise.

3.3.1.2 Military Actions in Wai‘ālae

Wai‘ālae in the 1889 “Insurrection”

In 1887, a secret organization called the Hawaiian League was formed to push for reform in the government of King Kalākaua. The men wanted to take away much of Kalākaua’s power and form a constitutional monarchy, with the Hawaiian king a mere figurehead. The main power would reside in a new cabinet, dominated by the members of the Hawaiian League, who were mainly *haole* (non-native Hawaiian) businessmen. In 1884, a volunteer military company, called the Honolulu Rifles was organized. In its first few years it operated mainly for drill exhibitions, often attended by Kalākaua himself, but it gradually became the military arm of the Hawaiian League. An 1889 photograph shows the Honolulu Rifles camped out in Wai‘ālae, on or near the

present Wai‘alae Golf Course grounds (Figure 16). Pressured by the Hawaiian League, with the added threat of the Honolulu Rifles, in 1887 Kalākaua dismissed his cabinet, signed a new constitution, and established the Reform Government. An insurrection to the new reform government, led by Robert Wilcox, was attempted in 1889. A supporter of Queen Lili‘uokalani for the throne, he organized a volunteer militia, mainly Hawaiians or part Hawaiians, called the Kamehameha Rifle Association. On July 30, they marched on ‘Iolani Palace, demanding that Kalākaua abrogate the 1887 constitution. The king was not at the palace, and Wilcox’s militia was soon surrounded in the palace yard. They came under fire when the Honolulu Rifles arrived at the palace, and eventually, they surrendered to government forces (Kuykendall 1967:347-352; 426-428).



Figure 16. 1889 photograph of “Camp Austen” in Wai‘alae, an encampment of the Honolulu Rifles; the photograph was taken from the general location of the Wai‘alae Golf Course, looking towards Wai‘alae Nui and Pālolo (Bishop Museum Archives; photograph reprinted in Scott 1968:679)

Wai‘alae in the 1895 “Rebellion”

In 1895, loyalists of the Hawaiian monarchy attempted to reestablish Queen Lili‘uokalani to the throne of Hawai‘i. In 1894, they had purchased from an agent in San Francisco 88 pistols, 288 Winchester rifles, and 50,000 cartridges. The arms were offloaded at three sites, near Rabbit Island on the Ko‘olau shore, near Kūpikipiki‘ō (Black Point), where the guns were hidden in the thick *kiawe* and *lantana*, and at the beach in Kāhala in Wai‘alae Nui, at the border of Paul Isenberg’s dairy ranch (Loomis 1976:133). Thomas Thrum, editor of the *Hawaiian Annual*, reported on “our late unpleasantness” in his publication of the following year:

On Sunday, January 6th, Nowlein and his trusted allies summoned their men to gather at Kaalawai, at foot of Diamond Head, some of whom readily responded, while others were lured under the guise of a luau, or forced—as they testified—at the point of a pistol. Here they were set to digging up and cleaning the buried guns, etc., and several squads hurriedly drilled in the use of arms. A number of

foreigners out for a stroll beyond Kapiolani Park were taken charge of and put under guard and kept prisoners for a time, together with residents of Waialae known to be opposed to their restoration scheme, to prevent the movement being reported to town. The telephone signal station at Diamond Head was also seized as a precautionary measure [Thrum 1896:57].

One of the captured Wai'alaie residents was Alex Isenberg, brother of the owner of Wai'alaie Ranch. Some of the conspirators then rendezvoused at the base of Diamond Head, at the house of one of the monarchy sympathizers, Henry Bertelmann. The police, sent with a warrant to Bertelmann's house, were fired upon, then retreated to the Kapi'olani Park area. Reinforced by the military, the police took a defensive position at the foot of Diamond Head and the park to prevent the rebels from advancing towards Honolulu. The insurgents had the high ground of Diamond Head, firing to the government forces below, but they were eventually forced to retreat to the west, along Wai'alaie Road. Eventually they realized their cause was lost, and the rebels surrendered or scattered, trying to escape along the upland trails (Loomis 1976:115-169).

3.3.1.3 History of the Wai'alaie Country Club and the Wai'alaie Golf Course

In 1925, officers of the Territorial Hotel Company were looking around for a good place to build a golf course. Wai'alaie had some advantages, such as the relatively flat, open land, but other disadvantages such as its distance from town over bad roads and its low population. There were only about 25 homes in the area around 1925, mostly beach cottages owned by rich businessmen whose principal homes were nearer Honolulu. In 1925, the officers obtained a lease from the Bishop Estate for 250 acres for Wai'alaie Golf Course, and also obtained the 4.29 acre plot on which the Wai'alaie Country Club was built (Sandler 1990; Hitch and Kuramoto 1981). The golf course was constructed in 1927 by the Territorial Hotel Company, who owned the large Waikiki Royal Hawaiian and Moana Hotels. It was designed to cater to wealthy tourists who arrived on the large Matson Navigation Company's ocean liners and who frequented these hotels. The club house, which was the original houselot for the Ross and Isenberg families, was used by the company for lunches, dinners, and dances for its hotel guests (Figure 17). The 1930 tourist's guide to the islands urged people to stop at the Wai'alaie Country Club:

We are soon whizzing past the beach houses that we saw from Black Point, and in a short time we reach the end of the Kahala road and turn sharply to the left - unless we want to enter the grounds of the Waialae Golf Club. Built by the Territorial Hotel Company, this club is under the direct control of the Royal Hawaiian Hotel. The eighteen-hole course is of the finest, and nowhere is golf played under a more ideal tropical setting. The clubhouse, surrounded by cocconut palms and tropical shrubbery and with a spacious lanai facing the water, is most inviting to the tired player or the tea-thirsty visitor. Friday-evening dinner dances and Sunday-night Italian suppers are drawing cards for residents and malihinis [newcomers] alike. Sitting on the comfortable lanai and fanned by the cool breezes sweeping over Koko Head, one cannot help but wander into the days of yesterday. With the old Hawaiian flag waving majestically above us, we could very easily be spending delightful days with some member of royalty or, better still, enjoying the seclusion of our own earthly paradise [Griffis 1930:73-74].



Figure 17. 1935 photograph of the Wai'alaie Country Club, view to the north (photograph reprinted in Hitch and Kuramoto 1981:45)

3.3.2 Wailupe Land Use

The 1925 LCAp map of Wailupe (see Figure 13), concerning the land purchase by Robert Hind of much of Wailupe Valley), indicates that by the early twentieth century, many of the lots adjacent to the highway were owned by businessmen of foreign ancestry. Several coastal lots are labeled as owned by A. Perry, and the two LCA parcels along the *mauka* boundary of the highway at each border of the *ahupua'a* area labeled as owned by A. Perry and R. Hind. Antonio Perry, a lawyer and judge on the Hawai'i Supreme Court, was the son of a Portuguese immigrant who operated a dry goods business in downtown Honolulu (Siddall 1921:311). Antonio Perry also invested in land, and he owned several beach lots in Wailupe, one on which he built a family house. Scott (1968:687) mentions that in 1880 Perry operated a dairy on this land, which was adjacent to the land of Alexander Adams in Niu Valley. Perry later sold most of his Wailupe lands to Robert Hind.

In 1924, Robert Hind, son of an American immigrant who established several sugar plantations, purchased 2,090 acres in Wailupe Valley and operated a dairy, which came to be known as the Hind-Clarke Dairy (Clark 1977:36-37). The Hind-Clarke Dairy was even a stop for tourists, as noted in a 1930 visitor's guide:

Emerging on to Waialae Road, the chief thoroughfare through Kaimuki, and keeping on into town, we swing to the right and border more of the [Wai'alaie] golf-course en route to Koko Head. All along here are groves of cocoanut palms and papaia orchards, with frequent truck gardens and chicken ranches. At the end of a mile and a half we are passing through the Wailupe Municipal Camping Park and then the Naval Trans-Pacific Radio Receiving Station.

The Hind-Clarke Dairy, a short way ahead and to our left with a large sign over the entrance, is not to be passed unnoticed. The dairy is a model of its kind and well affords an opportunity to see dairying in its most scientific form. The cottage cheese on sale is, perhaps, the most delicious you have ever tasted [Griffis 1930:74].

3.3.3 Niu Land Use

The Māhele awards for Wai'alaie mention the cultivation of native dryland (*kula*) crops, such as gourds, *pandanus*, sugarcane, coconuts, bananas, and sweet potatoes, and for introduced plants, such as watermelons, Irish potatoes, and oranges. Many of these crops were probably grown for trade to whalers or other visiting ships. Some of the *kula* lands were also used for cattle and livestock pasture (Erkelens and Athens 1994:22). There is less information concerning the use of the land in Niu, since the entire *ahupua'a* was awarded to just one man, Alexander Adams. The Māhele award (LCA 802) to Alexander Adams mentions that some land was used for the cultivation of taro, and that it also had a spring (Papalea Spring) at the southwest corner of the claim near the sea. Scott (1968:687) notes that in 1880, "1200 acres of pasture land for grazing milk cows and beef were available" on the lands owned by Alexander in Niu Valley combined with the adjacent Perry dairy pasture lands in Wailupe Ahupua'a.

The Adams homestead can be seen in a sketch made by Lt. John Dale (see Figure 7), a member of the United State Exploring Expedition in 1845, who came to Niu to examine one of the famous burial caves (Dale 1845; Forbes 1992:126-128). This sketch depicts Niu Valley looking towards Koko Head, with Kūpapa Fishpond along the coast surrounded by taro patches. The inland areas are covered by large rectangular fields that were probably planted in melons, cabbages, sweet potatoes, Irish potatoes, and pumpkins (Kuykendall 1965:313, 319). It is also known that Alexander Adams was one of the early planters of coffee on his Kalihi and Niu lands; he got his seedlings from John Wilkinson, who started the first coffee plantation in the islands in Mānoa Valley on O'ahu in 1825 (Goto 1982:113).

With the decline in the importance of whaling after the 1860s, cultivation for native and introduced crops declined and much of the land in this area was used exclusively for pasture. In later maps, such as the La Passe map of 1855 (see Figure 10), the taro patches and inland fields are not shown, only a few coconut trees near the coast. This again suggests that the inland areas were mainly used for pasturage. In the 1880s, the descendants of Alexander Adams used the inland areas of their Niu Valley lands as cattle pasture, adjacent to the pasture lands for the dairy run by the Perry family in the *ahupua'a* of Wailupe (Scott 1968:687), land later owned by Robert Hind and his family. In 1880, George Bowser was gathering statistics on commercial interests in the islands, and he visited "the small but very fine stock ranch at Niu, owned by the Adams Brothers" (Bowser 1880:79). There also seems to have been a sugar growing company,

called the Niu Plantation in 1881 (Nicholson 1881; Briggs 1926:40; Thrum 1881:57). It is not listed subsequent to this year, so it must have been very short-lived.

Adam's lands were passed to his daughter Victoria Bannister, then to Victoria's daughter, Mary, who married Charles Lucas. The land passed through the Hind, Lucas, and related families over time (*Honolulu Advertiser* 1999). Lands not retained by the Adams/Lucas family were broken up into smaller residential lots and sold as private property (Putzi et al. 1998:24).

In the 1920s the remaining Niu lands were still owned by the Adams descendants (Scott 1968:689) under the Charles W. Lucas Trust, Hawaiian Trust Col. Ltd. Et al. Trustees. This land grant was held intact until 1925, at which time Mrs. Charles Lucas, the granddaughter of Capt. Adams owned these lands. A photo taken in the 1920s (Figure 18) shows the undeveloped nature of the land, with the single Adams homestead complex on the shore. In the 1920s, there were numerous dairies in Kuli'ou'ou and Niu, and small farms raising pigs, chickens and vegetables (Henry 1959).



Figure 18. 1920s photograph of the Adams Homestead on the Niu coast (original photograph at Bernice P. Bishop Museum Archives; reprinted in Scott 1968:689).

In the 1940s, large parcels of land were subdivided into residential lots. The last dramatic change in this area occurred in 1953, when Niu (Kūpapa) Fishpond and later Maunalua Fishponds were filled in to make land for additional house lots (*Honolulu Advertiser* 1953:III:1). Charles Lucas, great-great-grandson of Alexander Adams opened M's Restaurant in the 1940s, later called the Ranch House. It was sold to Spencecliff Corp in 1968 and stayed open until 1987.

3.3.4 Kuli'ou'ou Land Use

In the late nineteenth century, the entire land of Kuli'ou'ou 2nd had been leased to Manuel Pico, a Portuguese immigrant to the islands born on the island of Pico in the Azores. He arrived in the islands on a whaling ship around 1877 and became the Superintendent of Roads on Maui. As his name Pico was close to the word Hawaiian word "piko" (umbilical cord; genitals), the Hawaiians changed his name to Paikō. Mr. Paikō invested in land, acquiring 400 acres of Kuli'ou'ou (Kuli'ou'ou 1st) in 1874 (see Figure 8). He lived in the area until his death in 1890, and bequeathed the land on his death or the death of his heirs to the Roman Catholic Church.

Eventually, the majority of the land was held in trust for the benefit of St. Francis Hospital. The Paikō family not only lived on the land, but also gained the rights to the Kuli'ou'ou Fishery, which extended out from the coast and included all the waters surrounding Paikō Peninsula, including the protected waters of Paikō Lagoon, which were excellent grounds for torch fishing for mullet.

The inland areas of Kuli'ou'ou were used for sugar cultivation (1881 Niu Plantation), dairy cattle pasture, alfalfa fields (Sterling and Summers 1978:271), for sheep pens (Thrum 1907:45), and for homesteads. A 1911 Hawai'i Territory survey map of Kuli'ou'ou 1st shows large areas of open pasture on either side of an extensive marsh lying along Kuli'ou'ou Stream. The "marsh" bells out inland of the "government road" which approximates the present alignment of Kalaniana'ole Highway. It seems likely that these extensive marsh lands would have been suitable for cultivation in pre-contact times and that Handy and Handy (1972:74) painted an overly bleak picture of Kuli'ou'ou agriculture.

3.4 Mid-Twentieth Century to the Present

By the early twentieth century, the Wai'alae Road ran from Kaimukī out to Wailupe fishpond and beyond. Beginning in the 1920s improvements were made to the road, as it became part of the Kalaniana'ole Highway project that would run through the eastern half of O'ahu. Two aerial photographs shows the highway as it appeared during the early 1930s (Figure 19 and Figure 20).

During the late 1940s, major changes occurred along the Kalaniana'ole Highway. In 1946, Robert Hind sold his dairy operation to Creameries of America, and soon after that began to develop his land for residential use. The former cattle pasture was subdivided into lots to form the new subdivision called 'Āina Haina, a name that mean's "Hind's land." Soon after this the Hawaiian Dredging Company filled in the old Wailupe Fishpond, forming the Wailupe Circle subdivision (Clark 1977:36-37). (Figure 21). The 'Āina Haina shopping center was built in 1950 on land still owned by the Hind family.

In 1946 a 24-inch water main was installed along part of the highway. According to an article of October 26, 1946 in the *Honolulu Star-Bulletin*:

Kalaniana'ole highway will be torn up in the vicinity of Waialae golf course beginning next week as the board of water supply commences laying a new 24 inch main.

Fred Ohrt, manager of water supply, said the construction is part of a piecemeal program of highly essential additions to the city water system carried on in the face of rising costs and shortages of materials and labor (p. 2, col. 5).

Major modifications to the present Kalaniana'ole Highway project area occurred in the late 1960s when the highway was widened from four to six lanes between 'Āinakoā Avenue and Kirkwood Street.

Currently Wai'alae, Wailupe, Niu, and Kuli'ou'ou are residential areas complete with schools, parks, shopping centers, libraries and other public places. A vast majority of the lower valley area has been completely developed during the course of several decades, with a few new homes being constructed up on the ridge and higher elevations of the mountain slopes.

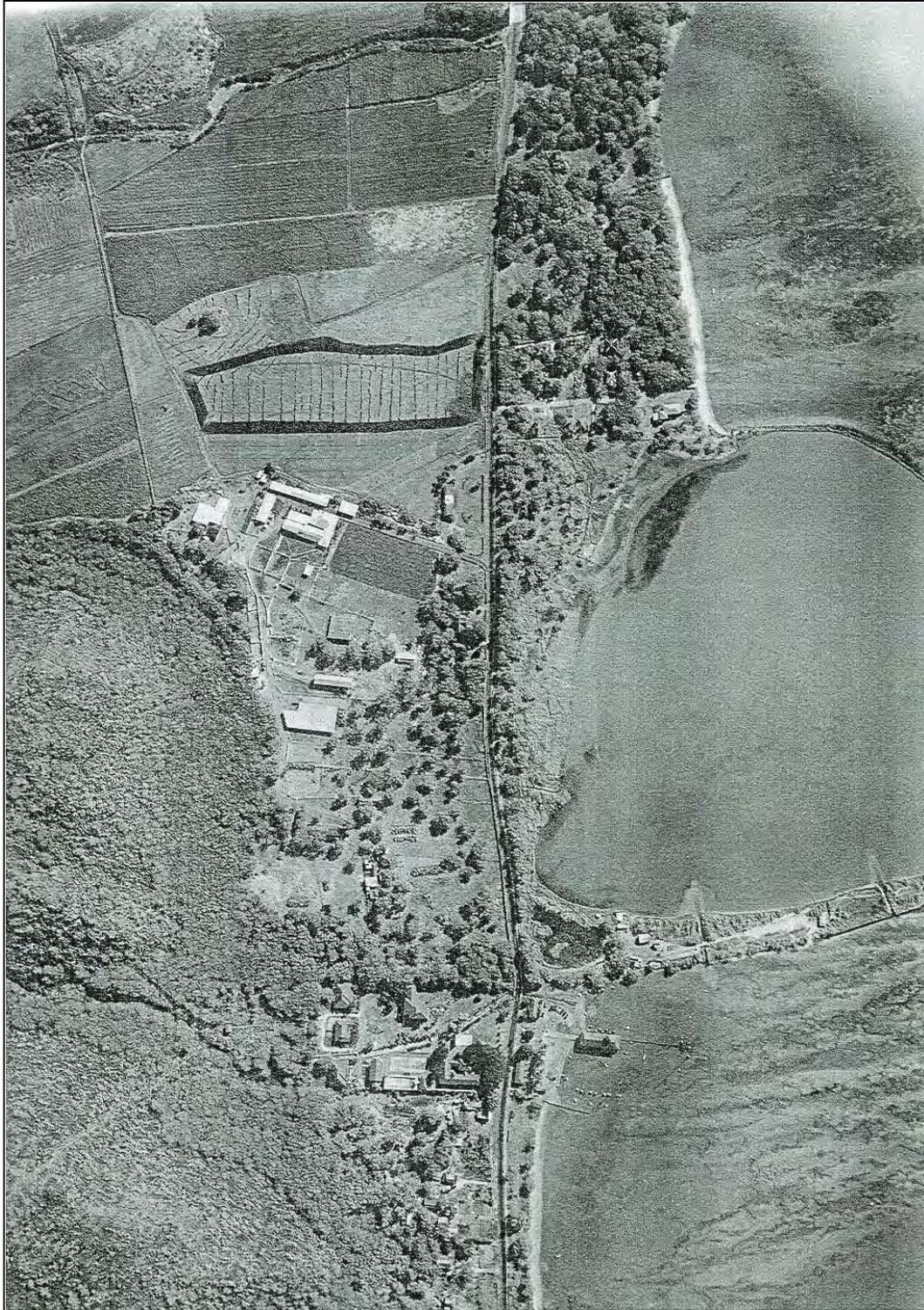


Figure 19. 1933 aerial photo of Wailupe fishpond and the former alignment and conditions of Kalaniana'ole Highway (Bishop Museum Archives); note buildings of the Hind-Clarke Dairy on the *mauka* side of the highway and Wailupe Fishpond on the *makai* side



Figure 20. Mid-1930s photograph of Wailupe Fishpond and Hind-Clarke Dairy; checkered fields on left are the site of the future 'Āina Haina shopping center, built in 1947 (Hind Estate archives; photograph reprinted in Scott 1968: 688)

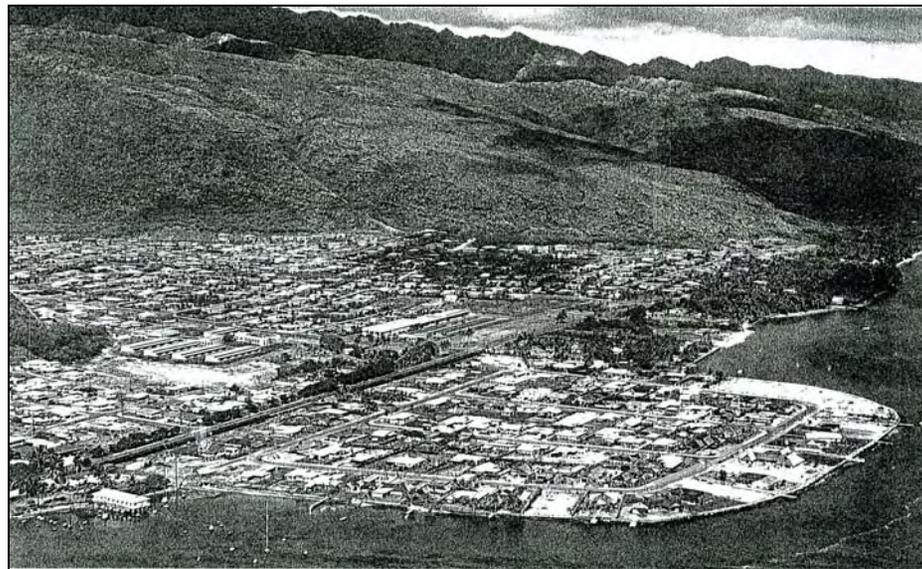


Figure 21. Circa 1950s photo of Wailupe peninsula, formed after the filling of the Wailupe fishpond and developed for residential homes (Bishop Museum Archives); the residential 'Āina Haina neighborhood is on the *mauka* side of the highway

A series of U.S. Geological survey maps show the changes in the Wai‘alae coast in the twentieth century. On a 1919 U. S. War Department map (Figure 22), coastal Wai‘alae is still part of Wai‘alae Ranch, which consists of a series of fenced fields and paddocks for Paul Isenberg’s cattle and horses. Wailupe also has long walls and enclosures around the Hind-Clarke Dairy surrounding the still existing Punakou Pond and Wailupe Pond. Long walls are also built in Niu along the Adams homestead, cattle ranch, and dairy. Scattered houses are found along the coast and near Wai‘alae Spring *makai* of the government road (later Kalaniana‘ole Highway), at a small community east of Wailupe Pond, and at the Niu Adams homestead.

On a 1927 U.S. Geological Survey map (Figure 23), the extensive fenced fields of the Wai‘alae Ranch have been cleared and the land is now the open grass of the Wai‘alae Golf Course. The old Isenberg home has been expanded into the Wai‘alae main clubhouse. New residential areas have been built *mauka* of Kalaniana‘ole Highway (formerly Wai‘alae Road), scattered along the highway, and along the Kāhala coastline. The former “lagoon” in Wai‘alae Community Park has been channelized, and the former fishponds have been filled or modified.

In Wailupe, little residential development has taken place, but dirt roads have been built into the valleys and on top of some ridges. For the Niu and Kuli‘ou‘ou section, Kūpapa is shown as a marsh rather than a pond, indicating the pond was not maintained very well by this time. There are still only a few scattered houses along the few unimproved (unpaved) roads. To the west of Wailupe Pond a Naval Radio Receiving Station, built in 1920, is labeled. In 1925, an unofficial communications intelligence site was established at this site, but the signal was too poor to be effective and it was closed down in 1934, and intelligence was instead gathered from a He‘eia station. A contemporary account describes the 1920s station.

The Wailupe receiving station is one of the largest receiving radio stations in the world. From this station as many as a half dozen messages may be sent and received simultaneously, on the different wave lengths used. About 60 men are employed at this station and over a million words of traffic by radio have been handled in a single month [Mulrone 1929:67].

On a 1943 U.S. War Department map (Figure 24), residential growth continues in Kāhala, along Wai‘alae Road and in the new *mauka* residential areas of ‘Āinakoā and Wai‘alae Iki. Wailupe is still dominated by the buildings and paddocks of the Hind-Clarke Dairy. Niu and Kuli‘ou‘ou are still fairly rural.

A 1954 Army Corp of Engineer map (Figure 25) shows the growth of the new “Kula” neighborhood surrounded by the golf course, with the addition of a Radio Tower in the center in Wai‘alae. In 1947, the Wailupe fishpond had been filled to form the Wailupe Peninsula and the area *mauka* of the highway has been graded and developed into the ‘Āina Haina subdivision. The former Naval Radio station is now a Coast Guard Station. Kūpapa Pond in Niu has also been filled, but not developed. There are a larger number of houses around Niu-Kuli‘ou‘ou on the *mauka* side of the highway.

The 2000 U.S. Geological Survey map (see Figure 1) shows the Kāhala Hilton, constructed in 1963 and other residential area, including the neighborhood within the golf course in Wai‘alae. Wiliwilinui Ridge has been graded and developed into the Wai‘alae Iki View subdivision.

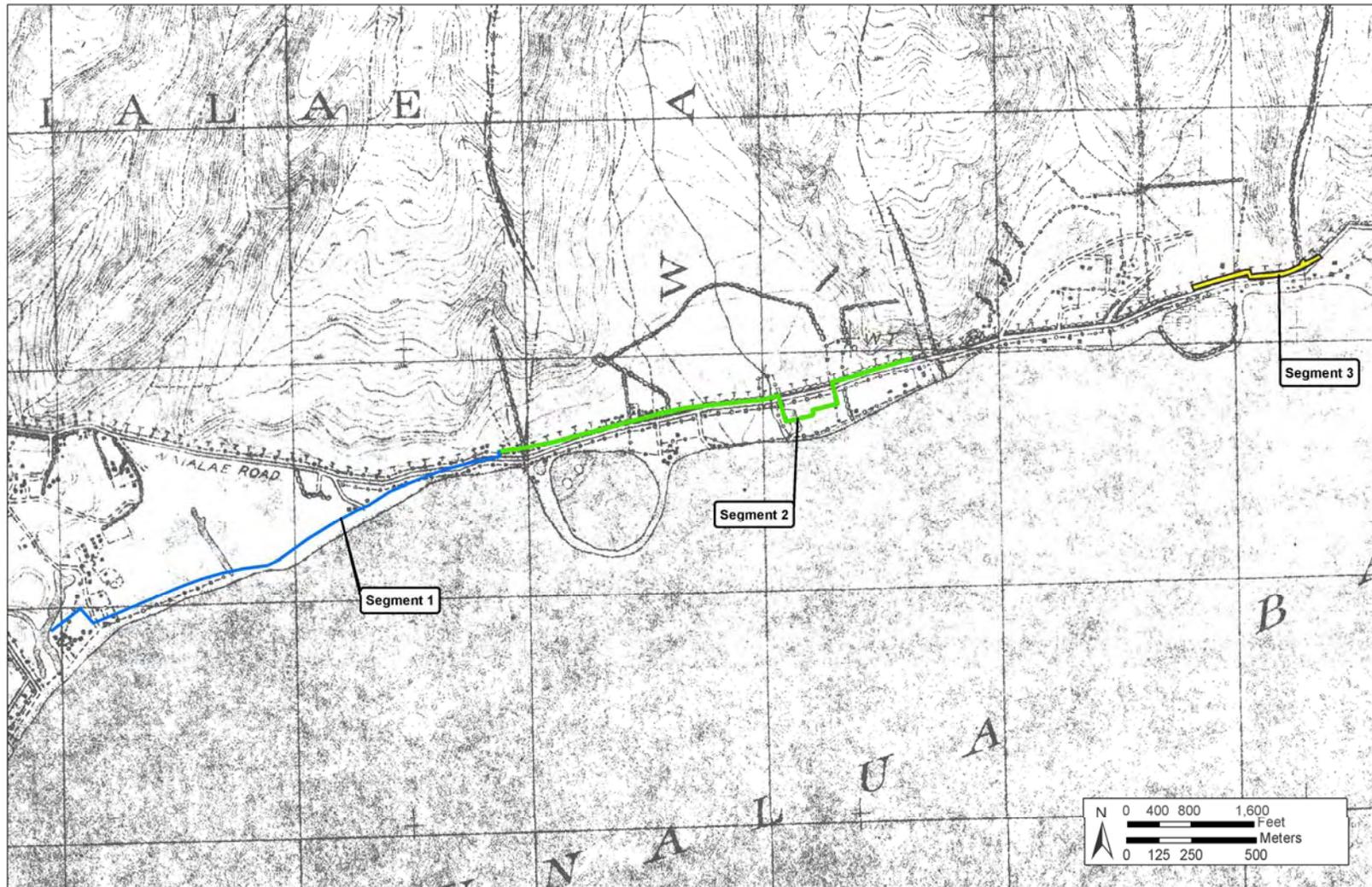


Figure 22. 1919 War Department Fire Control map (Koko Head Quad), showing the Kalaniana'ole Highway Sewer System Improvements project area

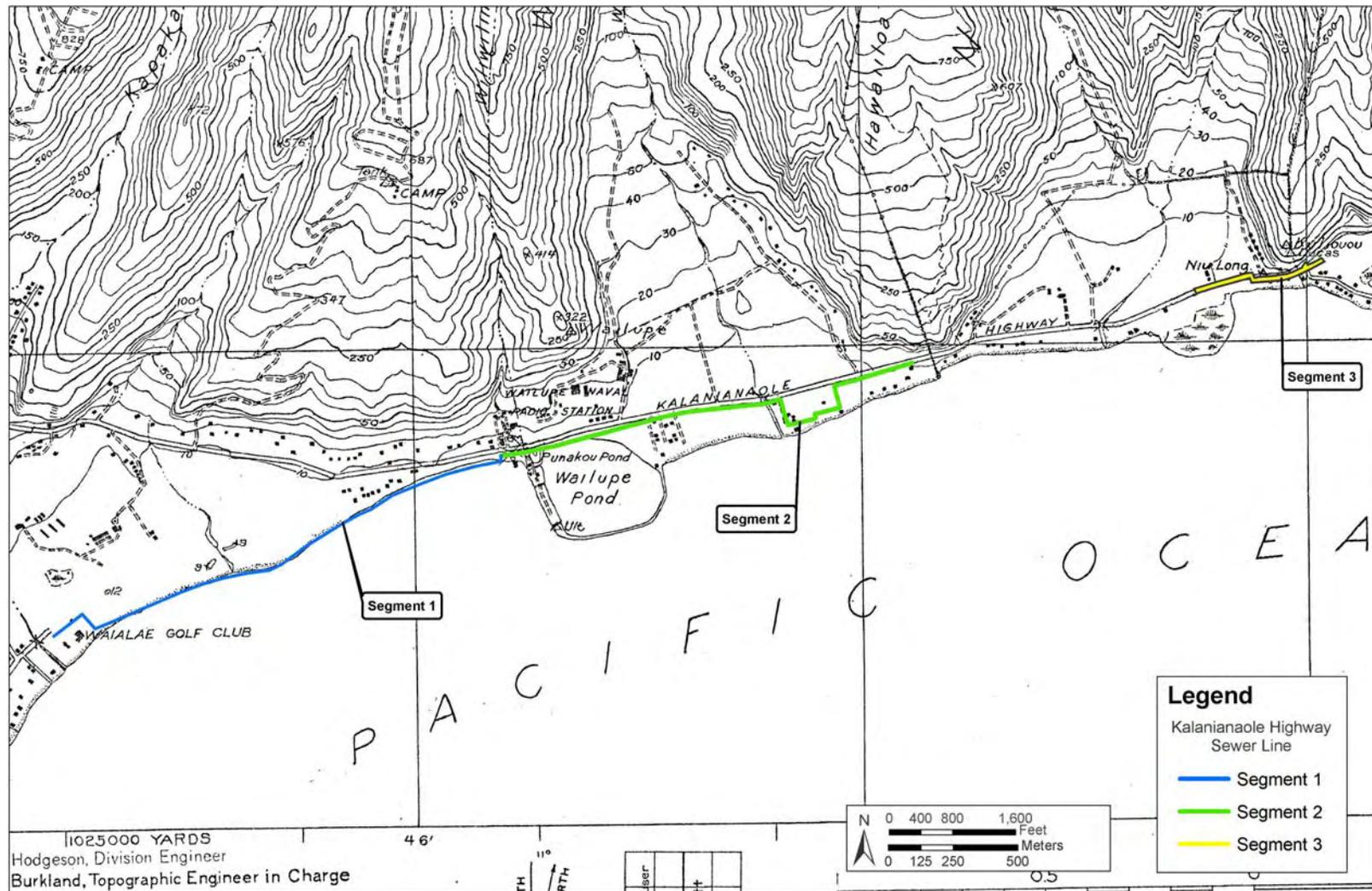


Figure 23. 1927 U.S. Geological Survey map (Koko Head Quad), showing the Kalaniana'ole Highway Sewer System Improvements project area

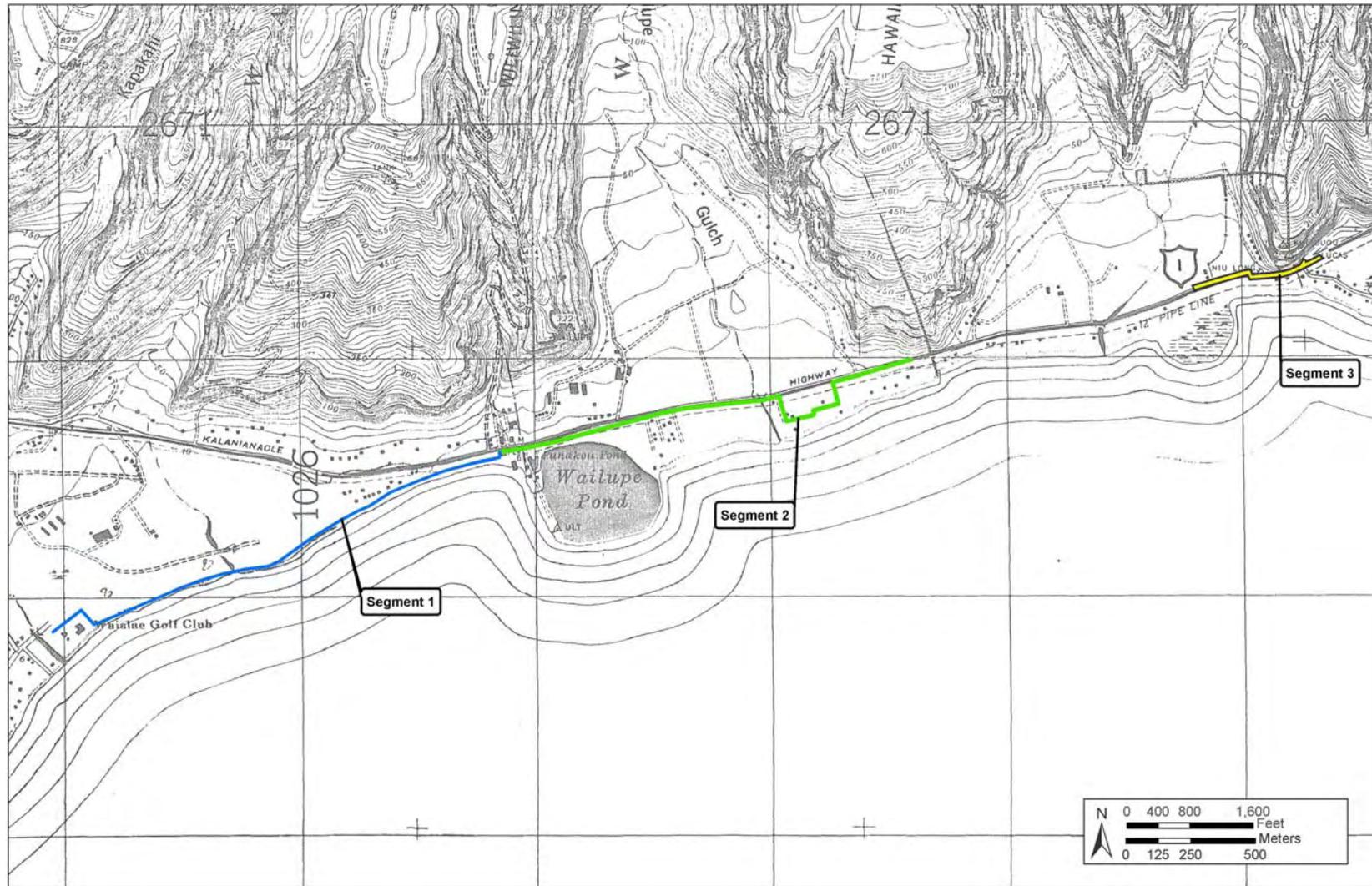


Figure 24. 1943 War Department map (Diamondhead Quad), showing the Kalaniana'ole Highway Sewer System Improvements project area

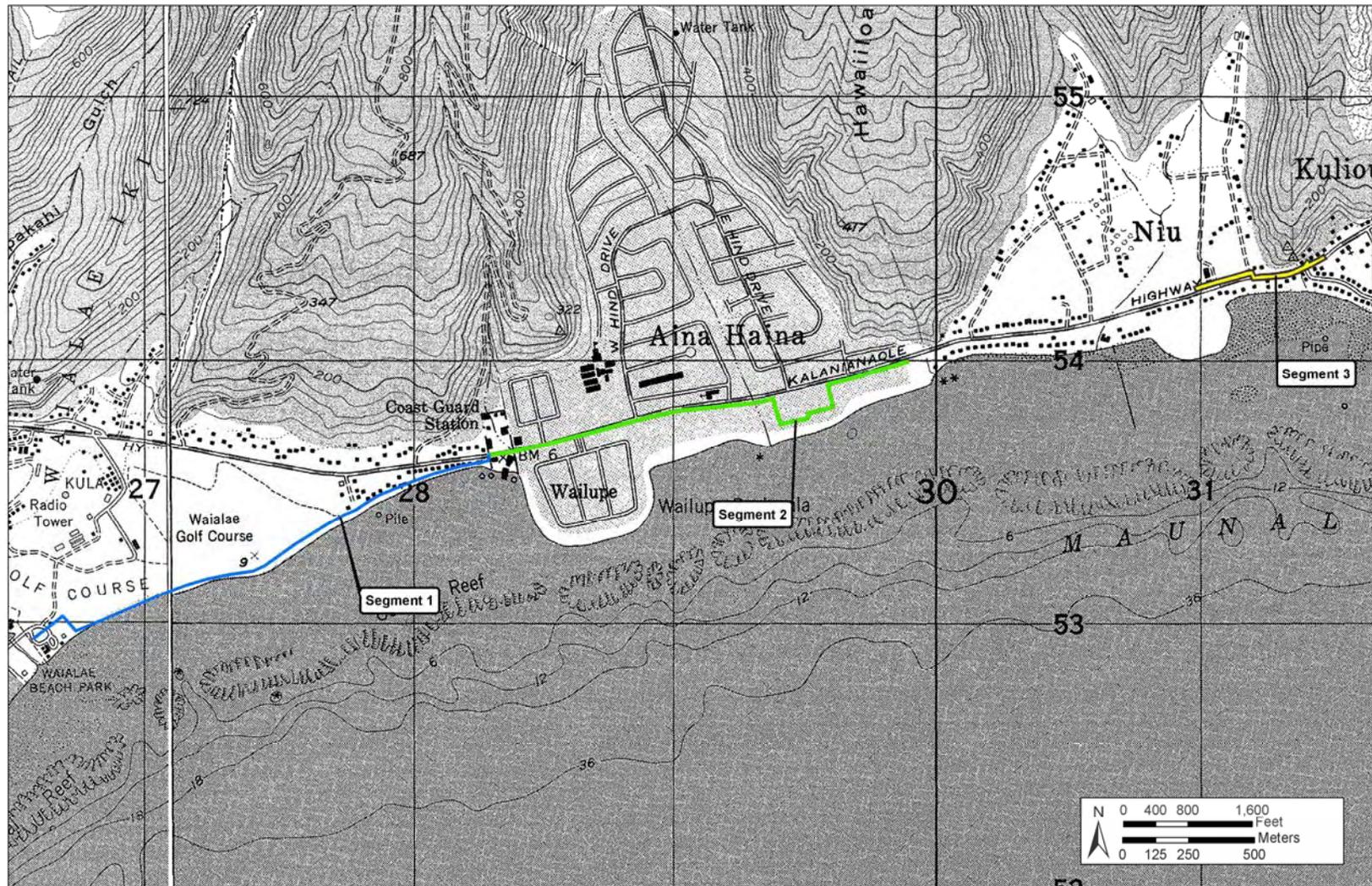


Figure 25. 1954 U. S. Army Mapping Service map (Koko Head Quad), showing the Kalaniana‘ole Highway Sewer System Improvements project area

3.5 Interview with Mr. Gregg Kashiwa

Cultural Surveys Hawai'i completed a Cultural Impact Evaluation (CIE) for a private residential lot in Wailupe (Stevens-Gleason and Hammatt 2008). Included in that report was a long interview with Mr. Gregg Kashiwa, a resident of Wailupe for over 50 years, who had memories of the area from Kāhala to Waimānalo. His interview speaks of the *lo'i* (wet-taro gardens) and *loko i'a* (fishpond) that existed before they were filled in for the Wailupe Peninsula development; the Hind-Clark dairy located in Wailupe Valley; the effects of the 1946 tsunami on the valley; and the fresh cold water that flowed in Wailupe Stream and emptied into the ocean. As a young child, he was told about the delicious Wailupe *poi* that was often traded for fish; and, he was also told to stay away from the burial caves that lined Wailupe Valley. The portions of Mr. Kashiwa's recollections (in Stevens-Gleason and Hammatt 2008: Appendix A) that deal specifically with information on Wai'alae, Wailupe, Niu, and Kuli'ou'ou are abstracted below:

Kāhala/Wai'alae Ahupua'a

I start at Kealaolu Street in Waialae Kahala where it runs into the freeway from Kahala Avenue. I start there because it formed the west (Ewa) boundary of Waialae Country Club that has remained intact without change. Kealaolu marked the end of the old fixed rail trolley system where a turntable was located called "Kealaolu Junction." . . . This also marked the end of orderly homes in Kaimuki and the beginning of the "Country." Prior to the 1950's Kahala was mainly agricultural west of Kealaolu, dotted with small truck, chicken farms, and piggeries. It produced most of the produce, eggs and flowers of East Oahu. I can recall going there to buy eggs and vegetables with my father. We always picked Ogo [Japanese name for seaweed] and Limu Kohu [*Asparagopsis taxiformis*; type of edible seaweed] prior to leaving and exchanged it for what we needed. This barter system prevailed until the farms were displaced by housing prior to Statehood. Most of these farmers were Japanese . . .

'Āina Koa like Kahala was mainly small farms. One 'Āina Koa feature that exists today, as a lined drainage channel, is Kapakahi Stream that flowed to the ocean through Waialae Country Club ("WCC"). It used to contain oopu [*'o'opu*; gobies] and an abundance of frogs. There were an abundance of Mullet on the mud flats at its mouth and I ventured as far west on the shoreline to fish there for Oama [*'oama*; young goatfish] during the summer season. Mixed with Oama fingerlings were large school of baby Mullet (*Ama ama*) and Moili [*moili'i*; young of the threadfish, *moi*]. It was a natural hatchery area much like the mouths of Wailupe, Niu and Kuliouou Streams used to be. When the Oopu spawned many Filipino families fished there. Where there is fresh water, there is Ogo and vast beds of Healthy Ogo flourished offshore growing into large softball sized clusters.

After Waialae Kahala, at the present site occupied by Kalani High School was the Dairyman's Dairy operation. It was located at the end of Iki Place. Kalani High School used to be a large grass field maintained by Dairyman's for its cows. The

grass was periodically harvested. The field was irrigated by a wooden flume system from a spring that fed Kapakahi Stream. There was a small zoo at the end of Iki Place with an elephant and some chimpanzees. My father used to take me there.

Wailupe Ahupua'a

Wailupe Valley was the Hind-Clark Dairy owned by the Hind Family, thus today's name, Aina Haina (Hind land). . . . Later in the mid-1950s Aina Haina was developed by the Hind Family. . . . The Hind Clark Dairy operation occupied the area presently being the Aina Haina Shopping Center and Aina Haina Elementary School. It stretched into the valley and up over the ridge now being Hawaii Loa Ridge subdivision. Hind Clark Dairy also had a small zoo near the library site today. They had a zebra in a pen that was killed by the tsunami. The most salient feature of Wailupe was its fish pond. The walls were severely damaged by the 1946 Tsunami. The Kaai [caretaker] for the pond lived on the knoll above Keikilani Circle that overlooked the pond. Later Hawaiian Dredging bought the pond and dredged the channel around what is today called Wailupe Peninsula by filling the pond. Some of the walls on its seaward sides are remnants of the original Hawaiian walls.

. . . there was a Kaai [caretaker] for the Konohiki [land manager] [in Kuli'ou'ou], one of the Ewaliko family, a very big guy. . . . I remember him (Mr. Ewaliko) telling me not to play in the caves in Wailupe valley because of "Obake" [ghosts]. I sense many of the caves were used for Hawaiian burials and we stayed out of them. He told me the valley was once lined with Lo'i [taro patches], and until the dairies cleared all the lands, he would trade fish for fresh poi which he kept in a large wooden barrel in his Kitchen. He said Wailupe poi was considered one of the best.

Niu Ahupua'a

An old time resident of the area said that in the old days the area of Niu Valley was called Pia, as in (the Hawaiian word for) arrowroot, because it used to grow abundantly in the area.

The shoreline lands between Wailupe peninsula and the Paiko Konohiki [*konohiki* = land manager] were called "Paa Haa." In those days Niu Valley owned by the Lucas family was called "Pia" as in haupia [confection made with *pia*, arrowroot]. Niu Peninsula like Wailupe was a fishpond [Kūpapa Pond], and was filled and subdivided. Niu Valley houses the Foremost dairy in the Niu Shopping Center area that was the home of "Lani Moo," Foremost's mascot. Most of Niu valley was dairy pasture with some small ranches and nurseries in the interior. Niu Stream, like Wailupe used to flow into the ocean, although at a much slower rate.

Kuli'ou'ou Ahupua'a

Kuliouou valley next door was owned in large part by the Pico family, thus its lands were known as Paiko. It was largely occupied by Waialae Niu Farms, partly ranch, partly dairy. It was the only place to buy fresh meat in the area. Most families living in Kuliouou were Portuguese, being ranchers and skilled with large animals. The fish pond known as Paiko Lagoon today was damaged by the tsunami, but Paiko Drive was built on its old walls that stretched out into the ocean in front of Kuliouou Beach Park. The lagoon remains where the pond once stood. The Lagoon area serves as a natural hatchery for mullet and nehu (anchovies).

Section 4 Previous Archaeological Research

4.1 Wai'alaie Archaeological Research

Only a few archaeological surveys have been conducted in Wai'alaie Nui and Wai'alaie Iki. Most of the archaeological work in the area was initiated by the inadvertent discovery of human remains during construction activities. The locations of project areas and sites can be found on Figure 26, and a summary of the non-burial and burial reports is presented in Table 2.

4.1.1 Non-Burial Reports

For McAllister's 1930s survey of the archaeological features of O'ahu, only one site is mentioned for Wai'alaie. An informant told him of a *heiau* called Kaunuakahekili in Wai'alaie Iki; McAllister noted that the *heiau* had been almost completely destroyed.

Site 55. Kaunua Kahekili heiau, Waialaeiki. Punahoa of Keahia says that Kaunua Kahekili was a very large heiau. It was located on the top of the ridge which divides Wailupe and Waialae, on the highest and most pronounced knoll. The site was formerly planted in pineapples, but now the heiau is overgrown with high grass and weeds and the pineapples are on the sloping ground which surrounds it. Many large rocks embedded in the earth are all that remain of the structure [McAllister 1933:71].

Lloyd Soehren (1967) of the Bishop Museum excavated a test unit in a cave, called the Wai'alaie shelter cave (Site 2503) in 1967 on Kuana Street. Marine shell food remains, traditional Hawaiian artifacts, and historic artifacts were recovered, including a fish hook, an octopus lure, a coral file, copper tubing and bottle glass dating from the 1880s to 1920s (report not found at SHPD; information from Kennedy 1991).

Joseph Kennedy (1991) conducted a surface survey of a 7.5 acre parcel occupied by facilities for the Star of the Sea Church-School complex located *mauka* and adjacent to Kalaniana'ole Highway. Two lava tubes and six caves were found, but they did not contain any cultural material. No other surface features were found.

Paul Cleghorn and Lisa Anderson (1992) conducted a surface survey of a 6.4 acre parcel in Kapakahi Gulch, *mauka* of the end of Luinakoa Street. No surface features were found.

David Chaffee and Robert Spear (1994) conducted an assessment of the surface features along a 1,100 meter long corridor of the Wiliwilinui Trail Alignment on Wai'alaie Iki Ridge. The only feature found was a World War II concrete and metal bunker, which was given the SIHP (State Inventory of Historic Places) site designation #50-80-14-4811. In *Sites of O'ahu*, there is a map showing the early recorded sites of the Kona District. The map shows the probable location of Kaunua Kahekili Heiau, as plotted by McAllister (1933:57). When this map is overlain on the Chaffee and Spear site map, the location of the WWII bunker and the *heiau* overlap. The archaeologists report that abutting the left side of the bunker was a large retaining boulder and cobble wall 7 to 8 course high that extended for 10 meters. The archaeologists interpreted it as a soil retention wall. Could this be a remnant of Kaunua Kahekili Heiau?

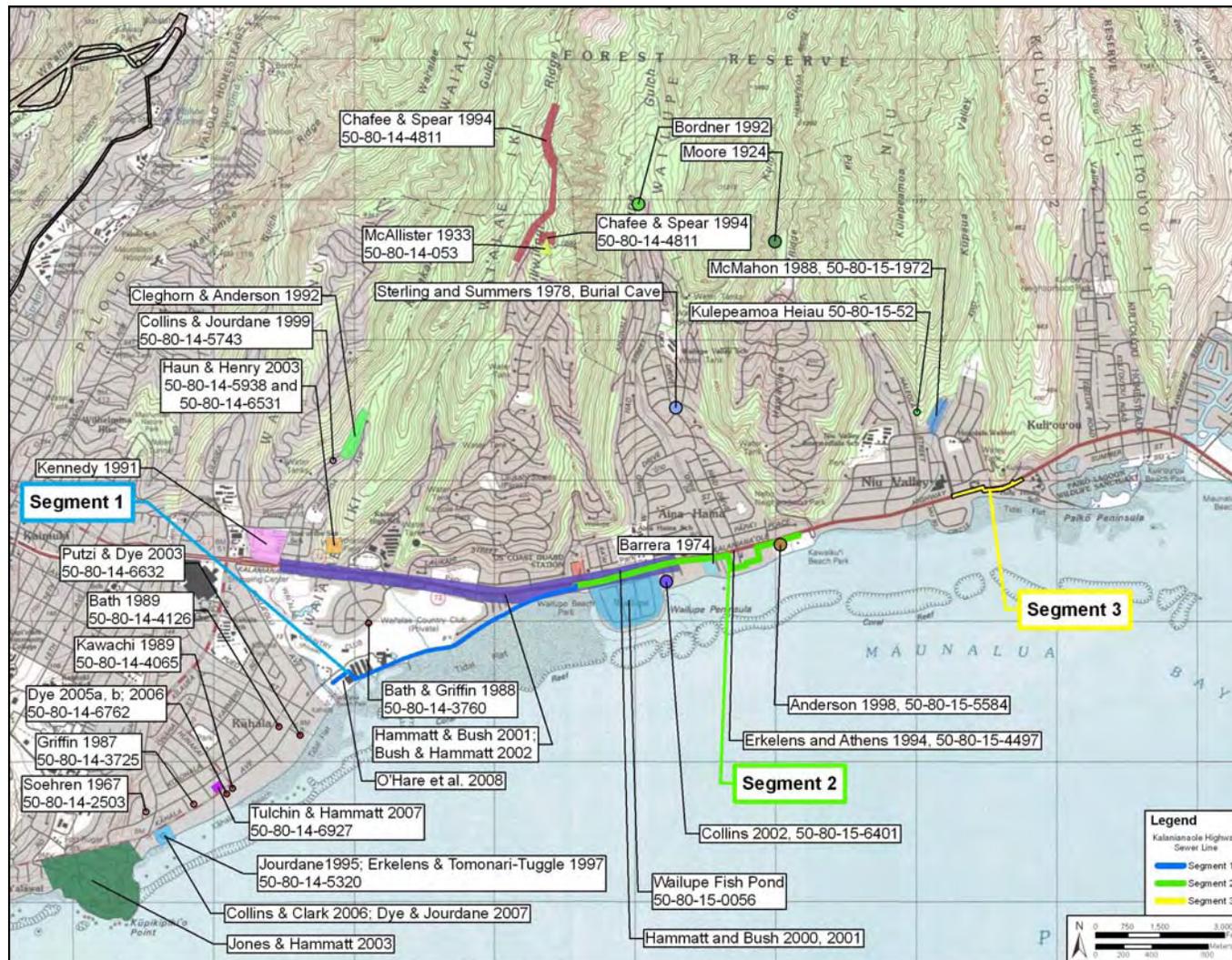


Figure 26. U.S. Geological Survey base map, showing location of previous archaeological project areas and archaeological sites in Wai'alae and Wailupe Ahupua'a

Table 2. Previous archaeological work in the Wai'alae-Kāhala area

Author	Location	Project Type	Site*	Findings
Non-Burial				
McAllister 1933	Wiliwilinui Ridge	Kaunua Kahekili Heiau	55	The <i>heiau</i> was destroyed before McAllister's survey.
Soehren 1967	Kuana St.	Cave description	2503	The cave contained midden, traditional Hawaiian and early historic artifacts.
Kennedy 1991	Star of the Sea Church	Surface Survey	--	No surface features were found.
Cleghorn & Anderson 1992	Kapakahi Gulch	Inventory Surface Survey	--	No surface features were found.
Chafee & Spear 1994	Wai'alae Iki Ridge above Luinakoa St.	Surface Survey	4811	A WWII bunker was recorded.
Hammatt and Bush 2001; Bush & Hammatt 2002	Kalaniana'ole Hwy.	Monitoring for Water/ Gas Mains	--	No subsurface features or burials found during monitoring of trench excavations.
Jones & Hammatt 2003	Black Point	Monitoring for Water System	--	No subsurface features or burials found during monitoring of trench excavations.
O'Hare et al. 2008	Wai'alae Country Club	Literature Search/ Field Inspection		No surface features were present. Background research indicated use for habitation, ranching, and recreation.
Burials				
Reports				
Griffin 1987 Lee & Pietrusewsky 1988	4505 Kāhala Ave.	Burial Recovery	3725	One primary semi-flexed burial (female) and one partial intrusive burial (male) were disinterred.
Bath & Griffin 1988 Douglas & Pietrusewsky 1988	1013 Waiholo St.	Burial Recovery	3760	One primary flexed adult female burial was disinterred. Subsequent examination of the material showed there was a second (adult male) individual
Bath 1989 Bradley & Pietrusewsky 1989a	4745 'Aukai Ave.	Burial Recovery	4126	One partial previously-disturbed burial of an adult male was disinterred.

Author	Location	Project Type	Site*	Findings
Bowen & Soehren 1966	Wai'alae Golf Course	Burial Report		26 burials disinterred from Pu'u Makani, also called Wai'alae Cemetery
Kawachi 1989 Bradley & Pietrusewsky 1989b	4585 Kāhala Ave.	Burial Recovery	4065	One disturbed partial flexed burial of a young female was disinterred.
Jourdane 1995; Erkelens & Tomonari-Tuggle 1997	4433 Kāhala Ave.	Subsurface Testing	5320	Over the course of two projects, the bones of three individuals, possibly Polynesian or Asian, were found. The presence of historic artifacts indicates the bodies were buried in the 19th century.
Collins & Jourdane 1999	'Āina Koa Subdivision near Luinakoa St.; Waialae Iki Ridge	Burial Report-Cave	5743	Skeletal remains of one individual were scattered over the bare floor of a cave.
Haun & Henry 2003	Waialae 180 Reservoir	Burial Report-Cave	5938, 6531	Remains of five individuals were found at site 5938 and one cranium was found at site 6531.
Putzi & Dye 2003	4773 Kāhala Ave.	Burial Recovery	6632	The skeletal remains of five individuals, probably Hawaiian, were disinterred. A cultural layer was noted.
Dye 2005a, b; Dye 2006	4577 Kāhala Ave.	Burial Recovery	6762	One in situ burial and one disturbed burial were disinterred.
Collins & Clark 2006; Dye & Jourdane 2007	4415, 4423, and 4433 Kāhala Ave.	Subsurface Testing	--	Subsurface testing was conducted in two phases to determine the nature of two possible cultural layers; work during the second phase indicated that the layers were not cultural.
Chinen 2007a,b Tulchin & Hammatt 2007	4564 Kāhala Ave.	Burial Recovery	6927	Human skeletal remains of one individual were recovered from a disturbed context.

* SIHP = State Inventory of Historic Properties No. (each site number in the table is formally preceded by the numbers "50-80-14 representing the State of Hawai'i, O'ahu Island and the USGS 7.5 Minute Series Quadrangle, respectively).

In 2001 and 2002, archaeologists from Cultural Surveys Hawai'i monitored the installation of a gas main (Hammatt and Bush 2001) and a water main (Bush and Hammatt 2002) from 'Āinakoā Avenue to West Hind Drive. The majority of the project corridor was within a zone or coral outcrop that has since been covered by eroded soil and fill layers. The main trenching line was found to be composed primarily of fill materials associated with different phases in the development of the highway. No cultural material (except modern trash) was encountered during installation of the gas main, but the presence of pockets of sand were noted. One horseshoe and one *poi* pounder fragment were collected during installation of the water main.

Cultural Surveys Hawai'i (Jones and Hammatt 2003) monitored the improvements to the water system at Black Point. Monitors were on-site during all excavations in areas thought to have Jaucas sand. The actual area that contained Jaucas sands was much smaller than predicted, but the excavations for the water system were generally shallow (less than 50 centimeters deep), and it was determined that strata of undisturbed sand were probably still undisturbed at a deeper level. No subsurface features were found.

In 2008, CSH (O'Hare et al. 2008) completed a literature research and field inspection report for the Wai'ālae Country Club parcel. No archaeological surface features were noted during the field inspection. Extensive background information on the history of the parcel was collected. The general area was used for traditional Hawaiian habitation and for burials into the mid-nineteenth century. It was the home in the 1850s-1870s for Captain John Ross and the home of Paul Isenberg in the 1880s to 1920; each at one time owned and operated the Waiālae Ranch. It became in the 1920s the country club to one of the first golf courses constructed in the Hawaiian Islands, and was a focal point for the social scene from the early to mid 1900s to the present.

4.1.2 Burials on Kāhala and Wai'ālae Beaches

4.1.2.1 Historic Accounts of Dune Burials in Wai'ālae

As noted in the background section of this report, many mid-nineteenth century visitors to the islands visited a large area of exposed bones in sand on the eastern side of Diamond Head or Black Point, in Wai'ālae Nui Ahupua'a. These tourists, including the writer Mark Twain, speculated that either these graves were the remains or warriors killed in one of Kamehameha's battles or the interment site for Hawaiians who died in one of the many epidemics that swept the islands in the years after contact with Westerners. The archaeologist John F. G. Stokes researched a similar dune graveyard in Keoneloā, Kōloā, Kaua'i, also said to be the site of one of Kamehameha's battles. He noted:

The subject is closely connected with a common fallacy that the many human skeletons found on the sand dunes of these islands are necessarily those of warriors slain in battle—in other words, that such sand dunes must be battle sites [Stokes1937:31].

Illustrative of the growth of neo-myth, possibly, may be the following incident. Having visited the Keoneloā dunes in company with local Hawaiians several times prior to 1916, the writer gleaned no information other than that the skeletons present were exposed burials. On a visit in September, 1936, a Hawaiian fisherman, in courtesy to the stranger, came forward and kindly

volunteered the information that the skeletons marked a battle site. Obviously the “hidden chapter” had spread under tourist demand [Stokes 1937:32].

Stokes noted that the dune burials were identified as local cemeteries, not battle grounds, to the earliest visitors. Urey Lisiansky (1814:122), who visited the islands in 1894 noted that “The poor are buried anywhere along the beach . . .” The missionary Rev. Samuel Whitney, traveled to the Kōloa sand dunes in 1826 and noted:

We passed over a mound of sand, white with human bones. I asked whether they were slain in battle, and was informed that this was the place for burying the dead, and that the wind had blown the sand away from the bones. “But why,” said I, “is this ground chosen?” “Because it is soft and the people are lazy,” was the reply [Whitney 1827, cited in Stokes 1937:32].

Robert Bowen (1981) in his master’s thesis on Hawaiian burial customs concluded:

The high concentrations of burial in sand environments, particularly where dunes have been formed, seem to indicate that these areas were set aside for disposal and probably used over long periods of time. Dunes were waste areas incapable of food production and usually located apart from residential areas. Digging was easy and preservation of bone material excellent [Bowen 1981:153].

From the early traveler’s accounts, this large dune cemetery was probably in Wai‘alae Nui in the Kāhala beach area. Several visitors to the cemetery noted that they rode or drove around Black Point, but had not yet reached the coconut groves of Wai‘alae Iki. Although it does not seem that the dense concentration of bones found in Kāhala extends to Wai‘alae Iki, it is likely that some burials were interred in the Wai‘alae Iki shore, wherever the sand was deep enough for a shallow pit.

4.1.2.2 Bishop Museum Collection from Wai‘alae-Kāhala Area

In 1998, a detailed assessment of the human remains curated at the Bernice P. Bishop Museum was made by their professional staff in consultation with representatives of the Administrator of the Island Burial Councils and other concerned groups in accordance with provisions of the Native American Graves Protection and Repatriation Act (NAGPRA), 43 CFR 10.10(b)(2). A list was prepared of all skeletal material donated to the museum or collected during archaeological excavations (Federal Register 1998); the material collected from Wai‘alae is summarized in Table 3.

In all, bones from at least 88 individuals from Wai‘alae were donated to the Bishop Museum. The locations of some of the finds are specific, e.g. 25 individuals were recovered from the Wai‘alae Golf Course, 22 in 1927 (during the original construction of the golf course) and 3 in 1963 (probably during the modification of the course needed to make way for construction of the Kāhala Hilton). Earle K. Vida, a former member of the Wai‘alae Greens Committee said that “the entire golf course area has bones beneath it. He said every time golf greens are moved, bones are uncovered” (Pratte 1966). Mr. David Belden’s family had a beach house near the first tee (of the original course). He also remembered when the golf course was built, and that many skeletons were found during the grading of the greens. The bones were collected and kept at a

Table 3. Human Skeletal Remains from Wai'alae Donated to the Bernice P. Bishop Museum

Date	No. of Indiv.*	Location	Donor	Funerary Objects
1927	22	Wai'alae Golf Course	Bishop Estate	None
1929	1	Wai'alae Iki	John McCombs	None
1931	1	Kāhala	John McCombs; found during sewer line construction	None
1937	4	Wai'alae-Kāhala	John McCombs of the Bishop Estate	None
1939	2	Kāhala	B. Kakanui Palmer	None
1940	2	Wai'alae	John McCombs of the Bishop Estate	Fish bone
1951	14	Kāhala	Mary Stacey; found during sewer line construction	None
1952	1	Kāhala	George F. Arnemann	None
1962	1	Wai'alae-Kāhala	Robert N. Bowen	1 coral piece
1963	3	Wai'alae Golf Course	Robert N. Bowen	1 basalt & 1 coral piece; whale tooth beads
1965	1	Kāhala	Barbara Walker	basalt stones, coral, fishbone, and shell
1966	32	Kāhala Cemetery	Collected by Robert N. Bowen and Lloyd J. Soehren from Kāhala Cemetery during construction activities	189 associated funerary objects include coins, rings, glass beads, pottery, pipes, cloth, and thimbles
1966	1	Kāhala	Lloyd J. Soehren	None
1966	1	Kāhala	Robert N. Bowen; found during construction activities	None
1986	2	Kāhala	Toni Han and Wendall Kim found during gardening activities	shell, glass fragments, metal fragments, and a pig bone.
Total	88			

*No. of indiv.=Number of individuals

structure (the old ranch slaughterhouse) near the 9th hole until they were collected by Kenneth P. Emory of the Bishop Museum (Typescript interview at the Bishop Museum Archives, Anthropology Group 1, Box 6.7).

Other donations are listed as only from "Wai'alae" or "Kāhala." Modern census tracks use the term "Kāhala" as the area *makai* of Kalaniana'ole Highway from Black Point to Wailupe

Fishpond, so it is difficult to determine if the bones donated from “Kāhala” are from the more traditional area of Kāhala in Wai‘alae Nui or also include Wai‘alae Iki to the east, surrounding the project area. John McCombs was once the Engineer for the Bishop Museum, contributing to an important work on the groundwater resources of O‘ahu. It is likely that the remains donated by him in 1929, 1931, 1937, and 1940 were found during road construction or sewer line excavations.

4.1.2.3 *Wai‘alae Private Cemetery*

Only one listing for skeletons donated to the Bishop Museum in Table 3 seems to be the result of a formal archaeological excavation, the 1966 disinterments of a cemetery on a portion of the Wai‘alae Golf Course, by Robert Bowen and Lloyd Soehren, two archaeologists working for the Bishop Museum. The Bishop Museum archaeologists informally referred to the site as the “Kahala Cemetery.” No formal report was published for this excavation, but background information can be viewed at the Bishop Museum Archives (Anthropology Group 1, Box 6.7). On August 13, 1963, during the excavation for a new sewer line on the golf course, five or six bones were found in a trench. Dr. Robert Bowen of the Bishop Museum was notified of the find, and he visited the site. The construction firm (no prior notice to museum) dug into a “mound” and uncovered additional skeletal material.

Because of the proposed construction, the museum personnel decided to initiate a program of salvage archaeology. A total of 26 burials were disinterred by Bishop Museum archaeologists between January 7, 1966 and January 22, 1966. At first the archaeologists believed that the burial ground dated to around 1825 to 1845. This was then corrected to 1825 to 1870, based on recovered grave goods such as bottles, the hexagonal coffin-style for one burial, and the presence of tooth evulsion (extraction by force). In the pre-contact/early post-contact periods, Hawaiians knocked out their front teeth (evulsion) to mark the death of certain Hawaiians, usually high *ali‘i*. However, the archaeologists were contacted by former residents in January 1966, and told that the area was a private cemetery called Pu‘u Makani, or Wai‘alae Private Cemetery, that was used by local residents and by ranch workers as late as 1920. On January 24, the museum decided that since there were recent burials at the cemetery, disinterment should be conducted by a mortuary service, rather than by archaeologists. The Greenlawn Funeral Home disinterred 17 additional burials and planned to re-inter the remains at a local cemetery. An unknown number of burials were left in place within the mound.

4.1.2.4 *Modern Archaeological Burial Reports*

Several brief accounts of human bones have been recorded in recent years and are discussed below.

During construction at a property at 4505 Kāhala Avenue, human bones were found by the construction crew and the SHPD was notified. Annie Griffin (1987) visited the site and disinterred the skeleton, which consisted of a primary burial of a young-to-middle aged female placed in a semi-flexed position. A subsequent examination of the remains by Lee and Pietrusewsky (1988) of the University of Hawai‘i determined that there was a second burial intrusive with the first, which consisted only of the lower limb bones of a young male adult. Both burials were assigned the site number SIHP #50-80-14-3725.

During the excavation of a swimming pool on a property at 1013 Waiholo Street, the SHPD was informed of the discovery of human bones by the medical examiner's office (Bath and Griffin 1988). The burial was in a flexed position. A subsequent examination of the remains by Douglas and Pietrusewsky (1988) of the University of Hawai'i determined the bones were of a female, approximately 35 years old. The burial was designated SIHP #50-80-14-3760.

Contractors at a construction site at 4745 'Aukai Avenue reported the discovery of human bones to the SHPD in 1989 (Bath 1989). A previously disturbed partial burial was found and disinterred. A subsequent examination of the remains by Bradley and Pietrusewsky (1989a) of the University of Hawai'i determined the bones were of a single adult male, 40-45 years old. The burial was designated SIHP #50-80-14-4126.

Human bones were found during the excavation of a house foundation at 4585 Kāhala Avenue and reported to the SHPD in 1989 (Kawachi 1989). The burial was disturbed by the construction, but the contractor's description indicated that the burial may have been in a flexed position. The skull and upper third of the body was missing. A subsequent examination of the remains by Bradley and Pietrusewsky (1989b) of the University of Hawai'i determined the bones were of a female, approximately 25 to 35 years old. The burial was designated SIHP #50-80-14-4065.

In 1995, human bones found during the excavation of an elevator shaft for a house at 4433 Kāhala Avenue were reported to the SHPD (Jourdane 1995). The bones (Burial 1) were determined to be likely from an ash and charcoal cultural layer 60 to 95 centimeters below the ground surface. The burial was disinterred and later reinterred. The burial and the cultural layer were designated SIHP #50-80-14-5320.

In 1997, additional burial recovery work was carried out at 4433 Kāhala Avenue (Erkelens and Tomonari-Tuggle 1997). Back dirt piles were screened and the loose soil was removed from the elevator shaft. When the walls of the shaft were cleaned, the profile of a fire pit and the profile of a burial pit were noted. A second burial was found in the burial pit and additional elements of this burial were found in the backdirt piles. A backhoe excavated a 4 by 2.5-m block around Burial 2 and a third burial was uncovered. Burial 1 was identified as the skeleton of a 30-35 year old male. A shell button and two porcelain beads in the backdirt probably belong to this individual. Burial 2 was identified as the skeleton of a 20-25 year old female. Burial 3 was identified as a 3-year old child, probably the child of the female (Burial 2). A square-cut nail was found with this burial. Due to the presence of historic artifacts, the burials were determined to be of Polynesian or Asian ethnicity, buried in the nineteenth century. All three burials were disinterred and reinterred elsewhere on the property. All three burials at the site are considered part of SIHP #50-80-14-5320.

In April of 1999, a local resident brought several bones that he collected from a cave to a forestry worker. The SHPD were notified and Sara Collins and Muffett Jourdane (1999) inspected the cave, which was located *mauka* of the end of Luinakoa Street ('Āina Koa Subdivision) on Wai'alae Nui Ridge. They reported that bones were scattered over the cave floor and probably represented the bones of just one individual. No other cultural remains were found in the cave. The cave and burial were designated SIHP #50-80-14-5743.

In 2003, archaeologists from Haun and Associates (Haun and Henry 2003) conducted a surface survey of the 8-acre Wai'alae 180 Reservoir Replacement project site near the Kalani High School Athletic Field, *mauka* of Kalaniana'ole Highway. Two caves with human remains were found; the caves were designated sites SIHP #50-80-14-5938 and #50-80-14-6531. The floor of each cave was bare lava. Several bones were found at Site 5938, including five crania; only one skeletal element, an infant cranium was found at Site 6531. No historic material was found in the caves, so the archaeologists determined that the remains were probably Hawaiians buried in the pre-contact or early post-contact periods.

During the excavation of a utility line at 4773 Kāhala Avenue in 2003, human bones were inadvertently exposed. T. S. Dye & Colleagues were contracted to conduct further investigation of the find (Putzi and Dye 2003). The remains of five individuals, a cultural layer, and several traditional Hawaiian artifacts were recovered from the excavation and from the back dirt piles. The burials were probably of Hawaiian ancestry based on the presence of the traditional artifacts. The burials and the cultural layer were designated SIHP #50-80-14-6632.

Human skeletal remains were found at 4577 Kāhala Avenue in 2006 during excavation of a sewer line. T. S. Dye & Colleagues (Dye 2005a, b; Dye 2006) were contracted to recover all bones from the trench and the back dirt piles. One *in situ* burial and one disturbed burial were found within a cultural layer. The remains were disinterred and reinterred on the same parcel. The burials and the cultural layer were designated SIHP #50-80-14-6762.

In 2006, Pacific Consulting Surfaces (Collins and Clark 2006) conducted extensive Phase I subsurface testing at three parcels, 4415, 4423, and 4433 Kāhala Ave. Fifty-one test units were excavated, covering the majority of the project area. Human remains had been previously found at 4433 Kāhala Avenue in the 1990s (Jourdane 1995; Erkelens and Tomonari-Tuggle 1997). Collins and Clark (2006) reported on two sand cultural layers, the upper believed to be associated with historic period habitation and the lower sand layer to be associated with traditional Hawaiian habitation.

The second phase of this project was carried out in 2007 (Dye and Jourdane 2007). During this phase, the 1997 reinterment site was relocated and marked on the surface. Twenty shovel tests were excavated in areas not covered by the Phase I project. Controlled block excavations were placed adjacent to shovel test pits which contained one or more of the two sand layers identified by Collins and Clark (2006). The work indicated that the possible two cultural layers were actually "a single old land surface, or paleosol, upon which a variety of historic-period artifacts had been deposited" (Dye and Jourdane 2007:32).

In March of 2007, the SHPD (Chinen 2007a) was notified that human skeletal remains had been found during construction of a new house and swimming pool at 4565 Kāhala Avenue. The bones were dispersed around the property's backyard. The SHPD determined that a qualified archaeological consultant would need to screen back dirt piles and conduct block excavations at the site to try to determine the original location of the burial and to test if other burials were present. Cultural Surveys Hawai'i (Tulchin and Hammatt 2007) excavated 25 test units but the original location of the burial could not be determined. They did recover additional skeletal remains from the backdirt piles. Following the test excavations, a CSH archaeologist monitored the remainder of construction related excavations in the project area. On April 25th May 15, and

July 11, 2007 additional human skeletal remains were observed (Chinen 2007b). These were determined to be from the same burial as that found in March. The SHPD assumed jurisdiction over the inadvertent discoveries and determined to relocate the remains. The burial was designated site SIHP #50-80-14-6927.

4.2 Wailupe Archaeological Research

Table 4 summarizes the archaeological projects and findings in Wailupe Ahupua'a. The locations of projects and sites are shown on Figure 26.

Table 4. Previous Archaeological Studies in Wailupe Ahupua'a

Author	Location	Project Type	Site*	Findings
Non-Burial				
McAllister 1933	Lower Wiliwilinui Ridge	Island-wide Survey	-54	Kawauoha Heiau (destroyed before 1933)
McAllister 1933	Near Wai'alae/Wailupe boundary	Island-wide Survey	-56	Wailupe Fishpond (filled-in the 1940s)
Sinoto 1973	Wailupe Stream	Recon. Survey	--	No sites reported
Moore 1974	Hawai'i Loa Ridge	Survey	No site nos.	Earthen terraces, wall, fence, unmodified rockshelter
Barrera 1984	'Aina Haina coastal lot	Survey & Auger Test	None	No surface or subsurface features were found.
Bordner 1992	Wailupe Well II	Reconn. Survey	No site nos.	Area had been bulldozed; 2 wall sections, 3 retaining walls/terraces, 1 semi-circular alignment, a mound, and a trail segment were recorded
Hammatt & Bush 2001; Bush & Hammatt 2002	Kalaniana'ole Hwy	Monitoring for Water/Gas Mains	None	No subsurface features or burials found during monitoring of trench excavations. Boulders found in Wailupe section that might have been part of the Wailupe fishpond wall
Fong & Hammett 2008	Wailupe Valley; west side of Hawai'i Loa Ridge	Surface Inventory Survey	None	Three concrete ditches and three rock overhangs were noted. No material was found in the overhangs.

Burials				
Anderson 1988	5371 Kalaniana'ole Hwy.	Inadvertent Burial Discovery	-5584	Discovery of a burial (one adult female) during excavation of a fence on a private coastal property.
Kawachi 1991	Kawaikui Beach Park	Site Visit		A skull and a clavicle were found in disturbed fill layers during excavation of a trench.
Erkelens & Athens 1994	Kalaniana'ole Hwy. widening	Monitoring	-4497	Skeletal remains of 15 individuals discovered, dispersed along highway between 'Āina Haina (Wailupe) and Niu Valley; Four individuals found in the Wailupe section
Collins 2002	925 Wailupe Place	Inadvertent Burial Discovery	-6401	Discovery of three human bones in sand next to large boulders.
Sinoto and Titchenal 2004	Kawaikui Beach Park	Surface Survey & Auger Testing		No cultural remains found but burials found in Wailupe during the Kalaniana'ole Hwy Widening project (Kawachi 1991; Erkelens & Athens 2994) were reinterred at the park

* SIHP = State Inventory of Historic Properties No. (each site number in the table is preceded by the numbers "50-80-15 representing the State of Hawai'i, O'ahu Island and the USGS 7.5 Minute Series Quadrangle, respectively).

4.2.1 Non-Burial Reports

J. Gilbert McAllister's classic archaeological survey of O'ahu Island in the 1930s recorded one *heiau* in Wailupe Ahupua'a. Site 54, Kawauoha Heiau, described by McAllister (1933:71) as: "The heiau was 75 feet square. It was completely destroyed only a few years ago." It was first noted by Thomas Thrum (1907:45), who noted: . . . Some remains of it still there; . . . just above Pu'u Hua, at the foot of hill Hawaii Loa."

The exact location of this *heiau* is unknown, since the description and plotted location by McAllister are inconsistent. From the description, the *heiau* would have been on the eastern border of Wailupe on Hawai'i Loa Ridge at the border with Niu Ahupua'a. A small map of O'ahu in McAllister's (1933:57) *Archaeology of Oahu* does have three numbered sites in Wailupe, but there is a problem with these points, as Site 53, Niu Burial Caves is placed down at the coast in Wailupe (when it should be in the uplands of Niu), and Site 54, Kawauoha Heiau falls somewhere in the middle of the *ahupua'a*, not on the eastern border.

Another researcher believed that the *heiau* was not on the eastern border or in the central section, but on the western border with Wai'alae. In a student's study of Wailupe settlement patterns, Ogata (1992:14) placed the *heiau* on the western border of the *ahupua'a* on Wiliwilinui Ridge based on the information in two LCA claims, LCA 2280-B and 2280.

The Land Commission records for LCA 2280-B to a man named Kalua notes the presence of a shrine called Kawauoha in a grove of coconut trees. This claim was not awarded, and thus is not shown on the 1925 map of *kuleana* awards in Wailupe (see Figure 13).

Kalua stated:

Unu [another term for *heiau*] of Kawauoha

Hear ye, ye Land Commissioners: I am writing concerning my coconut trees which were planted by my *kupunas* [ancestors]. There were eight of them. Most of them have been cut down. My *kupunas* made the *unu* (altar) of Kawauoha and when it was completed they sacrificed a man and planted those coconuts. Here is this explanation – at the time my *kupunas* were sent the pig by the *wahine* [woman] of Peleioholani, my *kupunas* received it and then sacrificed the pig and the man. This is the thing concerning these coconuts.

Wailupe, 29 Dec. 1847 Kalua

Native Register

Vol. 3, p 427–8 [Sterling and Summers 1978:275].

LCA 2280 was claimed by a man named Kumuhonua, who also stated that he had several coconut trees. This claim was also not awarded, so its exact location can not be determined, but in his testimony, Kumuhonua said that the land was at the border of Wailupe and Wai‘alae. It is probably from this testimony that Ogata decided that Kawauoha Shine was on the western border of Wailupe, not the eastern. Her determination is based on the assumption that the unawarded lot LCA 2280-B to Kalua and the lot LCA 2280 to Kumuhonua is describing the same property, but there is no direct evidence for this.

McAllister also recorded Site 56, Wailupe fishpond:

The pond is 41 acres in area. The wall is approximately 2500 feet long. The west side is a broad sandy area, at least 50 feet wide, through which four outlets (*makaha*) now pass. The remainder of the wall is 12 feet wide, with waterworn basalt faced higher on the outside than within. The central part is of a dirt and sand fill [McAllister 1933:71].

A letter in the Bishop Museum “Oahu Archaeology” files notes that an 11-year old resident of 705 Haina-uka Road (now called Hind Iuka Drive) took an archaeologist to a burial cave he had found in the back (*mauka*) of his property in the ‘Āina Haina subdivision on December 9, 1955 (Sterling and Summers 1978:275).

In 1973, Aki Sinoto (1973) conducted a survey along Wailupe Stream. No surface features were found.

In 1974, Kenneth Moore of the Bishop Museum conducted a walk-through at the *makai* plateau area (TMK 3-7-016, -017, -019) of Hawai‘i Loa Ridge, at an elevation of 200-1000 feet AMSL (above mean sea level) (TMK 1-3-7-016, -017, -018, and -019). Although this specific survey area is within Niu Ahupua‘a, the western side of the ridge is within Wailupe Ahupua‘a and is similar in terrain. Moore recorded earthen terraces, a bi-faced core-filled wall terminating at the set of fence posts, and a small rockshelter with no modifications. Moore concluded that

there was no evidence that any of these features were part of a traditional Hawaiian site and that they were more likely ranching features.

In 1984, William Barrera (1984) conducted a reconnaissance survey of a 2-acre parcel (TMK: 3-6-002:004) in the 'Āina Haina residential area east of Wailupe Circle and between Kalaniana'ole Highway and the sea. After the surface survey was completed, twelve auger holes were excavated to a depth of 1.1 meters. No surface or subsurface features were noted.

In 1992, Richard Bordner surveyed a proposed well site (TMK 1-3-6-004) and access road *mauka* of the northern end of Hao Street at within Wailupe Gulch at 1.6 to 1.8 miles (2.5-2.9 kilometers) inland of the coast. The area had been previously bulldozed and only remnants of features remained, such as short wall sections and terraces with retaining walls. Barrera suggested that the terraces might be traditional Hawaiian agricultural terraces, but they were so damaged that it was difficult to date the features or determine their exact function.

In 2001 and 2002, archaeologists from Cultural Surveys Hawai'i monitored the installation of a gas main (Hammatt and Bush 2001) and a water main (Bush and Hammatt 2002) from 'Āinakoā Avenue to West Hind Drive, which extends into Wailupe Ahupua'a to the east end of the Wailupe Peninsula. The main trenching line was found to be composed primarily of fill materials. No cultural material was encountered during installation of the gas main, but the presence of pockets of sand were noted. One horseshoe and one *poi* pounder fragment were collected during installation of the water main. Basalt boulders found in the Wailupe section were thought to possibly be part of the wall of the former Wailupe Fishpond.

In 2003, Aki Sinoto (2004) conducted monitoring during improvements to the Kawaiku'i Beach Park (TMK 1-3-6-003:001, 003, 003), including an expansion of the existing parking lot, grading and landscaping, and the installation of signs, ramps, walkways, and walls. All excavations took place in previously disturbed areas of the park; the excavations did not intrude past the modern fill layers. It was predicted that the only possible finds would be disturbed skeletal remains intermixed with the fill. No human remains or any other type of cultural material was found during the monitoring.

In 2008, CSH conducted an inventory survey (Fong and Hammatt 2008) of a 0.14 acre parcel on the west side of Hawai'i Loa Ridge to be developed for a private residence. The parcel is at an elevation of 160-180 ft AMSL (48-54 m) at the end of Manauwea Street (TMK 1-3-6-004:023). Three concrete drainage ditches and three rock overhangs were found during the survey. There were no modifications to the overhangs and no cultural material was noted in the overhangs.

4.2.2 Burials in Wailupe

4.2.2.1 Bishop Museum Collection from Wai'alae-Kāhala Area

In 1998, a detailed assessment of the human remains and funerary items ("grave goods") curated at the Bernice P. Bishop Museum was made by their professional staff in consultation with representatives of the Administrator of the Island Burial Councils and other concerned groups in accordance with provisions of the Native American Graves Protection and Repatriation Act (NAGPRA), 43 CFR 10.10(b)(2). A list was prepared of all skeletal material donated to the

museum or collected during archaeological excavations (Federal Register 1998). The list of material from Wailupe is summarized in Table 5.

Table 5. Human Skeletal Remains from Wailupe Donated to the Bernice P. Bishop Museum

Date	No. of Indiv.*	Location	Donor	Funerary Objects
1926	--	Wailupe Valley burial cave	Ft. Commander Gray	'O'o; wood digging stick
1950	1	Wailupe Valley burial cave	William Davenport	Canoe section with human remains and other artifacts
1950	1	Hawai'i Loa Ridge burial cave	Everett E. Carlson	Burial had been in a canoe and a box coffin
1951	1	Wailupe Valley burial cave	George Whisenand	Tapa piece, bone whistle, matting, a comb, a pipe, and cordage
1955	1	Wailupe	E. B. Kudlich	None
1955	--	Wailupe Valley burial cave	George Arnemann of the Bishop Museum	Gourd fragment, basalt adz chip, 4 tapa fragments, two cords
1956	26	Wailupe Valley	Lawrence P. Richards	One glass bead
1960	--	Wailupe Valley burial cave	Robert Bowen of the Bishop Museum	Wood pipe and brown cloth
1966	2	'Āina Haina burial cave, Wailupe	Lloyd J. Soehren of the Bishop Museum	None
1991	--	Wailupe Valley burial cave	Unknown	Cord, mat fragment, & 17 patterned tin fragments

4.2.2.2 Kalaniana'ole Highway Burials

When Kalaniana'ole Highway was widened to six lanes within the stretch from 'Āinakoā Avenue to Kirkwood Street in 'Āina Haina in the late 1960s, no statutory provisions for archaeological study or monitoring during construction activities were in place at the time. Hence no study or monitoring occurred. Such provisions were in place during the 1990s when subsequent portions of the highway to Hawai'i Kai were widened. Findings of archaeological investigations during these widening projects are relevant in determining possible subsurface material within the present project area.

The Kalaniana'ole Highway Widening Project - Phase II extended through the *ahupua'a* of Wailupe, Niu and Kuli'ou'ou, from West Hind Drive (at east end of Wailupe Peninsula) to East Halema'uma'u Road. In May of 1991, SHPD was notified of the inadvertent discovery of human

remains found during the excavation of a sewer trench line on the northern boundary of Kawaiku'i Park (TMK 1-3-6-003:002). A skull was found in the trench and a human clavicle was found in the backdirt pile. The burial was designated SIHP #50-80-15-4848. Both bones were in fill material. The archaeologist concluded that a burial was probably disturbed during filling and landscaping when the park was first created (Kawachi 1991:2).

Erkelens and Athens (1994) documented the discovery of the remains of at least 14 individuals during a Kalaniana'ole Highway widening project along the highway in 'Āina Haina and Niu Valley. The burials, although dispersed along the highway, were all subsumed under the site number #50-80-15-4497. In Āina Haina (Wailupe Ahupua'a), the burials were found at the *makai* end of Nenu Street (1 individual) and East Hind Drive (3 individuals); in Niu, between Hawai'i Loa and West Halema'uma'u Streets (7 coffin burials with 8 individuals in one cluster, and 2 isolated individuals). The seven coffin burials may be part of a family cemetery for the Adams/Cassiday/Pfluegar families (related to the Hinds/Lucas family of Wailupe). In two nineteenth to early twentieth century newspaper obituaries, it was reported that a deceased member of these families would be buried in Niu, which must have been a private family cemetery (Erkelens and Athens 1994:60).

In 1998, a burial was reported at a coastal lot at 5371 Kalaniana'ole Highway during the excavation for a fence line along the property boundary (TMK 1-3-6-003:032). The burial was assigned SIHP #50 80-14-5584. It was disinterred and reinterred at another location in the same property. The burial was an adult female, found in a tightly flexed position. The archaeologists indicated that it was probably interred in the pre-contact or early post-contact period (Anderson 1998:21).

In 2002, the SHPD (Collins 2002) was notified on burial remains found during the excavation of a swimming pool at 925 Wailupe Place (TMK 1-3-6-992:021, 034). Two human lumbar vertebrae and an iliac fragment were found along with several non-human bones. As the bones were found in sand surrounded by boulders, the archaeologists concluded that the bones were probably buried in the traditional Hawaiian manner and were bones of a native Hawaiian. The burial was designated SIHP #50-80-15-6401.

In 2003, improvements at Kawaiku'i Beach Park, at the eastern coastal boundary of Wailupe Ahupua'a, were monitored by the firm, Aki Sinoto Consulting (Sinoto and Titchenal 2004). No subsurface features or human remains were found during the monitoring, but it was decided that the human remains found on the northern boundary of the park in 1991 during the Kalaniana'ole Widening project (Kawachi 1991; Erkelens and Athens 1994), should be reinterred at a location on the park grounds.

4.3 Niu Archaeological Research

McAllister (1933:70) recorded two archaeological sites in Niu Valley during his island-wide survey of O'ahu in the early 1930s; Site 51, Kūpapa Fishpond on the Niu coast, and Site 52, Kūlepeamoā Heiau on Kūlepeamoā Ridge (Figure 27). Most subsequent non-burial archaeological research in Niu Valley has concentrated on inland habitation, agricultural, and ceremonial sites or on coastal aquacultural sites (fishponds). Research into burial sites has been split between burial caves in the ridges fringing the valleys and a series of coastal burial sites. A

number of the coastal burial sites have been located in the vicinity of Kalaniana'ole Highway (Figure 28).

4.3.1 Habitation/Agricultural Sites and Deposits

In 1987 the Bishop Museum (McMahon 1988) surveyed a 5-acre parcel in Niu Valley documenting two walls (Site #50-80-15-1972) in the vicinity of the reported location of Kūlepeamoā Heiau but no association was established. No subsurface cultural features were encountered in three backhoe trenches.

In 2008, CSH monitored the replacement of the Niu Valley Force Main Waterline along Kalaniana'ole Highway (Hazlett and Hammatt 2008). With the exception of a discontinuous buried road surface in Kawaikui Beach Park, no cultural material was encountered during the monitoring fieldwork.

4.3.2 Ceremonial Sites – Kūlepeamoā Heiau

Thrum (1906:45) recorded one unnamed *heiau* in Niu: “. . . Niu, at foot of Kulepīamoā [Kūlepeamoā] (the middle ridge), of about same size as Hawea; used in later years as a sheep pen.” McAllister (1933:70) called this *heiau* Kūlepeamoā (SIHP #50-80-15-52), which translates as “flapping of chicken” (Pukui et al. 1974:123). Portions of the *heiau* were still standing in the 1930s.

Kulepeamoā Heiau. Site 52. Kulepeamoā heiau, Niu, at the foot of the middle ridge which takes its name from the heiau. Portions of a terrace are still to be seen, 120 feet wide and 5 feet high, with the length ranging from 40 to 100 feet according to the rise of the ridge. There were no terraces above this one, but there may have been one or more on the sea side. The stones are waterworn basalt of varying size, most of which have been used in walling a cattle pen in the vicinity. A small section in the center of the remaining terrace and also the southwest corner appear to have been stepped. The heiau faces the sea on the south. A pit 10 feet deep faces the sea on the south. A pit 10 feet deep and 10 by 15 feet in extent, located 60 feet south of the center of the terrace, appears to be modern [McAllister 1933:70].

4.3.3 Aquacultural Sites – Kūpapa Fishpond

At the coast in Niu Ahupua'a was a fishpond, variously labeled Kūpapa Fishpond or Niu Fishpond (SIHP #50-80-15-51). It was a *loko kuapā type* (Kikuchi 1973), a shore fishpond. Fish such as *'ama'ama* (mullet) and *awa* (milkfish) were probably raised there.

Site 51. Kupapa fishpond, Niu. The pond is now filled in and has been used for agricultural purposes. The wall, of waterworn basalt, was 3 feet high by 8 feet in width and formed a semi-circle 2000 feet long. It inclosed several acres. The name was given to me by Kalaluhi Akana Kapiiohe [McAllister 1933:70].

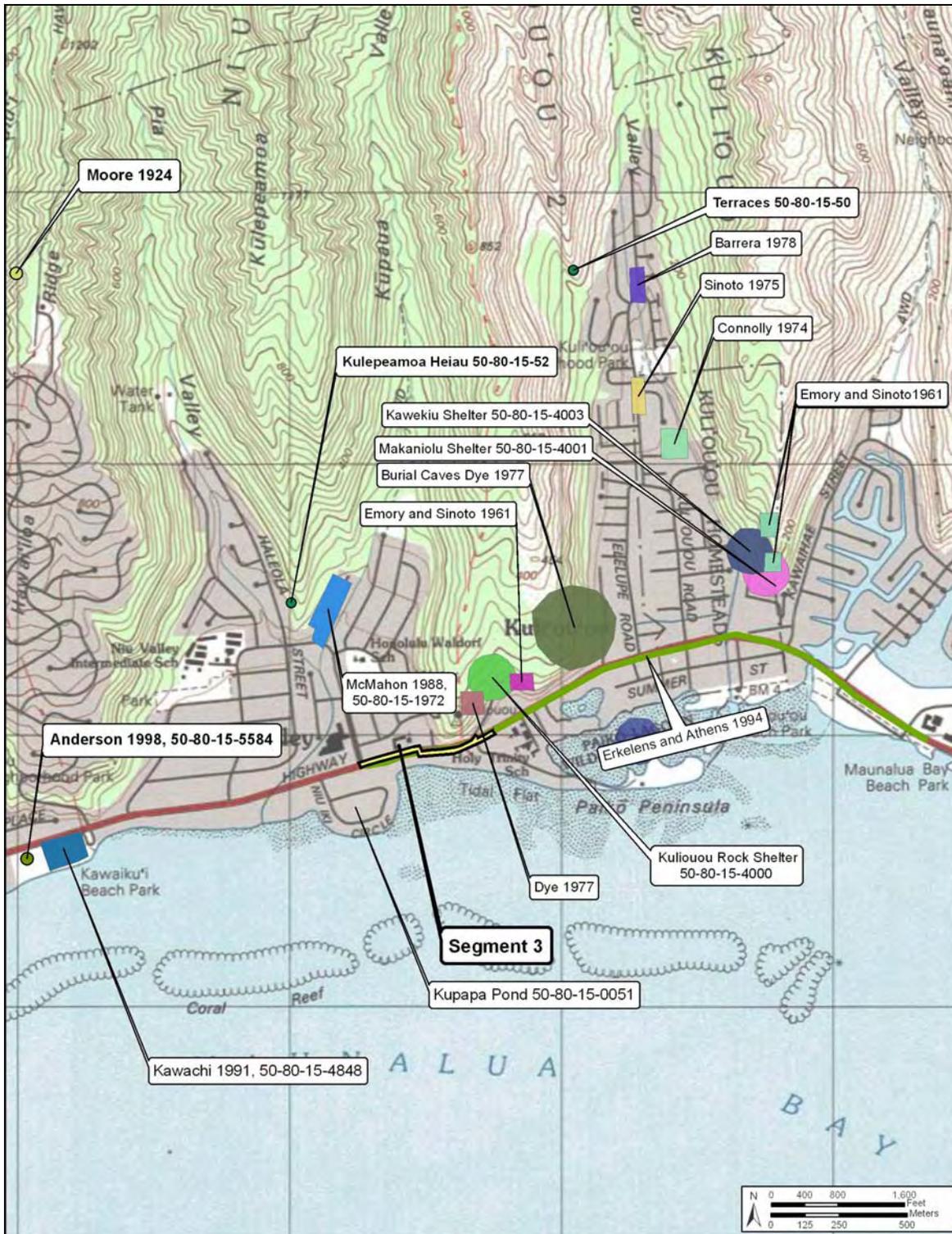


Figure 27. U.S. Geological Survey base map, showing previous archaeology in Niu and Kuli'ou'ou in the vicinity of the project area

A *Honolulu Advertiser* article in 1953 discusses the ownership of this land.

Kupapa Fishpond. Old Niu fish pond is part of a tract of 2,446 acres that was once a summer home of Kamehameha I and which was later claimed by Alexander Adams under Claim No. 802 filed Feb. 14, 1848, with the land commission at the time of the Great Māhele. The claim states:

“From the testimony of Governor Kekuanaoa and Mrs. Ii, it appears that the claimant was created lord or konohiki of this land, in the time of Kamehameha I, and that he has exercised the konohikiship [land management] of the same without dispute ever since the year of Our lord 1822.

It further appears that the claimant obtained his rights in this land, in the same way that he obtained his rights in the land comprised in the Claim No. 801, namely in remuneration for services rendered the king as sea captain or sailing master” [cited in Sterling and Summers 1978:274].

4.3.4 Burial Sites

4.3.4.1 Burial Caves (SIHP #50-80-15-53)

Niu was noted in early records for a number of inland caves used for burials. Westervelt (1904:149) noted that

Sometimes the bodies of chiefs were placed in small canoes, or parts of a canoe, and hidden in roomy caverns, watched over by devoted guards. This was done at Niu, where decayed remnants of canoes can still be seen. . . .On Oahu the caves of Niu . . . were abundantly used for burial.

John B Dale, of the 1845 U.S. Exploring Expedition led by Lt. Wilkes, visited the burial caves, riding through Waikiki past Diamond Head and Kāhala to reach Niu Valley:

We dismounted after a ride of 8 or 10 miles to the edge of this valley and tethered our horses under a clump of cocoa-nut trees. A couple of lanterns had been sent out by a native in advance for the purpose of exploring the cave. . . . We began to ascend the craggy mountain. A few hundred feet from the plain, a natural arch juts out from the precipice and near this is the mouth of the cave. Nothing could induce the natives, who gathered around us, to enter a place . . . filled with the mysterious and awful spirits of the departed. Indeed it was not inviting [from the journal of Lt. John Dale, dated Nov. 1845, aboard the U.S frigate *Constitution*, cited in Forbes 1992:127-128].

These caves can be seen in a sketch (see Figure 7) made by Dale in 1845, with the openings to the cave at the right next to a cliff and a picaresque arch. “Neither the cave nor the arch seems to exist today” (Forbes 1994:128).

McAllister (1933) also made a personal visit to the caves in the early 1930s.

Chief Justice Antonio Perry kindly directed me to the Niu cave. It is a tunnel approximating 100 feet in length. Near the mouth are remnants of numerous burials. Not far from the entrance is a wooden coffin which contains a few bones. Back of the coffin are fragments of tapas, cloth, lauhala mats, and portions of many skeletons. A small part of a canoe was seen. All of the burials have been disturbed and plundered [McAllister 1933:70].

4.3.4.2 Bishop Museum Collection from Niu

In 1998, a detailed assessment of the human remains curated at the Bernice P. Bishop Museum was made by their professional staff in consultation with representatives of the Administrator of the Island Burial Councils and other concerned groups in accordance with provisions of the Native American Graves Protection and Repatriation Act (NAGPRA), 43 CFR 10.10(b)(2). A list was prepared of all skeletal material donated to the museum or collected during archaeological excavations (Federal Register 1998). The material that was collected from Niu is summarized in Table 6.

Table 6. Human Skeletal Remains from Niu Donated to the Bernice P. Bishop Museum

Date	No. of Indiv.*	Location	Donor	Funerary Objects
1950	1	Niu or Wailupe, Hawai'i loa Ridge	Everett E. Carlson	Burial was found in a canoe and a box coffin (not donated)
1950	1	Niu	Walter Johnson	None
1959	1	Niu Valley cave	R. Smith	None

4.3.4.3 Coastal Burial Sites

Erkelens and Athens (1994) documented the discovery of at least 14 individuals during a Kalaniana'ole Highway widening project along the highway in 'Āina Haina and Niu Valley (Figure 28). All of these burials, although dispersed along the highway, were included in SIHP #50-80-15-4497. In 'Āina Haina (Wailupe Ahupua'a), four burials were recorded; one individual at the *makai* end of Nenu Street and three individuals at East Hind Drive. Ten burials were documented in Niu between Hawai'i Loa and West Halema'uma'u Streets; seven coffin burials (8 individuals), and two individual burials. The seven coffin burials may be part of a family cemetery for the Adams/Cassiday/Pflueger families. In two 19th to early 20th century newspaper obituaries, it was reported that a deceased member of one of these families would be buried in Niu, probably this private family cemetery (Erkelens and Athens 1994:60).

In 1998, Garcia and Associates (Putzi et al. 1998) conducted archaeological monitoring during the Phase II widening of Kalaniana'ole Highway through the *ahupua'a* of Niu (2 sites), Kuli'ou'ou (8 sites) and Maunalua. Ten sites were recorded; six sites with burials, three sites with non-burial features, and one site with both burial and non-burial features. A total of 40 human individuals (Eblé and Cleghorn 1994a-d), with 29 discrete burial features, were recorded. Burials from 18 of the 29 burial features were disinterred and reburied in two burial vaults. The remaining burials were left *in situ*. In Niu Ahupua'a, two individuals within one burial pit were found east of East Halema'uma'u Street (SIHP #50-80-15-4838) and three burials were found adjacent to East Halema'uma'u Street (SIHP 50-80-15-4840), as shown on Figure 28.

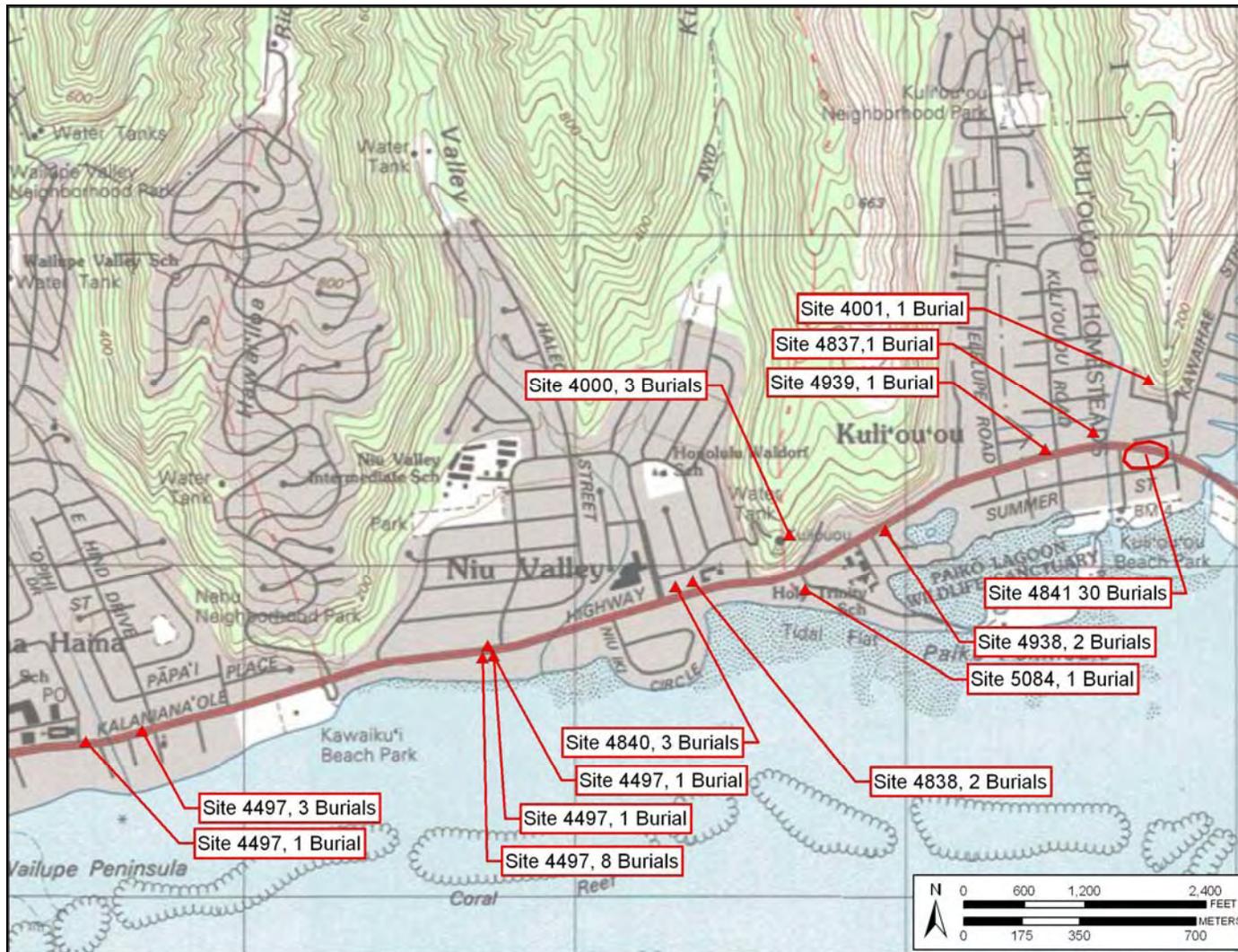


Figure 28. U.S. Geological Survey base map, showing burials adjacent to Kalaniana'ole Highway from Wai'alae to Maunaloa

4.4 Kuli'ou'ou Archaeological Research

4.4.1 Non-Burial Reports

Several archaeological studies have documented historic properties in Kuli'ou'ou (see Figure 27).

Thrum (1906) briefly described two *heiau* in the 'ili of Waialele in Kuli'ou'ou, one destroyed before ca. 1896 and a remnant of one still standing in 1906:

Ahukini . . . Kaowa, Waialele.—A square heiau about 50 feet in size, destroyed some ten years ago and its stones used for fences.

Kauiliula . . . Kuliouou, Waialele.—A similar sized heiau, little of which now remains [Thrum 1906:45].

In the 1930s, J. Gilbert McAllister conducted an island-wide survey of important archaeological sites. He could not relocate and positively identify either the *heiau* of Ahukini or Kauiliula, but he did record the remains of a terrace (SIHP #50-80-15-0050) on the west side of Kuli'ou'ou Valley “just inland of the Perry place” (McAllister 1933:70). In discussing Thrum's *heiau*, McAllister (1933:196) stated “Either this [Kauiliula] or the following site [Ahukini] may have been seen (Site 50).” He described it as:

Only a tumbled-down corner of what was apparently a terrace remains. It can be traced for 25 feet in one direction and for 33 feet in the other. There are a few pieces of old coral about the site [McAllister 1933:70].

In 1974, Connolly (1974) conducted a reconnaissance survey of a 13-acre parcel in Kuli'ou'ou Valley. Four previously recorded sites were found and two new features (a walled structure and a stone wall) were recorded. No site numbers were assigned.

In 1974 and 1975, the Bishop Museum (Sinoto 1975) conducted two brief reconnaissance field surveys in Kuli'ou'ou Valley of a 13-acre parcel and a 66-acre parcel. Sinoto describes the sites in the survey area as “agricultural and consist primarily of crude terraces, alignments, and walls defining small plots.” These features were not described or mapped and no site numbers were assigned.

In 1978 Barrera (1978) surveyed a 60-acre parcel in the back of Kuli'ou'ou Valley recording nineteen sites with 67 features associated with dryland habitation and agriculture.

Three non-burial historic properties have also been documented in Kuli'ou'ou east of the current project area (not shown on Figure 27). SIHP #50-80-15-4694 is a habitation complex comprising 61 features discovered underneath the *makai* lane of Kalaniana'ole Highway west of Kuli'ou'ou Stream and near the residence at 6133 Kalaniana'ole Highway (Putzi et al. 1998:66). The documentation of this property was limited to the exposed portion of construction trenching and thus the north and south boundaries are uncertain. The features included cooking pits, refuse pits, post hole, fire pits and *imu*. Putzi et al. (1998) describes the property as representing

. . . a large, intact, contiguous site . . . this remains an extremely valuable example of an extended habitation and processing site. Site 50-80-15-4694 was located on a dune or a high sand bank above the bank of Kuli'ou'ou Stream. The site was situated to take advantage of resources downstream at Paikō Lagoon and the wetlands immediately upstream, which could have been utilized for either wet taro production or fishponds. The area across Kuli'ou'ou Stream containing a prehistoric and historic era burial ground was utilized concurrent to the occupation of Site 4694 [Putzi et al 1998:83].

SIHP #50-80-15-4733 consists of five features, including three trash pits, the skeletal remains of a pig, and a posthole. A storage cache (feature 4) containing an assemblage of traditional and early historic artifacts associated with fishing, the manufacture of various implements and sinker stones, and nearby habitation was located 11 meters west of the center of Kuli'ou'ou Road and 10.5 meters north of the northern edge of Kalaniana'ole Highway (Putzi et al. 1998: 62). SIHP #50-80-15-5083 consists of three features including a historic trash pit, a cobblestone septic tank and a cobble alignment and trash pit (Putzi *et al.* 1998: 58-61).

4.4.2 Burial Sites

4.4.2.1 Burials from Caves and Ridges

Burials have been recorded from cave shelters and in subsurface excavations, usually found during road construction and water and sewer improvement projects. The locations of recorded burials in the Niu and Kuli'ou'ou area are shown in Figure 28.

In 1961, Kenneth P. Emory and Yosihiko Sinoto published "Oahu Excavations", presenting results from work at three rock shelters at Kuli'ou'ou which had gone on intermittently since 1938. Apparently, the remains of three individuals (SIHP #50-80-15-4000) were found at the Kuli'ou'ou Shelter (Bishop Museum site O1) and additional burial caves were located just to the east and west. A human burial was also encountered at the Makani'olu Shelter (Bishop Museum site O2; site 50-80-15-4001) which had been excavated intermittently since 1950. No burials were recorded from a third shelter, Kawekiu Shelter, site -4003.

In 1977, Thomas Dye documented a lava tube burial cave at the southern end of Kuli'ou'ou Ridge that contained disturbed human remains.

In 1992, Michael Pietrusewsky documented human remains from Kuli'ou'ou Ridge (no exact location).

4.4.2.2 Bishop Museum Collection from Kuli'ou'ou

In 1998, a detailed assessment of the human remains curated at the Bernice P. Bishop Museum was made by their professional staff in consultation with representatives of the Administrator of the Island Burial Councils and other concerned groups in accordance with provisions of the Native American Graves Protection and Repatriation Act (NAGPRA), 43 CFR 10.10(b)(2). A list was prepared of all skeletal material donated to the museum or collected during archaeological excavations (Federal Register 1998). The human remains collected from Kuli'ou'ou are summarized in Table 7.

Table 7. Human Skeletal Remains from Kuli'ou'ou Donated to the Bernice P. Bishop Museum

Date	No. of Indiv.*	Location	Donor	Funerary Objects
1950	5	Kuli'ou'ou Valley	Unknown	Two turtle bones
1958	3	Kuli'ou'ou walled cave	Mrs. Ernest Dias	None
1972	1	Kuli'ou'ou	Roxanne Grigalot	None
1995	8	Kuli'ou'ou	Kenneth P. Emory (dates unknown)	None

4.4.2.3 Kalaniana'ole Highway Burials

In 1998, Garcia and Associates (Putzi et al. 1998) conducted archaeological monitoring during the Phase II widening of Kalaniana'ole Highway through the *ahupua'a* of Niu (2 sites), Kuli'ou'ou (8 sites) and Maunalua. Ten sites were recorded; six sites with burials, three sites with non-burial features, and one site with both burial and non-burial features (SIHP #50-80-15-4841). A total of 40 human individuals (Eblé and Cleghorn 1994a-d), with 29 discrete burial features, were recorded. Burials from 18 of the 29 burial features were disinterred and reburied in two burial vaults.

In Kuli'ou'ou Ahupua'a, twenty burial features (30 individuals) were found within one site (SIHP #50-80-15-4841) between Kawaihae Street and Kuli'ou'ou Road east of Kuli'ou'ou Stream; the burial cluster contained both traditional Hawaiian pit burials and historic (non-Hawaiian) coffin burials. One traditional Hawaiian pit burial was found west of Kuli'ou'ou Stream (SIHP #50-80-15-4837), one traditional Hawaiian pit burial was found west of Kuli'ou'ou Road (SIHP #50-80-15-4939), one burial was found near Holy Trinity School (SIHP #50-80-15-4938), and one burial was found at Paikō Drive (SIHP #50-80-15-5084). One burial was found east of SIHP #50-80-15-4841 in Maunalua Ahupua'a; this burial was not assigned an SIHP number. The locations of the five sites with burials in Kuli'ou'ou are shown on Figure 28.

Of the eight sites in Kuli'ou'ou, five contained burials, as described above. The remaining three sites were: SIHP #50-80-15-5083, three trash pits; SIHP #50-8015-4733, three trash pits, one post hole, and a pig skeleton; and, SIHP #50-80-15-4841, five firepits, one trash pit, and three postholes. The features of each site are rather widely dispersed along the highway; the location of each feature is not shown on Figures 27 or 28 (see Putzi et al. 1998 for feature map).

4.5 Background Summary and Predictive Model

4.5.1 Wai'alae Predictive Model

In Wai'alae wetland taro was grown along inland streams, however the main crop in this *ahupua'a* was probably sweet potatoes, as the elaborate cultivated and irrigated taro fields that characterized the Honolulu and Waikīkī shore did not extend past Pālolo, on the western border of Wai'alae Nui (Handy 1940; Handy and Handy 1972).

One section of Wai'alae was different however, in that one or more springs near the coast provided sufficient water to support a dense concentration of taro fields. This section extended from the project area on the coast up to the main cross-*ahupua'a* trail, which later became

Wai'alaie Road, then Kalaniana'ole Highway. Early historic accounts often refer to the large coconut grove in this area, which is depicted on several nineteenth century maps. Missionaries and other visitors noted a sizeable settlement at Wai'alaie, inhabited by farmers and fishermen. Māhele records show that most of the agricultural land was located around the springs and Kapakahi Stream, but many of the awardees had house lots near the shore.

Hawaiians buried their dead along the sand dunes of the Wai'alaie shore, which is confirmed by the Māhele testimony and the numerous burials recovered by archaeologists in sand layers along Kāhala Avenue. According to several historical accounts, there was once a large Hawaiian burial ground somewhere on the Wai'alaie coastline, but its exact location is unknown. In the nineteenth century it was on an eroding beach, possibly submerged during high tide. The entire cemetery may have eroded away in the last 100 years. The use of sand areas for cemeteries continued into the twentieth century. There was a private family cemetery, called Pu'u Makani within the grounds of the Wai'alaie County Club, which was used for burial as late as 1920.

4.5.2 Wailupe Predictive Model

From previous archaeological studies and historic documents it is apparent that land use in the vicinity of the current project area is long and varied, extending from pre-contact times into the modern era. The vast majority of the previous archaeological research in Wailupe Ahupua'a is within the lower valley floor and coastal plains. These studies indicate that Wailupe Ahupua'a was highly populated and utilized during pre-contact and early historic times.

Traditional Hawaiian activities in the vicinity of Kalaniana'ole Highway and the coast would have primarily been dryland agriculture, habitation, transportation/pathways, possibly religious activities, resource gathering, and burials. The discovery of numerous burial caves within the Niu, Wailupe, and Kuli'ou'ou areas indicate that certain geologic formations may contain additional human remains. Numerous burials have also been found in areas of Jaucas sand along Kalaniana'ole Highway and on the sand beaches of Wailupe.

There was cultivation of a variety crops on the Wailupe Valley floor, the full extent of what is unclear. Cultivation of dryland crops such as sweet potato, gourds, and other dryland crops were likely planted along the flatter coastal areas. Aquaculture in the form of man-made fishponds, such as the former Wailupe fishpond, was another important subsistence activity. Habitations were primarily located within the coastal region and along the Wailupe Stream floodplain. With the urbanization of the area for residential use and the construction of Kalaniana'ole Highway, evidence of the former cultural landscape was almost entirely removed.

4.5.3 Niu Predictive Model

The entire *ahupua'a* of Niu was awarded to one individual, Alexander Adams, in the Māhele, so information on traditional Hawaiian land use or early historic land use for Niu is sparse. Some taro, and undoubtedly some dryland crops, were grown along the two streams, near the Papalea Spring at the Adams homestead, and near Lucas Spring at Kūpapa Fishpond. Most of the lands seem to have been used for cattle and sheep pasture.

Niu is most famous for its many burial caves, but these are inland of the sewer alignments. Concern for the specific project rests with the numerous traditional Hawaiian pit burials, isolated

historic burials, and family cemeteries that have been documented during previous archaeological projects along Kalaniana'ole Highway. Such burials can be found wherever undisturbed strata of sand are present on the surface or below modern fill layers.

4.5.4 Kuli'ou'ou Predictive Model

Kuli'ou'ou 1st was awarded to one individual during the Māhele; Kuli'ou'ou 2nd became Crown Lands, and was subdivided into grant lands. One individual, Manual Paikō later acquired much of the land in Kuli'ou'ou 1st. As a result, little is known of the traditional Hawaiian or early post-contact use of the land. In the post-contact period, the flow of the stream was slow and the soil was too porous to support many crops. The inland area was used mainly for ranches and dairys. Kuli'ou'ou did have a bounty of marine resources, at Paikō Pond and lagoon. Kuli'ou'ou still remained rural while Wai'alae and Wailupe were developed in the 1920s to 1940s, but by the 1950s, Kuli'ou'ou was covered with residential subdivisions, schools, churches, and shopping centers. Like Niu, the previous archaeology for Kuli'ou'ou consists mainly of the documentation of burials in caves and in sand deposits along Kalaniana'ole Highway. Burials have been found as isolated traditional Hawaiian pit burials and in small pre- and post-contact cemeteries. Burials are likely wherever undisturbed Jaucas sands are present on the surface or under fill layers.

4.6 Recommendations

Extensive modifications have been made to the surface and subsurface of areas along Kāhala Avenue and Kalaniana'ole Highway. It is likely that the top layers of soil along the sewer line have been heavily disturbed due to previous sewer line construction, but there may be intact deposits of Jaucas sands below the modern disturbed sand and fill layers. Within these strata, the potential for both pre-contact and post-contact burials is relatively high, based on previous archaeological work in the area. The potential for pre-contact Hawaiian habitation deposits is relatively high, as the project extends from the former Wai'alae fishing and farming village to an equally populated Wailupe Village through Niu and to the marine resource rich Paikō Lagoon in Kuli'ou'ou. The potential for nineteenth century habitation deposits, such as historic artifacts, is also relatively high. Wai'alae, Wailupe, Niu, and Kuli'ou'ou land was early used for cattle pasture, for ranches, and for dairies. Historic artifacts, such as domestic trash and commercial refuse could be found in buried privies or other subsurface trash deposits. Trash deposits and old structure foundations associated with such early buildings as the Wai'alae Country Club and the Alexander Adams homestead in Kuli'ou'ou could also be present.

In summary, any excavations below the top disturbed/fill layers in the project area have a relatively high possibility to encounter pre- and post-contact burials, pre-contact Hawaiian cultural layers and artifacts, nineteenth century artifacts related to the use of the property as the home of ranch/dairy owners, and late-nineteenth century artifacts related to social events at the Wai'alae Country Club. It is recommended that an archaeological monitoring program (monitoring plan, on-site monitoring & monitoring report) be instituted with an archaeological monitor present on-site during all initial ground-disturbing activities in relation to the sewer improvements for the Kalaniana'ole Highway Sewer System Improvements project area.

Section 5 Results of Field Inspection

A field inspection of the project area was conducted on September 5, 2008 by Constance R. O'Hare, B.A. under the general supervision of Hallett H. Hammatt, Ph.D. The field inspection component of the archaeological literature review and field check was carried out under archaeological permit number 08-14 issued by the SHPD/DLNR, per Hawai'i Administrative Rules (HAR) Chapter 13-282. The field effort required one-half person-day to complete.

The Kalaniana'ole Highway Sewer System Improvements Project consists of three segments. Segment 1 begins at the Kāhala Wastewater Pump Station and crosses through the Wai'ālae Country Club parking lot. The sewer line then extends along the coastline, past the beachfront of the Kāhala Beach Apartments and the Kāhala Hotel and Resort. It is then aligned along Kāhala Beach from the Wai'ālae Country Club to the western edge of Wailupe Beach Park. Segment 2 is aligned with Kalaniana'ole Highway from Wailupe Beach Park to east of East Hind Drive. A segment then extends approximately 600 feet through a coastal residential section *makai* of the highway, then returns to Kalaniana'ole Highway and ends near Kawaiku'i Beach Park. Segment 3 extends along Kalaniana'ole Highway in Niu Valley between Halema'uma'u Street and just east of the turn-off to Paikō Drive. The field inspection consisted of driving along sewer segments adjacent to Kāhala Avenue and Kalaniana'ole Highway and walking along public access areas that crossed residential areas and beach parks in Segments 1 and 2. No surface historic properties were noted along the route.

General environmental photographs were taken by Ms. O'Hare. In addition, the client provided photographs of various sections of the sewer alignment. A selection of the photographs is presented in Figure 29 to Figure 38.



Figure 29. Segment 1 sewer line west end at Kāhala Wastewater Pumping Station, view to the west

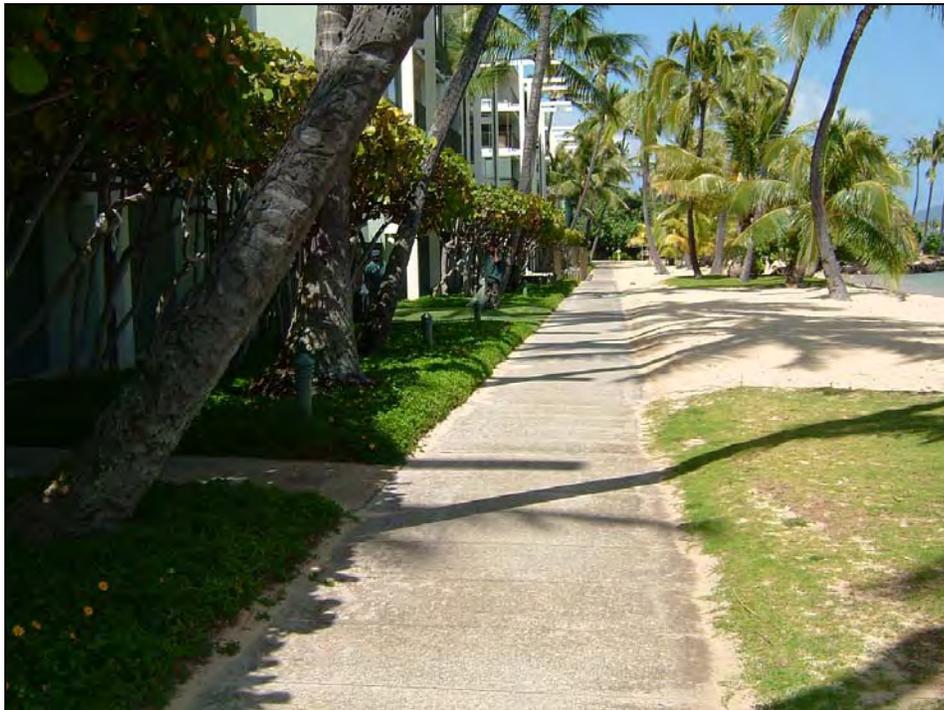


Figure 30. Segment 1 sewer line, located along Kāhala Beach Apartments (left of sidewalk), view to the east; no excavation and minimal access required



Figure 31. Segment 1 sewer line, located along Wai‘alae Country Club Golf Course, view to the east. Sewer line is to the right of the palm trees



Figure 32. Segment 1 sewer line located along Wailupe Beach, view to the west. Manhole frame and cover to be replaced



Figure 33. Segment 1 sewer line, located at Wailupe Beach Park (behind rest station), view to the west



Figure 34. Segment 2 sewer line and manhole along Kalaniana'ole Highway, view to the east



Figure 35. Segment 2, sewer line and manhole in residential area east of Wailupe Circle, view to the south



Figure 36. Segment 2 sewer line along Kalaniana'ole Highway near Kawaiku'i Park, view to the east



Figure 37. Segment 3 sewer line and manhole along Kalaniana'ole Highway sidewalk area, view to the east



Figure 38. Segment 3 sewer line within Kalaniana'ole Highway, view to the east

Section 6 References Cited

Ai, Chung Kun

1960 *My Seventy Nine Years in Hawaii*. The Cosmorama Pictorial Publisher, Hong Kong.

Anderson, Lisa

1998 *Emergency Data Recovery of the Inadvertent Discovery of Human Skeletal Remains Located at 5371 Kalaniana'ole Highway, Honolulu, Hawai'i (TMK: 3-6-03:32)*. Anderson Archaeological Research Consultants, Honolulu.

Anderson, Mary

1865 *Scenes in the Hawaiian Islands and California*. The American Tract Society, Boston, Mass.

Andrews, Lorrin

1922 *A Dictionary of the Hawaiian Language* (originally published in 1865). Revised by Henry Parker, 1922. Board of Commissioners of Public Archives of the Territory of Hawai'i, Honolulu

Barlow, Inigo

1789 "A View of the Bay of Woahoo, Sandwich Islands." Copper engraving, published as the Act directs Capt. Dixon, January 17, 1789, London. Reprinted as plate facing page 55, in W. Beresford 1968 *A Voyage Round the World: But More Particularly to the North-west Coast of America*, edited by Captain George Dixon. De Capo Press, New York. Originally published in 1789, G. Goulding, London.

Barrera, William

1978 *Kuliouou Valley Archaeological Survey*. Revised. Chiniago Inc. Kamuela, Hawai'i.

1984 *Archaeological Reconnaissance, Aina Haina, Oahu TMK: 4-6-02:4*. Chiniago Inc., Kamuela, Hawai'i.

Barrère, Dorothy B.

1994 *The King's Mahele: The Awardees and Their Lands*. Dorothy B. Barrère, Compiler, Hilo, Hawai'i. Ms. on file, Historic Preservation Division, State of Hawaii Department of Land and Natural Resources, Kapolei.

Bath, Joyce

1989 *Aukai-Kāhala Burial 4747 Aukai Avenue, Kahala, Honolulu, District of Oahu*. Department of Land and Natural Resources, State Parks Division, Historic Sites Section, Honolulu.

Bath, Joyce, and Agnes Griffin

1988 *A Human Skelton from Waiholo Street, Kahala, Oahu*. Department of Land and Natural Resources, State Parks Division, Historic Sites Section, Honolulu.

Baxley, Henry Willis

1865 *What I Saw on the West Coast of South and North America, and at the Hawaiian Islands*. D. Appleton & Co., New York.

Beckley, Emma [Emma Kailikapuolono Metcalf Beckley Nakuina]

n.d. *Beckley Story* [stories about Kane and Kanaloa creating springs on Oahu]. Box M-85, Theodore Kelsey Collection, File #468 Legends. Hawai'i State Archives, Honolulu.

Beresford, W.

1968 *A Voyage Round the World: But More Particularly to the North-west Coast of America*, edited by Captain George Dixon. De Capo Press, New York. Originally published in 1789, G. Goulding, London.

Bishop [Bernice P.] Estate

1903 Map of Lower Wai'alaie, no surveyor listed, Bishop Estate Map No. 335. Archived at Kamehameha Schools Office, 567 South King Street, Suite 200, Honolulu, Hawai'i.

1920 Map of Wai'alaie, no surveyor listed, Bishop Estate Map 718-B. Archived at Kamehameha Schools Office, 567 South King Street, Suite 200, Honolulu, Hawai'i.

Bishop Museum Archives

1889 Photograph of "Camp Austen" in Wai'alaie. Bishop Museum Archives, Bishop Museum, 1525 Bernice Street Honolulu, Hawai'i, 96817. Photograph reprinted in Edward B. Scott, 1968, *The Saga of the Sandwich Islands, Volume 1*, p. 679. 4th Edition, Sierra-Tahoe Publishing Co, Crystal Bay, Lake Tahoe, Nevada.

1933 Photograph of the Adams Homestead on the Niu Coast. Bishop Museum Archives, Bishop Museum, 1525 Bernice Street Honolulu, Hawai'i, 96817. Photograph reprinted in Edward B. Scott, 1968, *The Saga of the Sandwich Islands, Volume 1*, p. 689. 4th Edition, Sierra-Tahoe Publishing Co, Crystal Bay, Lake Tahoe, Nevada.

1933 Aerial photo of Wailupe fishpond. Bishop Museum Archives, Bishop Museum, 1525 Bernice Street Honolulu, Hawai'i, 96817.

1950s (ca.) Photograph of Wailupe Peninsula Residential Area. Bishop Museum Archives, Bishop Museum, 1525 Bernice Street Honolulu, Hawai'i, 96817.

Bordner, Richard

1992 *Wailupe Well II, 'Ili of Wailupe, Wailupe, Island of O'ahu*. Social Research Systems Co-operative, Honolulu.

Boundary Commission Testimony (BCT)

1864-1935 *Commission on Boundaries*. Testimony. Hawai'i State Archives, Honolulu.

Bowen, Robert N.

- 1981 *Hawaiian Disposal of the Dead*. A Thesis submitted to the Graduate School of the University of Hawaii in Partial Fulfillment of the Requirements for the Degree of Master of Arts, University of Hawai'i, Honolulu.

Bowen, Robert, and Lloyd Soehren

- 1966 *Field Notes of Disinterments at Kahala Cemetery, Waialae Golf Course, Wai'alae Iki Ahupua'a, Honolulu*. Unpublished notes on file in Anthropolgy Group 1, Box 6.7, Bernice P. Bishop Museum Archives, Honolulu.

Bowser, G.

- 1880 *The Hawaiian Kingdom Statistical and Commercial Directory and Tourists' Guide, 1880-1881*. George Bowser and Company, Honolulu and San Francisco.

Bradley, Maureen, and Michael Pietruszewsky

- 1989a *Human Skeletal Remains Found at 4745 Aukai Ave., Kahala, Honolulu, O'ahu (M.D. No. 89-0724)*. University of Hawai'i-Manoa, Honolulu.
- 1989b *A Partial Skeleton Found in Kahala, Honolulu, O'ahu*. University of Hawai'i-Manoa, Honolulu.

Briggs, L. V.

- 1926 *Experiences of a Medical Student in Honolulu, and on the Island of Oahu*. David D. Nickerson Co., Boston, Mass.

Bush, Anthony, and Hallett H. Hammatt

- 2002 *Archaeological Monitoring Report for the Installation of the Honolulu Board of Water Supply 16 inch Water Main and Appurtenances along Kalaniana'ole Highway in East Honolulu, O'ahu, (TMK 3-5-019,021, to 023,042,044, to 47,049; 3-6-001, 009, & 011)*. Cultural Surveys Hawai'i, Kailua, Hawai'i.

Campbell, Lord George

- 1877 *Log-Letters from "The Challenger."* Fourth Edition, Revised, Macmillan and Co., London.

Chafee, David B., and Robert L. Spear

- 1994 *An Archaeological Assessment of the Wiliwilinui Trail Realignment on Waialae Iki Ridge, Waialae Iki, Kona, O'ahu*. Scientific Consultant Services, Inc., Kāne'ohe, Hawai'i.

Chamberlain, Levi

- 1826 *Trip Around Oahu in 1826*. Manuscript in the Hawaiian Mission Children's Society Library, Honolulu.
- 1956 *Tour Around Oahu, 1828*. *Hawaiian Historical Society Annual Report* 65:25-41.

Char, Tin Yuke, and Wai Jane Char

- 1988 *Chinese Historic Sites and Pioneer Families of Rural Oahu*. Hawaii Chinese History Center, Inc., Honolulu.

Chinen, Melanie

2007a *Inadvertent Discovery of Human Skeletal Remains at 4546 [sic:4564] Kahala Avenue, Waikiki Ahupua'a, Honolulu [Kona] District, Island of O'ahu, TMK: (1) 3-5-004:015.* Department of Land and Natural Resources, State Historic Preservation Division, Kapolei, Hawai'i. LOG NO: 2007.0893; DOC NO: 0703AJ07 Archaeology. March 12, 2007.

2007b *Inadvertent Discovery of Human Skeletal Remains at 4564 Kahala Avenue, Waikiki Ahupua'a, Kona District, Island of O'ahu, TMK: (1) 3-5-004:015.* Department of Land and Natural Resources, State Historic Preservation Division, Kapolei, Hawai'i. LOG NO: 2007.1583; DOC NO: 0703MC05. May 16, 2007.

Clark, John R. K.

1977 *The Beaches of O'ahu.* University of Hawai'i Press, Honolulu.

Cleghorn, Paul L., and Lisa Anderson

1992 *Archaeological Inventory Survey in Kapakahi Gulch, Waialae, O'ahu.* Paul Cleghorn Consulting, Kailua, Hawai'i.

Collins, Sara

2002 *Inadvertent Discovery of Human Remains at 925 Wailupe Place, Aina Haina, O'ahu.* Department of Land and Natural Resources, State Historic Preservation Division, Kapolei, Hawai'i.

Collins, Sara, and Stephan D. Clark

2006 *Subsurface Testing Program in Support of Due Diligence, 4415, 4423 and 4433 Kahala Avenue, Honolulu, Hawai'i, TMK (1) 305-003:008, 009, 010.* Pacific Consulting Services, Inc., Honolulu.

Collins, Sara, and Muffet Jourdane

1999 *Investigation of Alleged Burial Cave on the Slopes of Waialae Nui Ridge.* Department of Land and Natural Resources, State Historic Preservation Division, Kapolei, Hawai'i.

Connolly, Robert D. III

1974 *Kuliouou Reconnaissance Survey, Oahu.* Bernice P. Bishop Museum, Honolulu.

Cordy, Ross

2002 *The Rise and Fall of the Hawaiian Kingdom. A Brief Overview of O'ahu's History.* Mutual Publishing, Honolulu.

Craft, Mabel Clare

1899 *Hawaii Nei.* William Doxey, San Francisco.

Dale, J.

1845 Sketch, sepia wash over pencil, titled "Burial Cavern, Valley of Niu (Koko Head). Original in J. Wells Henderson Collection. Copy transparency on file, Honolulu Academy of Arts, Honolulu.

Damon, Ethel M.

1931 *Koamalu. A Story of Pioneers on Kauai and of What They Built on That Island Garden.* 2 Volumes. Privately printed at the Honolulu Star-Bulletin Press, Honolulu.

Day, A. Grove

1984 *History Makers of Hawaii: A Biographical Dictionary.* Mutual Publishing, Honolulu.

Desha, Stephen L.

2000 *Kamehameha and His Warrior Kekūhaupi'o.* Translated by Francis N. Frazier. First published in the Hawaiian language newspaper *Ka Hoku o Hawai'i* in a series of articles from December 16, 1920 to September 11, 1924. Kamehameha Schools Press, Honolulu.

Dorrance, William H., and Francis S. Morgan

2000 *Sugar Islands. The 165-Year Story of Sugar in Hawai'i.* Mutual Publishing, Honolulu.

Douglas, Michele Toomay, and Michael Pietruszewsky

1988 *A Human Skeleton from Waiholo Street, Kahala, O'ahu.* University of Hawai'i-Manoa, Honolulu.

Dye, Thomas S.

1977 *Archaeological Inspection of a Cave on Kuli'ou'ou Ridge.* Copy on file at State of Hawai'i, Department of Land and Natural Resources, Historic Preservation Division, Kapolei, Hawai'i.

2005a *Recovery of Human Remains at Site 50-80-14-6762, 4577 Kahala Avenue, TMK:3-5-4-003.* T. S. Dye & Colleagues, Archaeologists, Inc., Honolulu.

2005b *Inadvertent Discovery of Human Remains During Archaeological Monitoring of Electrical Trench Excavation at 4577 Kahala Avenue (TMK:3-5-4:003).* T. S. Dye & Colleagues, Archaeologists, Inc., Honolulu.

2006 *Burial Site Component of a Data Recovery Plan for 4577 Kahala Avenue, TMK:3-5-4:003.* T.S. Dye & Colleagues, Archaeologists, Inc., Honolulu.

Dye, Thomas S., and Elaine Jourdane

2007 *Archaeological Inventory Survey of a Residential Parcel on Kahala Avenue, O'ahu, Hawai'i (TMK:3-5-3:8, 9, 10).* T.S. Dye & Colleagues, Archaeologists, Inc., Honolulu.

Eblé, Francis, and Paul Cleghorn

1994a *First Incident of Human Skeletal Remains (Burial No. 2) Uncovered as a Result of Construction Activities for Phase II Widening of Kalaniana'ole Highway, Honolulu, Hawai'i.* Copy on file at State of Hawai'i, Department of Land and Natural Resources, Historic Preservation Division, Kapolei, Hawai'i.

- 1994b *Second Incident of Human Skeletal Remains (Burial No. 3) Uncovered as a Result of Construction Activities for Phase II Widening of Kalaniana'ole Highway, Honolulu, Hawai'i.* Copy on file at State of Hawai'i, Department of Land and Natural Resources, Historic Preservation Division, Kapolei, Hawai'i.
- 1994c *Third Incident of Human Skeletal Remains (Burial No. 4) Uncovered as a Result of Construction Activities for Phase II Widening of Kalaniana'ole Highway, Honolulu, Hawai'i.* Copy on file at State of Hawai'i, Department of Land and Natural Resources, Historic Preservation Division, Kapolei, Hawai'i.
- 1994d *Fourth Incident of Human Skeletal Remains (Burial No. 5) Uncovered as a Result of Construction Activities for Phase II Widening of Kalaniana'ole Highway, Honolulu, Hawai'i.* Copy on file at State of Hawai'i, Department of Land and Natural Resources, Historic Preservation Division, Kapolei, Hawai'i.

Emerson, Nathaniel B.

- 1993 *Pele and Hiiaka-A Myth from Hawaii.* 'Ai Pohaku Press, Honolulu.

Emory, Kenneth P., and Yoshiko H. Sinoto

- 1961 *O'ahu Excavations.* Bernice P. Bishop Museum Special Publication 49. Bishop Museum, Honolulu.

Erkelens, Conrad, and J. Stephen Athens

- 1994 *Burials, Highways, and History: Archaeology along Kalaniana'ole Highway, East Honolulu, O'ahu, Hawai'i.* International Archaeological Research Institute, Inc., Honolulu.

Erkelens, Conrad, and Myra J. Tomonari-Tuggle

- 1997 *Archaeological Investigations at 4433 Kahala Avenue, Honolulu, Hawai'i.* International Archaeological Research Institute, Inc., Honolulu.

Federal Register

- 1998 Federal Register, January 28, 1998 (Volume 63, Number 18) [Notices] [Page 4277-4284] From the Federal Register Online via GPO Access [wais.access.gpo.gov] [DOCID:fr28ja98-114]. Department of the Interior National Park Service Notice of Inventory Completion for Native American Human Remains and Associated Funerary Objects from the Island of Oahu, Hawai'i in the Possession of the Bishop Museum, Honolulu, HIAGENCY: National Park Service.

Fitzpatrick, Gary L.

- 1986 *The Early Mapping of Hawai'i.* Editions Limited, Honolulu.

Fong, Jeffrey W. K., and Hallett H. Hammatt

- 2008 *Archaeological Assessment for the Proposed Mike Horack Residential Use, Single Family Dwelling Project, Wailupe Ahupua'a, Kona District, O'ahu Island TMK: [1] 3-6-004: por. 023.* Cultural Surveys Hawai'i, Inc., Kailua, Hawai'i.

Foote, Donald E., E.L. Hill, S. Nakamura, and F. Stephens

- 1972 *Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii.* U.S. Dept. of Agriculture, U.S. Government Printing Office, Washington, D.C.

Forbes, David W.

1992 *Encounters with Paradise. Views of Hawaii and its People, 1778-1941.* Academy of Arts, Honolulu.

Fornander, Abraham

1917 History of Kūali'i. In, *Fornander Collection of Hawaiian Antiquities and Folk-Lore*, Vol. IV, Part II:364-434. Bishop Museum Press, Honolulu.

1918 Legend of Kawelo. In, *Fornander Collection of Hawaiian Antiquities and Folk-Lore*, Vol. V, Part I:2-71. Bishop Museum Press, Honolulu.

1918 Legend of Palila. In, *Fornander Collection of Hawaiian Antiquities and Folk-Lore*, Vol. V, Part I:136-153. Bishop Museum Press, Honolulu.

1919 Legend of Kamapuaa. In, *Fornander Collection of Hawaiian Antiquities and Folk-Lore*, Vol. V, Part II:314-363. Bishop Museum Press, Honolulu.

Frank, Lilia

1958 *Oahu Place Names – Trip from Ka-imu-iki and Vicinity, Kona District, March 19, 1958.* Manuscript available at Hawai'i State Archives, Box M-445, Item # 81, Honolulu.

Giambelluca, Thomas W., Michael A. Nullet, and Thomas A. Schroeder

1986 *Rainfall Atlas of Hawai'i.* Department of Land and Natural Resources, Honolulu.

Goto, Baron

1982 Ethnic Groups and the Coffee Industry in Hawai'i. *Hawaiian Journal of History* 16:112-124.

Grant, Glen

2000 *Hawai'i Looking Back, An Illustrated History of the Islands.* Mutual Publishing, Honolulu.

Griffin, Annie

1987 *Preliminary Report on a Burial Found in a Construction Site at 4505 Kahala Ave., Honolulu, Oahu.* Department of Land and Natural Resources, State Parks Division, Historic Sites Section, Honolulu.

Griffis, Townsend

1930 *When You Go To Hawaii You Will Need This Guide to the Islands.* Houghton Mifflin and Co., Boston and New York.

Hammatt, Hallett H., and Anthony R. Bush

2001 *Archaeological Monitoring Report for the 4-inch Gas Main within the Kalaniana'ole Highway Right-of-Way, Ainakoa Avenue to Wailupe Circle, East Honolulu, Kona, O'ahu.* Cultural Surveys Hawai'i, Inc., Kailua, Hawai'i.

Handy, E. S. Craighill

1940 *The Hawaiian Planter, Volume 1.* Bishop Museum Bulletin No. 161, Bernice P. Bishop Museum, Honolulu.

Handy, E. S. Craighill, and Elizabeth G. Handy

1972 *Native Planters in Old Hawaii: Their Life, Lore, and Environment.* Bishop Museum Bulletin 233, Bernice P. Bishop Museum, Honolulu.

Haun, Alan E., and Dave Henry

- 2003 *Archaeological Inventory Survey, Waialae 180 Reservoir Replacement, Land of Waialae Iki, Honolulu District, Island of O'ahu (TMK 3-5-20:Portion 11)*. Haun & Associates, Keau'u, Hawai'i.

Hawai'i Land Survey Division

- 1848 Helu LCA 6175 Kamaka, map with Land Court Award 6175 to Kamaka (Map on file at Hawai'i Land Survey Division; reprinted in Ogata 1992, Settlement Survey of Wailupe 'Ili, Waikiki Ahupua'a, Kona District, Island of O'ahu. Manuscript, State Historic Preservation Division, Honolulu: Appendix II). Archived at Hawai'i Land Survey Division, Department of Accounting and General Services, 1151 Punchbowl St., Room 210, Honolulu, Hawai'i.
- 1903 Grant 4728 to Antonio Perry for Wailupe Fishpond, (Map on file at Hawai'i Land Survey Division; reprinted in Ogata 1992, Settlement Survey of Wailupe 'Ili, Waikiki Ahupua'a, Kona District, Island of O'ahu. Manuscript, State Historic Preservation Division, Honolulu: Appendix II). Archived at Hawai'i Land Survey Division, Department of Accounting and General Services, 1151 Punchbowl St., Room 210, Honolulu, Hawai'i.
- 1922 Applicant: Joseph Paikō, Jr., Being the Ahupuaa of Kuliouou 1st, Honolulu, Oahu, T. H., Land Court Application (LCAp) Map No. 578. Archived at Hawai'i Land Survey Division, Department of Accounting and General Services, 1151 Punchbowl St., Room 210, Honolulu, Hawai'i.
- 1925 Applicant: Robert Hind, Being Land Situated within the Ili 'Āina of Wailupe, at Waikiki, Honolulu, Oahu, T. H., Land Court Application (LCAp) Map No. 656. Archived at Hawai'i Land Survey Division, Department of Accounting and General Services, 1151 Punchbowl St., Room 210, Honolulu, Hawai'i.
- 1927 Applicant: Bertha Adele Swanton Isenberg, Being Land Situated at the Sea, At Waialae-Iki, Honolulu, Oahu, T. H., Land Court Application Map No. 665. Archived at Hawai'i Land Survey Division, Department of Accounting and General Services, 1151 Punchbowl St., Room 210, Honolulu, Hawai'i.
- 1927 Applicant: Trustees under the Will and of the Estate of Bernice Pauahi Bishop, Deceased, Land Situated between Kalaniana'ole Highway, Kealaolu Avenue, Kahala Avenue & the Sea, Waialae-Iki and Waialae-Nui, Honolulu, Oahu, T. H., Land Court Application Map No. 828. Archived at Hawai'i Land Survey Division, Department of Accounting and General Services, 1151 Punchbowl St., Room 210, Honolulu, Hawai'i.

Hazlett, Alexander, and Hallett H. Hammatt

- 2008 *Archaeological Monitoring Report for Niu Valley Force Main Replacement, Niu Ahupua'a, Kona District, O'ahu TMK: [1] 3-6-003:001-002; 3-7-001:002,003, 005, 007, 009, 010, and 016*. Cultural Surveys Hawai'i, Inc., Kailua, Hawai'i.

HEN (Hawaiian Ethnological Notes)

- n.d. *Waialae Springs*. Edgar Henriques Collection, HEN:Vol. 1, p. 1108.

Henriques, Lucy K.

- 1916 *Paper of Lucy K. Henriques, read before the Hui ona Pua o Hawaii at the Annual Meeting.* HEN Volume 1:1326-1329. Bishop Museum Archives, Bernice P. Bishop Museum, Honolulu.

Henry, L.

- 1959 *A Geographical Study of the Central Maunaloa Region, Island of Oahu, State of Hawaii.* Unpublished Master's thesis on file, University of Hawai'i, Honolulu.

Hind Estate Archives

- Mid-1930s Photograph of Wailupe Fishpond and Hind-Clarke Dairy. Hind Estate Archives. Photograph reprinted in Edward B. Scott, 1968, *The Saga of the Sandwich Islands, Volume 1*, p. 688. 4th Edition, Sierra-Tahoe Publishing Co, Crystal Bay, Lake Tahoe, Nevada.

Hitch, Thomas Kemper, and Mary Ishii Kuramoto

- 1981 *Wai'alaie Country Club. The First Half Century.* Wai'alaie Country Club, Honolulu.

Honolulu Advertiser

- 1953 Ancient Fishpond at Niu is Homesite Development. *Honolulu Advertiser*, March 22, 1953.
- 1999 Obituary. Ranch House founder Charles Lucas. *Honolulu Advertiser*, September 21, 1999: B2.

Honolulu Star-Bulletin

- 1946 *Honolulu Star-Bulletin*, October 26, 1946. Honolulu.

Ho'oulumāhiehie

- 2006a *The Epic Tale of Hi'iakaikapoliopele.* As Told by Ho'oulumāhiehie. Translated by M. Puakea Nogelmeier. Awaiaulu Press, Honolulu.
- 2006b *Ka Mo'olelo o Hi'iakaikapoliopele.* Original Hawaiian text taken from series of articles in *Ka Na'i Aupuni* 1905-1906. Awaiaulu Press, Honolulu.

‘Ī‘Ī, John Papa

- 1959 *Fragments of Hawaiian History.* (Pukui translation). Bishop Museum Press, Honolulu.

Indices of Awards

- 1929 *Indices of Awards Made by the Board of Commissioners to Quiet Land Titles in the Hawaiian Islands.* Office of the Commissioner of Public Lands. Territory of Hawai'i, Honolulu.

Jackson, George G. E.

- 1883 Wai'alaie Coast, Registered Map No. 1293. Archived at Hawai'i Land Survey Division, Department of Accounting and General Services, 1151 Punchbowl St., Room 210, Honolulu, Hawai'i.

Jones, Carlin K., and Hallett H. Hammatt

2003 *Archaeological Monitoring Report for the Black Point Water System Improvements Project, Kapahulu 'Ili, Waikiki Ahupua'a; Kona District; Island of O'ahu (TMK 3-1-40, 41& 44; 3-5-01, 02, & 13)*. Cultural Surveys Hawai'i, Inc., Kailua, Hawai'i.

Jourdane, Elaine

1995 *Inadvertent Discovery of Skeletal Remains at 4433 Kahala Avenue, Wai'alaie, Kona, O'ahu*. Department of Land and Natural Resources, State Historic Preservation Division, Kapolei, Hawai'i.

Judd, Henry Pratt

1930 *Hawaiian Proverbs and Riddles*. Bernice P. Bishop Museum Bulletin 77. Bernice P. Bishop Museum, Honolulu.

Kalākaua, David

1990 *The Legends and Myths of Hawai'i*. Mutual Publishing, Honolulu.

Kawachi, Carol

1989 *Burial Investigation at 4585 Kahala Ave., Kahala, Honolulu District, O'ahu Island*. Department of Land and Natural Resources, Division of State Parks, Recreation and Historic Sites, Honolulu.

1991 *Kawaiui Beach Park Burial, DOT Highway Widening Project, Wailupe, Kona, O'ahu*. Department of Land and Natural Resources, State Historic Preservation Division, Kapolei, Hawai'i.

Ke Au Okoa

1867 He Moolelo no Pakaa. *Ke Au Okoa*, Nov. 14, 1867.

Kennedy, Joseph

1991 *Archaeological Inventory Report for TMK 3-5-17: Por. 2, Waialae Nui, Island of O'ahu*. Archaeological Consultants of Hawai'i, Haleiwa, Hawai'i.

Kikuchi, William K.

1973 *Hawaiian Aquaculture System, A Dissertation*. Department. of Anthropology, University of Arizona, Tempe, Arizona.

Krauss, Beatrice

1974 *Ethnobotany of Hawai'i*. University of Hawai'i, Department of Botany, Honolulu. Copy available at University of Hawai'i-Manoa, Hamilton Library, Honolulu.

Kuykendall, Ralph S.

1965 *The Hawaiian Kingdom: 1778-1854. Volume I. Foundation and Transformation*. University Press of Hawaii, Honolulu.

1967 *The Hawaiian Kingdom: 1874-1893. Volume 3. The Kalakaua Dynasty*. University Press of Hawai'i, Honolulu.

La Passe, Lt. Joxeph de

1855 Plan du Mouillage [Anchorage] d'Honolulu. Reprinted in, *The Early Mapping of Hawai'i*, by Gary L. Fitzpatrick 1986, Editions Limited, Honolulu, pp. 82-83.

Lee, Lou Jane M., and Michael Pietrusewsky

1988 *A Human Skeleton Found During Excavations at 4505 Kahala Ave., Honolulu, O'ahu*. University of Hawai'i-Manoa, Honolulu.

Lisiansky, Urey

1814 *A Voyage Around the World in the Years, 1803, 1804, 1805, and 1806*. Booth, London.

Loomis, Albertine

1976 *For Whom are the Stars*. An informal history of the overthrow of the Hawaiian Monarchy in 1893 and the ill-fated counterrevolution it evoked. The University Press of Hawai'i and Friends of the Library of Hawai'i, Honolulu.

Mathison, Gilbert Farquhar

1825 *Narrative of a Visit to Brazil, Chile, Peru and the Sandwich Islands, during the Years 1821 and 1822*. Charles Knight, London.

McAllister, J. Gilbert

1933 *Archaeology of Oahu*. Bishop Museum Bulletin 104. Bishop Museum Press, Honolulu. Reprinted 1971. Kraus Reprint Co., New York.

McCoy, Patrick

1971 *Exploration of Burial Rockshelter on Kaalakei Ridge, O'ahu*. Bernice P. Bishop Museum: Honolulu.

McMahon, Nancy

1988 *Archaeological Reconnaissance Survey of a Five-Acre parcel in Niu Valley, O'ahu Island, Hawai'i*. Public Archaeology Section, ARG, Bernice P. Bishop Museum, Honolulu.

Mokumaia, J. K.

1920 Aekai o Waialae-nui ame Waialae-iki. *Ka Nūpepa Ku'oko'a*, June 18, 1920.

Moore, Kenneth

1974 *Report of Walk-Through Survey at Hawaii Loa Ridge, Oahu*. Bernice P. Bishop Museum, Honolulu.

Mulrone, M. A.

1929 Radio in Hawaii. *Hawaiian Almanac and Annual for 1929*, pp. 66-69. Thos. G. Thrum, Honolulu.

Nagaoka, Lisa

1985 *The Agriculture of Palolo, Waialae, and Wailupe*. Department of Anthropology, University of Hawai'i at Mānoa, Honolulu. Copy available at Department of Land and Natural Resources, State Historic Preservation Division, Kapolei, Hawai'i.

Nakuina, Moses K.

1990 *The Wind Gourd of La'amaomao*. Second Edition. Translated by Esther T. Mookini, and Sarah Nākoa. Kalamaku Press, Honolulu.

Nakuina, Moses K.

- 1998a Aiai, Son of Ku'ula. Part II of the Legend of Ku'ula, the Fish God of Hawaii. Translation of story by Moke Manu by M. K. Nakuina, in *Hawaiian Folk Tales*, compiled by Thomas G. Thrum, pp. 230-249. Mutual Publishing, Honolulu.
- 1998b Fish Stories and Superstitions. Translated by M. K. Nakuina. In, *Hawaiian Folk Tales*, compiled by Thomas G. Thrum, pp. 269-274. Mutual Publishing, Honolulu.

Nicholson, H. W.

- 1881 *From Sword to Shore; or A Fortune in Five Years at Hawaii*. W.H. Allen & Co., London.

Ogata, C.

- 1992 *Settlement Survey of Wailupe 'Ili, Waikiki Ahupua'a, Kona District, Island of O'ahu*. Manuscript available at Department of Land and Natural Resources, State Historic Preservation Division, Kapolei, Hawai'i.

O'Hare, Constance R., David W. Shideler, and Hallett H. Hammatt

- 2008 *Archaeological Literature Review and Field-Check for the Proposed Wai'alaie Country Club Master Plan Project, Wai'alaie Iki Ahupua'a, Honolulu District, O'ahu Island, TMK: [1] 3-5-023: 003 and 038*. Cultural Surveys Hawai'i, Inc., Kailua, Hawai'i.

Pease, W. H.

- 1850-1860 Plan of Wailupe, Registered Map No. 578. Archived at Hawai'i Land Survey Division, Department of Accounting and General Services, 1151 Punchbowl St., Room 210, Honolulu, Hawai'i.

Pietrusewsky, Michael

- 1992 *Human Remains from Kuli'ou'ou Ridge (TMK 3-7-04)*. Copy on file at State of Hawai'i, Department of Land and Natural Resources, Historic Preservation Division, Kapolei, Hawai'i.

Portlock, Capt. Nathaniel

- 1789 *A Voyage Round the World, but More Particularly to the North-west Coast of America: Performed in 1785, 1786 and 1788 in the King George and Queen Charlotte by Captains Portlock and Dixon*. Second edition. George Goulding, London.

Pratte, Alf

- 1966 Kahala Bones Said Hint of Battle Site. *Honolulu Star-Bulletin*, January 19, 1966.

Pukui, Mary Kawena, and Caroline Curtis

- 1951 *The Water of Kane and Other Legends of the Hawaiian Islands*. Collected or Suggested by Mary Kawena Pukui, retold by Caroline Curtis. The Kamehameha Schools Press, Honolulu.

Pukui, Mary Kawena, and Samuel H. Elbert

- 1986 *Hawaiian Dictionary*. Second Edition. University of Hawai'i Press, Honolulu.

- Pukui, Mary K., Samuel H. Elbert, and Esther T. Mookini**
1974 *Place Names of Hawaii*. University of Hawai'i Press, Honolulu.
- Putzi, Jeffrey L., and Thomas S. Dye**
2003 *Report on Burial Recovery Operations at 4773 Kahala Avenue; State Site 50-80-14-6632*. T. S. Dye & Colleagues, Archaeologists, Inc., Honolulu.
- Putzi, Jeffrey L., Tim Denham, Francis J. Eblé, and Jeffrey Pantaleo**
1998 *Archaeological Monitoring Report for Phase II Widening of Kalaniana'ole Highway, East Halema'uma'u Rd. to Keahole St., East Honolulu, O'ahu Island*. Garcia and Associates, Honolulu.
- Rockwood, Paul**
1959 - Maps depicting trails in O'ahu ca. 1810. Printed in, *Fragments of Hawaiian History*, by John Papa 'Ī'i, 1959, Bishop Museum Press, Honolulu, pp. 90, 93.
- Sandler, Rob (ed.)**
1990 *Hawaii Guide to Golf*. Pacific Publishing, Hong Kong.
- Scott, Edward B.**
1968 *The Saga of the Sandwich Islands, Volume 1*. 4th Edition, Sierra-Tahoe Publishing Co, Crystal Bay, Lake Tahoe, Nevada.
- Siddall, John William (editor)**
1921 *Men of Hawai'i. Volume II*. Honolulu Star-Bulletin, Ltd., Honolulu.
- Sinoto, Aki**
1973 *Survey of Wailupe Stream Project Area, Oahu. TMK: 3-6*. Department of Anthropology, Bernice P. Bishop Museum, Honolulu.
1975 *Archaeological Reconnaissance of Portions of Kuliouou Valley, Honolulu, Oahu Island, TMK 3-8-10:5,6,7; 3-8-11: por 1*. Department of Anthropology, Bernice P. Bishop Museum, Honolulu.
- Sinoto, Aki, and Paul Titchenal**
2004 *Archaeological Monitoring, Various Improvements at Kawaiku'i Beach Park Aina Haina, Kona, O'ahu*. Bernice P. Bishop Museum, Honolulu.
- Soehren, Lloyd**
1967 *Waialae Shelter Cave 2503*. On file at Department of Land and Natural Resources, State Historic Preservation Division, Kapolei, Hawai'i. [not found]
- Sterling, Elspeth P., and Catherine C. Summers**
1978 *Sites of Oahu*. Bishop Museum Press, Honolulu.
- Stevens-Gleason, Aggy, and Hallett H. Hammatt**
2008 *Cultural Impact Evaluation for the Mike Horack Residential Use, Single Family Dwelling Project, Wailupe Ahupua'a, Honolulu (Kona) District, O'ahu Island TMK: (1) 3-6-004:023*. Cultural Surveys Hawai'i, Inc., Kailua, Hawai'i.
- Stokes, John F. G.**
1937 *Dune Sepulture, Battle Mortality and Kamehameha's Alleged Defeat on Kauai. Extract, 45th Annual Report of the Hawaiian Historical Society*, Honolulu.

Takemoto, A., P. Joerger, M.E. Mitchell, and C.E. Bareng

- 1975 *Historical/Cultural Essay Report on the Kuapa Pond Area*. Joerger-Takemoto Historical Research for United States Army Corps of Engineers.

Thrum, Thomas G.

- 1880 The Hawaiian Flag. *Hawaiian Almanac and Annual for 1880*, pp. 24-26. Thos G. Thrum, Honolulu.
- 1881 Sugar Plantations and Mills. *Hawaiian Almanac and Annual for 1881*, pp. 56-57. Thos G. Thrum, Honolulu.
- 1877 A Trip to the Sandwich Islands, by E. S. Baker [From *The Resources of California* (unknown year), edited by John S. Hittell]. *Hawaiian Almanac and Annual for 1887*, pp. 27-40. Thos G. Thrum, Honolulu.
- 1896 Brief Record of the Rebellion. *Hawaiian Almanac and Annual for 1896*, pp. 56-67. Thos G. Thrum, Honolulu.
- 1907 Heiaus and Heiau Sites Throughout the Hawaiian Islands. Omitting Koas, Or Places of Offering to Kuula, The Deity Of Fisher Folk. *Hawaiian Annual and Almanac for 1907*:36-48. Thos. G. Thrum, Honolulu.
- 1922 Hawaiian Place Names, In *A Dictionary of the Hawaiian Language* (originally published in 1865) by Lorrin Anderews, pp. 625-674. Revised by Henry Parker, 1922. Board of Commissioners of Public Archives of the Territory of Hawai'i, Honolulu.

Titcomb, Margaret

- 1972 *Native Use of Fish in Hawaii*, University of Hawai'i Press, Honolulu.

Tulchin, Todd, and Hallett H. Hammatt

- 2007 *Burial Site Component of an Archaeological Data Recovery Plan for a Project at 4564 Kahala Avenue, Waialae Ahupua'a, Honolulu District, O'ahu Island, TMK: [1] 3-5-004:015*. Cultural Surveys Hawai'i, Inc., Kailua, Hawai'i.

Twain, Mark

- 1966 *Mark Twain's Letters from Hawaii*. Edited by A. Grove Day. Appelpson-Century, New York.

U.S. Army Mapping Service

- 1954 U.S. Army Mapping Service 7.5 minute topographic map, Koko Head Quad. Available at U.S. Geological Survey Maps/ U.S. Department of War Maps. Available at USGS Information Services, Box 25286, Denver, Colorado.

U.S. Department of Agriculture

- 1972 Soil maps from Foote, Donald E., E.L. Hill, S. Nakamura, and F. Stephens, 1972, Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii. U.S. Dept. of Agriculture, U.S. Government Printing Office, Washington, D.C. Available online at <http://www.ctahr.hawaii.edu/soilsurvey/soils.htm>.

U.S. Geological Survey

- 1927 U.S. Geological Survey 7.5 minute topographic map, Koko Head Quad. Available at U.S. Geological Survey Maps/ U.S. Department of War Maps. Available at USGS Information Services, Box 25286, Denver, Colorado.
- 1998 U.S. Geological Survey 7.5 minute topographic map, Honolulu Quad. Available at U.S. Geological Survey Maps/ U.S. Department of War Maps. Available at USGS Information Services, Box 25286, Denver, Colorado.
- 1999 U.S. Geological Survey 7.5 minute topographic map, Koko Head Quad. Available at U.S. Geological Survey Maps/ U.S. Department of War Maps. Available at USGS Information Services, Box 25286, Denver, Colorado.
- 2005 U.S. Geological Service Orthoimagery, Honolulu Quad (Aerial photograph). Available at U.S. Geological Survey Maps/ U.S. Department of War Maps. Available at USGS Information Services, Box 25286, Denver, Colorado.

U.S. War Department

- 1919 U.S. War Department 7.5 minute topographic map, Koko Head Quad. Available at U.S. Geological Survey Maps/ U.S. Department of War Maps. Available at USGS Information Services, Box 25286, Denver, Colorado.
- 1943 U.S. War Department 7.5 minute topographic map, Diamond Head Quad. Available at U.S. Geological Survey Maps/ U.S. Department of War Maps. Available at USGS Information Services, Box 25286, Denver, Colorado.

Wai'alaie Country Club

- 1935 Photograph of the Wai'alaie Country Club. Waianae Country Club Collection. Photograph reprinted in, Thomas Kemper Hitch and Mary Ishii Kuramoto, 1981, *Wai'alaie Country Club. The First Half Century*, p. 45. Waialae Country Club, Honolulu.

Waihona 'Āina

- 2000 The Mahele Database. Electronic document, <http://waihona.com>

Westervelt, W. D.

- 1904 Hawaiian Burial Caves. *Hawaiian Almanac and Annual for 1904*, pp. 145-154. Thos. G. Thrum, Honolulu.

Whitney, S.

- 1827 Tour around the Island [of Kauai in 1826]. *Missionary Herald*, June 1827, p. 184. Boston.

Whitney, Henry M.

- 1890 *The Tourist's Guide through the Hawaiian Islands*. The Hawaiian Gazette Co., Honolulu.

Wright, G.

- 1925 Claimant's Brief, Land Court 578. On file, Hawai'i State Archives, Honolulu.

Appendix C

Biological Resources Assessment Supplemental Information

Appendix C-1

**Personal Communication with
U.S. Fish & Wildlife Service**

Li, Melanie

From: Aaron_Nadig@fws.gov
Sent: Tuesday, October 21, 2008 7:34 AM
To: Li, Melanie
Subject: Requested Maunalua Bay Natural Resources Information
Attachments: Sedimentation Erosion BMPs revised.doc

Melanie,

This responds to your October 15, 2008, e-mail request for Fish and Wildlife Service (Service) to provide information for threatened and endangered species and federally designated critical habitat that may occur within the proposed project area Maunalua Bay, Oahu. These comments are provided in accordance with the Endangered Species Act of 1973 (16 U.S.C. 1531 *et seq.*; 87 Stat. 884), as amended (ESA); and other authorities mandating Federal oversight of environmental resources including the Migratory Bird Treaty Act (16 U.S.C. 703 *et seq.*), as amended (MBTA).

Your office is in the process of developing an environmental assessment with the overall goal to repair and modernize the existing wastewater sewer lines in the Maunalua Bay area. We have reviewed the information you provided and pertinent information in our files, including data compiled by the Hawaii Biodiversity and Mapping Program as it pertains to ESA listed species and designated critical habitat. The federally endangered Hawaiian monk seal (*Monachus schausinlandii*), Hawksbill sea turtle (*Eretmochelys imbricate*), Hawaiian coot (*Fulica alai*), Hawaiian stilt (*Himantopus mexicanus knudseni*), and threatened green sea turtle (*Chelonia mydas*) may use aquatic and coastal areas near the proposed project. The western most boundary of the proposed project is located adjacent to an active Wedge-tailed shearwater (*Puffinus pacificus*) nesting colony, a species protected under MBTA. The eastern boundary is adjacent to the State of Hawaii Paiko Lagoon Sanctuary. No critical habitat occurs within the proposed project area. You may need to contact the National Marine Fisheries Service for additional assistance in measures regarding the Hawaiian monk seal.

Sea turtles come ashore to nest on beaches from May through September, peaking in June and July. Many factors affect the potential survival of these turtles, including the loss or destruction of nesting and basking beaches, predation, and other human activities such as the use of artificial lights. Optimal nesting habitat is a dark beach free of barriers that restrict their movement. We recommend if nighttime operations are required shielding of construction lighting around the proposed project site. This will reduce the direct and ambient lighting of the beach habitats within and adjacent to the area. Effective light shields should be completely opaque, sufficiently large, and positioned so that light from the shielded source does not reach the beach.

I have attached BMPs that we discussed over the phone on October 20, 2008. We appreciate your efforts to conserve public trust resources. If you have questions, please contact me at (808) 792-9466, if I can be of further assistance.

Sincerely,
Aaron

~~~~~  
Aaron Nadig  
Fish and Wildlife Biologist  
Consultation and Technical Assistance Program  
Pacific Islands Fish and Wildlife Office  
300 Ala Moana Boulevard, Room 3-122, Box 50088  
Honolulu, Hawaii 96850  
  
Phone:(808) 792-9466  
Fax:(808) 792-9581  
~~~~~

10/27/2008

Appendix C-2

**Report on Hawaiian Monk Seal
Use of Maunalua Bay**

Hawaiian Monk Seal Use of Maunalua Bay¹

Tracy Wurth

Pacific Islands Fisheries Science Center
National Marine Fisheries Service

This report summarizes all documented sightings of Hawaiian monk seals within Maunalua Bay on the island of Oahu. For the purpose of this report the areas included in Maunalua Bay are Kahala, Wailupe Peninsula, Aina Haina, Niu Peninsula, Paiko Peninsula, Hawaii Kai and Portlock. It is important to note that the majority of Hawaiian monk seal sighting information collected in the main Hawaiian Islands is reported by the general public and is highly biased by location and reporting effort. The only truly systematic monk seal count data available are from aerial surveys conducted by the Pacific Island Fisheries Science Center (PIFSC) in 2000-2001 and 2008.

Aerial surveys of all the main Hawaiian Islands were conducted in 2000-2001 and in 2008 (Baker and Johanos 2004², PIFSC unpublished data). These represent the only systematic complete surveys for monk seals in the main Hawaiian Islands. One complete survey of Oahu was conducted for each of these years. The 2000 survey was conducted from an airplane, and the 2001 and 2008 surveys of Oahu were both conducted by helicopter. No Hawaiian monk seals were sighted within the Maunalua Bay area during any of the three surveys.

Reports by the general public, which are non-systematic and not representative of overall seal use of main Hawaiian Islands shorelines, have been collected in the main Hawaiian Islands since the early 1980s. In total, thirty-one Hawaiian monk seal sightings have been reported in or near Maunalua Bay. For the purposes of this report, a sighting is defined as a calendar day during which an individual seal was documented as present. Sightings were divided into four different areas within Maunalua Bay based on reported location (Table 1). The first documented monk seal sighting in Maunalua Bay was in February of 1991. More sightings in this area have been reported in recent years. Twelve of the thirty-one sightings can be attributed to four individually identified seals. No monk seal births have been documented in the Maunalua Bay area.

¹ PIFSC Internal Report IR-08-019. Issued 15 October 2008.

² Baker, J. D., and T. C. Johanos. 2004. Abundance of the Hawaiian monk seal in the main Hawaiian Islands. *Biological Conservation* 116:103-110.

Table 1. Number of reported Hawaiian monk seal sightings in Maunalua Bay on the island of Oahu (1991-October 15, 2008)

Location	1991	2002	2003	2004	2005	2006	2007	2008	Total
Aina Haina		1		1			1	1	4
Kahala			1					4	5
Maunalua Bay	1					1			2
Portlock			1	1	3	1	5	9	20
Total	1	1	2	2	3	2	6	14	31

Appendix C-3

**Report on Marine Turtle Activity
in Maunalua Bay Area**

Special Report on Marine Turtle Activity in the Maunalua Bay Area, Oahu¹

Stacy Hargrove (stacy.hargrove@noaa.gov)
Marine Turtle Research Program
Pacific Islands Fisheries Science Center

The Marine Turtle Research Program (MTRP) of the Pacific Islands Fisheries Science Center has been collecting data on marine turtle activity (captures, strandings, and nesting) in the Hawaiian Islands since the 1970s. The Hawaiian green turtle population has been steadily increasing since the mid-1980s (Balazs and Chaloupka 2006, Chaloupka and Balazs 2007, Chaloupka et al. 2008). The MTRP has not conducted any ocean capture research in Maunalua Bay; however, due to the calm nature of this bay and its suitable habitat for marine turtles, it is commonly used by MTRP as a release location for rehabilitated turtles being released back to the wild. Local dive operators work at several sites in the bay and report that sightings of green turtles are common. One such site is named "Turtle Canyon" because green turtles can reliably be seen there. Strandings of 173 green turtles have been documented by the MTRP in the Maunalua Bay area since 1982, indicating that the habitat is used as a foraging and resting area by green turtles (Figures 1 and 2). Strandings have been recorded during all months of the year with fewer being reported in the fall and winter months than in the spring and summer months (Figure 3). No hawksbills or other marine turtle species have been reported stranded in this area. Basking by green turtles has not been documented in the Maunalua Bay area and any turtle seen on the beach or shore should be considered stranded and reported to the MTRP at 983-5730. Limited nesting by green and hawksbill turtles has been documented in the main Hawaiian Islands during the summer months; however no nesting has been documented in the Maunalua Bay area.

References:

- Balazs G.H. and M. Chaloupka. 2006. Recovery trend over 32 years at the Hawaiian green sea turtle rookery of French Frigate Shoals. *Atoll Res. Bull.* 543: 147-158
- Chaloupka M. and G. Balazs. 2007. Using Bayesian state-space modeling to assess the recovery and harvest potential of the Hawaiian green sea turtle stock. *Ecol. Model.* 205(1-2): 93-109
- Chaloupka M., K.A. Bjorndal, G.H. Balazs, A.B. Bolten, L.M. Ehrhart, C.J. Limpus, H. Suganuma, S. Troeng, M. Yamaguchi. 2008. Encouraging outlook for recovery of a once severely exploited marine megaherbivore. *Global Ecol. Biogeogr.* 17(2): 297-304

¹ PIFSC Internal Report IR-08-020
Issued 22 October 2008

Figure 1. Green turtle strandings by year in the Maunalua Bay area (1982-2008).

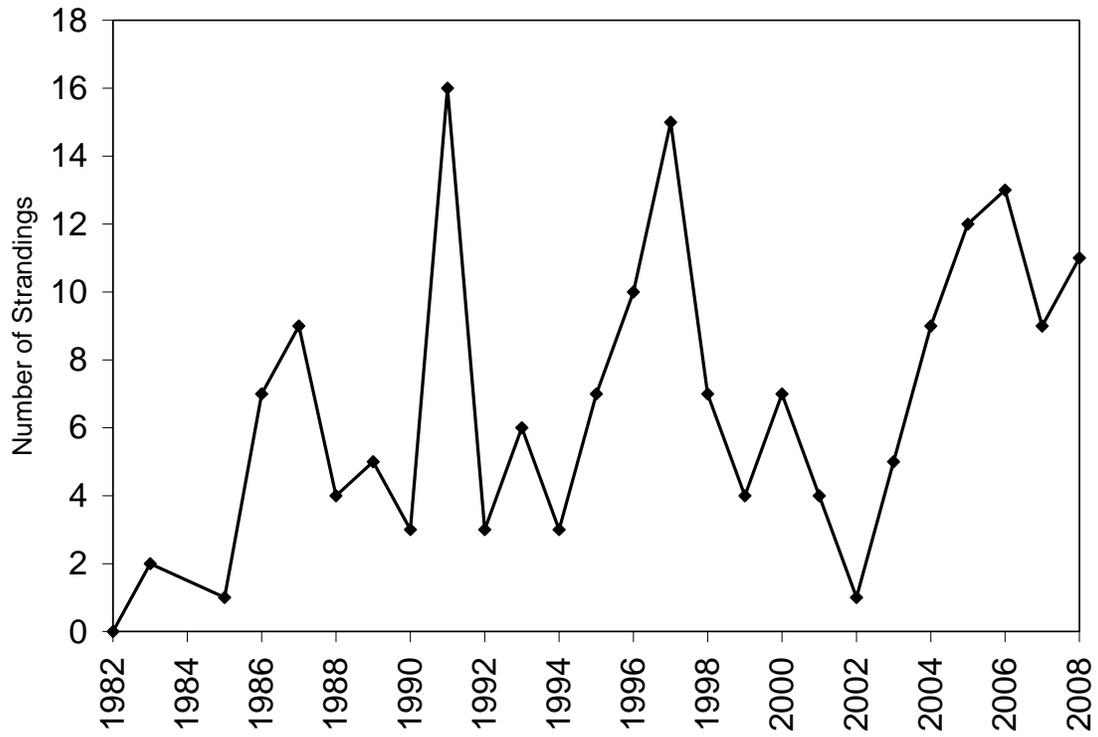
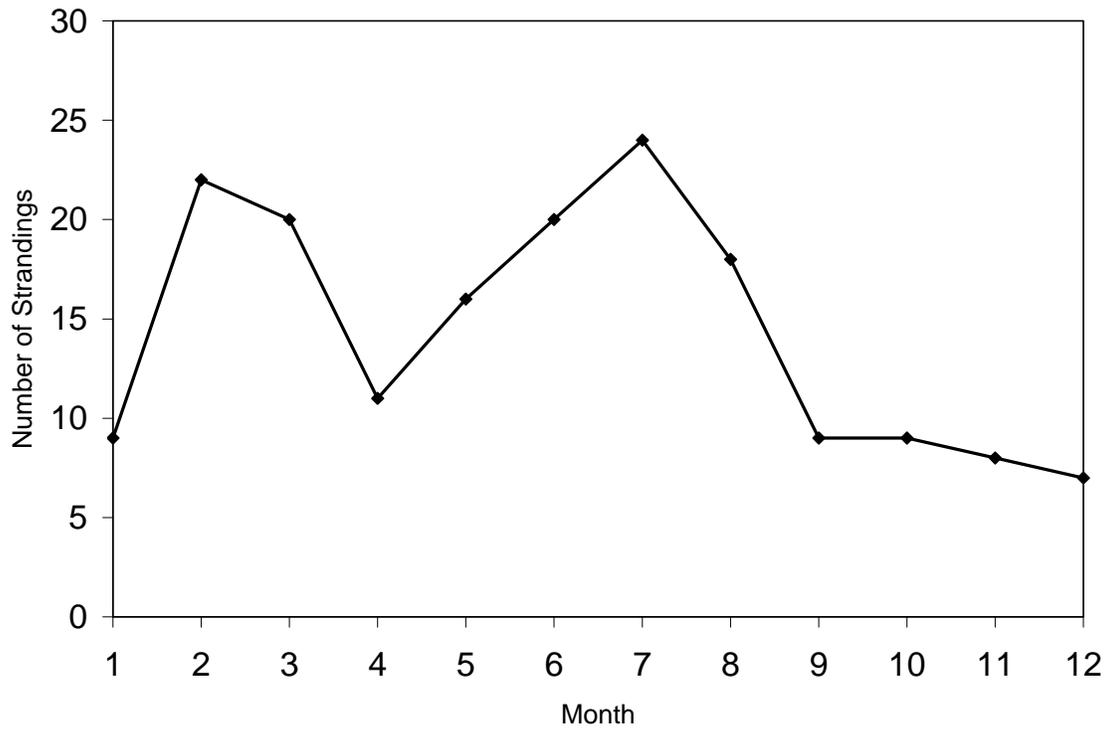


Figure 3. Green turtle strandings by month in the Maunalua Bay area (1982-2008).



Appendix C-4

Fish Survey for Maunalua Bay

Li, Melanie

From: Brett.D.Schumacher@hawaii.gov
Sent: Wednesday, October 01, 2008 10:37 AM
To: Li, Melanie
Subject: RE: Maunalua Bay Wildlife Information
Attachments: Maunalua sp list.xls

Hi Melanie,

Attached is an excel spreadsheet with a list of species that we have seen on surveys in Maunalua Bay. This shouldn't be thought of as an exhaustive list of all species that occur in the bay, just the ones that have been sighted while we were doing surveys. For example, there are honu in the bay but they haven't showed up on our surveys. Also, these survey sites are in about 40ft of water, so species that are more common in deep water may not show up during these surveys. Please let me know if you have any questions.

Aloha,
Brett

Brett Schumacher
Division of Aquatic Resources
Department of Land and Natural Resources
1151 Punchbowl St. Room 330
Honolulu, HI 96813
(808) 587-0113
(808) 587-0115 fax

Survey locations	Latitude	Longitude
Site A	N21.26997	W157.74410
Site B	N21.27287	W157.73405

Family	Species	Common name(s)
Acanthuridae (Surgeonfish)		
	<i>Acanthurus achilles</i>	paku'iku'u/Achilles tang
	<i>Acanthurus blochii</i>	pualu/ringtail surgeonfish
	<i>Acanthurus dussumieri</i>	palani/eyestripe surgeonfish
	<i>Acanthurus leucopareius</i>	maikoiko/whitebar surgeonfish
	<i>Acanthurus nigrofuscus</i>	ma'i'i'i/brown surgeonfish
	<i>Acanthurus olivaceus</i>	na'ena'e/orangeband surgeonfish
	<i>Acanthurus triostegus</i>	manini/convict tang
	<i>Acanthurus xanthopterus</i>	pualu/yellowfin surgeonfish
	<i>Ctenochaetus strigosus</i>	kole/goldring surgeonfish
	<i>Naso brevirostris</i>	kala lolo/paletail unicornfish
	<i>Naso hexacanthus</i>	kala lolo/'opelu kala/sleek unicornfish
	<i>Naso lituratus</i>	umaumalei/orangespine unicornfish
	<i>Naso unicornis</i>	kala/bluespine unicornfish
	<i>Zebrasoma flavescens</i>	lau'ipala/yellow tang
Aulostomidae (Trumpetfish)		
	<i>Aulostomus chinensis</i>	nunu/trumpetfish
Balistidae (Triggerfish)		
	<i>Melichthys niger</i>	humuhumu'ele'ele/black durgon
	<i>Melichthys vidua</i>	humuhumu hi'ukole/pinktail durgon
	<i>Rhinecanthus rectangulus</i>	humuhumu nukunuku apua'a/reef triggerfish
	<i>Sufflamen bursa</i>	humuhumu lei/lei triggerfish
	<i>Sufflamen fraenatus</i>	humuhumu mimi/bridled triggerfish
Blenniidae (Blennies)		
	<i>Exallias brevis</i>	pao'o kau'ila/shortbodied blenny
Chaetodontidae (Butterflyfish)		
	<i>Chaetodon auriga</i>	kikakapu/threadfin butterflyfish
	<i>Chaetodon ephippium</i>	kikakapu/saddleback butterflyfish
	<i>Chaetodon lunula</i>	kikakapu/raccoon butterflyfish
	<i>Chaetodon miliaris</i>	lau wiliwili/milletseedbutterflyfish
	<i>Chaetodon multicinctus</i>	kikakapu/multiband butterflyfish
	<i>Chaetodon quadrimaculatus</i>	lauhau/fourspot butterflyfish
	<i>Forcipiger flavissimus</i>	lau wiliwili nukunuku 'oi'oi/forcepsfish
	<i>Forcipiger longirostris</i>	lau wiliwili nukunuku 'oi'oi/longnose butterflyfish
Cirrhitidae (Hawkfish)		
	<i>Cirrhitops fasciatus</i>	piliko'a/redbarred hawkfish
	<i>Cirrhitus pinnulatus</i>	po'opa'a/stocky hawkfish
	<i>Paracirrhites arcatus</i>	piliko'a/arc-eye hawkfish
	<i>Paracirrhites forsteri</i>	hilu piliko'a/blackside hawkfish
Fistulariidae (Cornetfish)		
	<i>Fistularia commersonii</i>	nunu peke/cornetfish
Holocentridae (Soldierfish and Squirrelfish)		

<i>Myripristis berndti</i>	'u'u/menpachi/bigscale soldierfish
<i>Myripristis kuntee</i>	u'u/menpachi/epaulette soldierfish
<i>Sargocentron diadema</i>	ala'ihī/crown squirrelfish

Labridae (Wrasses)

<i>Anampses cuvier</i>	opule/pearl wrasse
<i>Bodianus alboteniatus</i>	a'awa/hawaiian hogfish
<i>Cheilio inermis</i>	kupoupou/cigar wrasse
<i>Coris gaimard</i>	hinalea 'akilolo/yellowtail coris
<i>Gomphosus varius</i>	hinalea 'i'iwi/bird wrasse
<i>Halichoeres ornatissimus</i>	ohua/ornate wrasse
<i>Labroides phthirophagus</i>	hawaiian cleaner wrasse
<i>Macropharyngodon geoffroy</i>	shortnose wrasse
<i>Novaculichthys taeniourus</i>	rockmover wrasse
<i>Oxycheilinus bimaculatus</i>	twospot wrasse
<i>Pseudocheilinus octotaenia</i>	eightstripe wrasse
<i>Pseudocheilinus tetrataenia</i>	fourstripe wrasse
<i>Stethojulis balteata</i>	omaka/belted wrasse
<i>Thalassoma ballieui</i>	hinalea lauhine/blacktail wrasse
<i>Thalassoma duperrey</i>	hinalea lauwiili/saddle wrasse

Lethrinidae (Emperors)

<i>Monotaxis grandoculis</i>	mu/bigeye emperor
------------------------------	-------------------

Lutjanidae (Snappers)

<i>Lutjanus fulvus</i>	to'au/blacktail snapper
<i>Lutjanus kasmira</i>	ta'ape/bluestripe snapper

Monacanthidae (Filefishes)

<i>Cantherhines dumerilii</i>	o'ili/barred filefish
<i>Cantherhines sandwichiensis</i>	o'ili lepa/squaretail filefish
<i>Pervagor aspricaudus</i>	o'ili/yellowtail filefish

Mullidae (Goatfishes)

<i>Mulloidichthys flavolineatus</i>	weke 'a
<i>Mulloidichthys vanicolensis</i>	weke 'ula
<i>Parupeneus cyclostomus</i>	moano kali/moano kea/blue goatfish
<i>Parupeneus insularis</i>	munu/doublebar goatfish
<i>Parupeneus multifasciatus</i>	moano/multibar goatfish
<i>Parupeneus pleurostigma</i>	malu/sidespot goatfish

Muraenidae (Moray eels)

<i>Gymnothorax meleagris</i>	puhi 'oni'o/whitemouth moray
<i>Gymnothorax flavimarginatus</i>	puhi paka/yellowmargin moray

Pomacanthidae (Angelfish)

<i>Centropyge potteri</i>	Potter's angelfish
---------------------------	--------------------

Pomacentridae (Damselfish)

<i>Abudefduf abdominalis</i>	mamo/Hawaiian sergeant
<i>Abudefduf vaigiensis</i>	mamo/Indopacific sergeant
<i>Chromis agilis</i>	Agile chromis
<i>Chromis hanui</i>	Chocolate-dip chromis
<i>Chromis ovalis</i>	Oval chromis
<i>Chromis vanderbilti</i>	Blackfin chromis

Dascyllus albisella alo'ilo'i/Domino damselfish
Plectroglyphidodon johnstoni Blue-eye damselfish
Stegastes marginatus Pacific gregory

Scaridae (Parrotfish)

Calotomus carolinus ponuhunuhu/stareye parrotfish
Chlorurus perspicillatus uhu uliuli, uhu ahū'ula/spectacled parrotfish
Chlorurus spilurus uhu/bullethead parrotfish
Scarus psittacus uhu/palenose parrotfish
Scarus rubroviolaceus palukaluka/redlip parrotfish

Serranidae (Groupers)

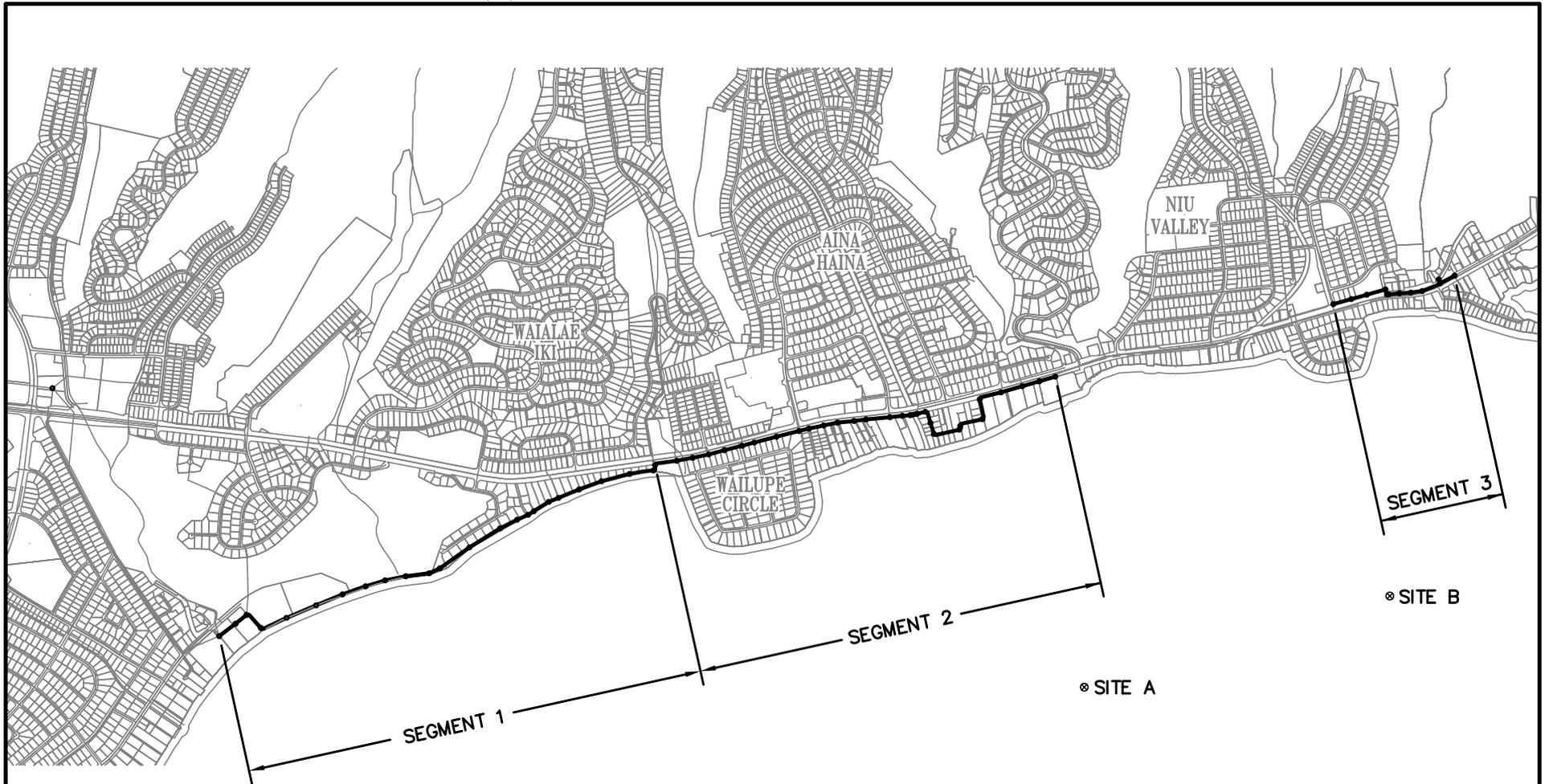
Cephalopholis argus roi/peacock parrotfish

Tetraodontidae

Arothron meleagris o'opu hue/spotted puffer
Canthigaster jactator Hawaiian whitespotted toby

Zanclidae (Moorish Idol)

Zanclus cornutus kihikihi/moorish idol



LEGEND

- ⊗ APPROXIMATE SURVEY LOCATION
- SEWER LINE IN PROJECT



GRAPHIC SCALE:



SCALE: 1" = 2000'

Appendix D

Traffic Assessment Study



KENNETH K. KUROKAWA, P.E.
TERRANCE S. ARASHIRO, P.E.
DONOHUE M. FUJII, P.E.
STANLEY T. WATANABE
IVAN K. NAKATSUKA, P.E.

#09-018

April 1, 2009

Mr. Roy K. Abe
HDR/Hawaii Pacific Engineers, Inc.
1132 Bishop Street, Suite 1003
Honolulu, Hawaii 96813

Dear Mr. Abe:

**Subject: Traffic Assessment for
Kalaniana'ole Highway Sewer Improvements
Job No. W3-08,**

Project Description

As requested, Austin, Tsutsumi & Associates, Inc. (ATA) has conducted a traffic assessment to identify overnight lane closure periods on Kalaniana'ole Highway for the subject Project. The Project will involve sewer rehabilitation that will require the closure of one (1) traffic lane in the Eastbound and Westbound direction on weekdays and weekends. Construction of the Project is anticipated to occur in late 2009 as the Project will likely be bid in the second quarter of 2009.

Eastbound single lane closures are planned from the Wailupe Beach Park area (Kalaniana'ole Highway Station 80+13) to the Kawaikui Beach Park area (Kalaniana'ole Highway Station 139+14) for the shoulder lane. Westbound single lane closures are planned from Halemaumau Street intersection (Kalaniana'ole Highway Station 176+65) to Paiko Drive intersection (Kalaniana'ole Highway Station 190+75) for the shoulder, middle or median lanes. Figure 1 shows the Project location with the lane closure location in the Eastbound and Westbound directions. Hereinafter, Project shall refer to the sections mentioned above; the section between Wailupe Beach Park and Kawaikui Beach Park and the section between Halemaumau Street and Paiko Drive.

Study Scope

The primary focus of the study will analyze weekend traffic volume data as it is recognized that overnight closures on weekdays will be limited due to the implementation of the Westbound contra flow lane during the AM peak period beginning at 5:30 AM. Therefore, weekday morning volumes will not be analyzed as the contra flow lane operation will dictate when the lane needs to be re-opened in the morning. However, weekday evening volumes will be analyzed to determine if closures can begin earlier.



Mr. Roy K. Abe
HDR/Hawaii Pacific Engineers Inc.

April 1, 2009

- The weekday traffic pattern on Kalanianaʻole Highway generally consists of a commuter peak in the Westbound direction in the morning with the AM peak hour of traffic occurring from 6:30 AM to 7:30 AM and in the Eastbound direction in the afternoon with the PM Peak hour of traffic occurring from 5:30 PM to 6:30 PM. Currently, the two (2) Eastbound lanes generally operate with reduced capacity during the morning contra flow period without problems.
- The weekend traffic pattern displays a single peak in each direction, generally around mid-day. The traffic count data indicates that Saturday Eastbound traffic generally peaks from 1:45 PM to 2:45 PM and Westbound traffic peaks earlier from 9:15 AM to 10:15 AM. The traffic count data indicates that Sunday Eastbound traffic generally peaks from 1:45 PM to 2:45 PM and Westbound traffic from 12:30 PM to 1:30 PM.
- A study of historic traffic count data indicates that no significant traffic growth occurred between 2006 and 2007 and in some cases indicates decrease of traffic (24-hour traffic count for the 2008 was not available at the time of this writing). Therefore, it is likely that traffic volumes will remain constant within the near future or the timeframe of the Project construction. Table 1 compares the traffic volumes according to 24-hour volume data collected at Count Station 045 located along Kalanianaʻole Highway in the vicinity of Ainakoa Avenue for years 2006 and 2007. Annual Average Daily Traffic (AADT) volume data is only published for years 2006 and 2007 at Count Station 045.
- The Project area is located approximately 1.2 to 3.2 miles east of Count Station 045; therefore traffic volumes were compared at other existing count stations to determine the relative magnitude of traffic within the Project area. A comparison of 2007 volumes for HDOT Count Stations B72007201682 (referred to as “B1”) located between Kalaniiki Street and Ainakoa Avenue and B72007201549 (referred to as “B2”) located between Kirkwood Street and East Hind Drive, respectively, shows a relative decrease in traffic volumes approaching Hawaii Kai in the Eastbound and Westbound directions and is shown in Table 2. Traffic Count Station 045 is essentially in the same location as Count Station B1.
- The AADT volumes at Count Station 045 indicate that the month of April generally exhibited relatively higher traffic volumes as compared to other months as shown in Table 1 and Table 3.



Mr. Roy K. Abe
 HDR/Hawaii Pacific Engineers Inc.

April 1, 2009

Table 1: Traffic Growth on Kalaniana'ole Highway

Year	Monthly Average		% Increase
	2007	2006	
January	84,498	85,315	-1%
February	85,218	85,560	0%
March	83,574	81,749	2%
April	85,559	85,741	0%
May	85,298	85,643	0%
June	84,986	85,589	-1%
July	84,959	86,262	-2%
August	78,632	87,469	-10%
September	69,056	85,086	-19%
October	71,765	83,197	-14%
November	69,989	84,391	-17%
December	67,265	86,542	-22%

Table 2: 24-hour Traffic Volume Comparison

<u>Eastbound Traffic</u>		
Station	B1	B2
EB Volume	39,549	32,470
Difference	--	-18%
<u>Westbound Traffic</u>		
Station	B1	B2
WB Volume	36,374	30,068
Difference	--	-21%



Mr. Roy K. Abe
HDR/Hawaii Pacific Engineers Inc.

April 1, 2009

Table 3: 2007 Daily Traffic Volumes

Month	Weekday Average	Monthly Average
January	86,744	84,498
February	87,555	85,218
March	85,642	83,574
<u>April</u>	<u>87,747</u>	<u>85,559</u>
May	87,424	85,298
June	87,159	84,986
July	87,354	84,959
August	80,006	78,632
September	70,709	69,056
October	73,203	71,765
November	71,242	69,989
December	69,177	67,265

Methodology

Traffic count data for Count Station 045 on Kalaniana'ole Highway was requested and obtained from HDOT for the month of April 2007; 2008 data was also requested but was not available. Traffic count data included Eastbound and Westbound volumes per lane for 24-hour periods compiled in 15-minute increments. The month of April was selected for analysis as it exhibited relatively higher traffic volumes as compared to other months as described in the previous section.

The traffic count data was analyzed to determine potential overnight lane closure periods for the Eastbound and Westbound directions. Since the Eastbound operating conditions are generally favorable during the contra flow operations, the data during that period was utilized to determine an allowable flow rate allowed that can be supported by two-lanes (each lane on the highway is counted separately including the contra flow lane).

The highest 15-minute volume recorded during the morning contra flow period, 5:30 AM to 8:30 AM, was selected from each weekday (Monday thru Friday not including holidays) to determine a maximum two-lane flow rate for the analysis. These values



Mr. Roy K. Abe
HDR/Hawaii Pacific Engineers Inc.

April 1, 2009

were then averaged yielding a two-lane flow rate of 590 vehicles per 15-minute period in the Eastbound direction. In order to maintain a buffer between the highest 15-minute volume and the actual demand, this average value was reduced by 10 percent to account for variability in arrival rate, resulting in a two-lane flow rate of 530 vehicles per 15-minute period. Figure 2 graphs the peak volume of each weekday, the average value and the allowable flow rate.

Count Station B2 is located in the vicinity of the Project; therefore, the reduction of 10 percent coupled with the higher volumes obtained from Count Station 045 used in the analysis yield a conservative allowable two-lane flow rate estimate as the traffic volume in the vicinity of the Project is approximately 20 percent lower than the traffic volumes utilized for this analysis as described in the previous section.

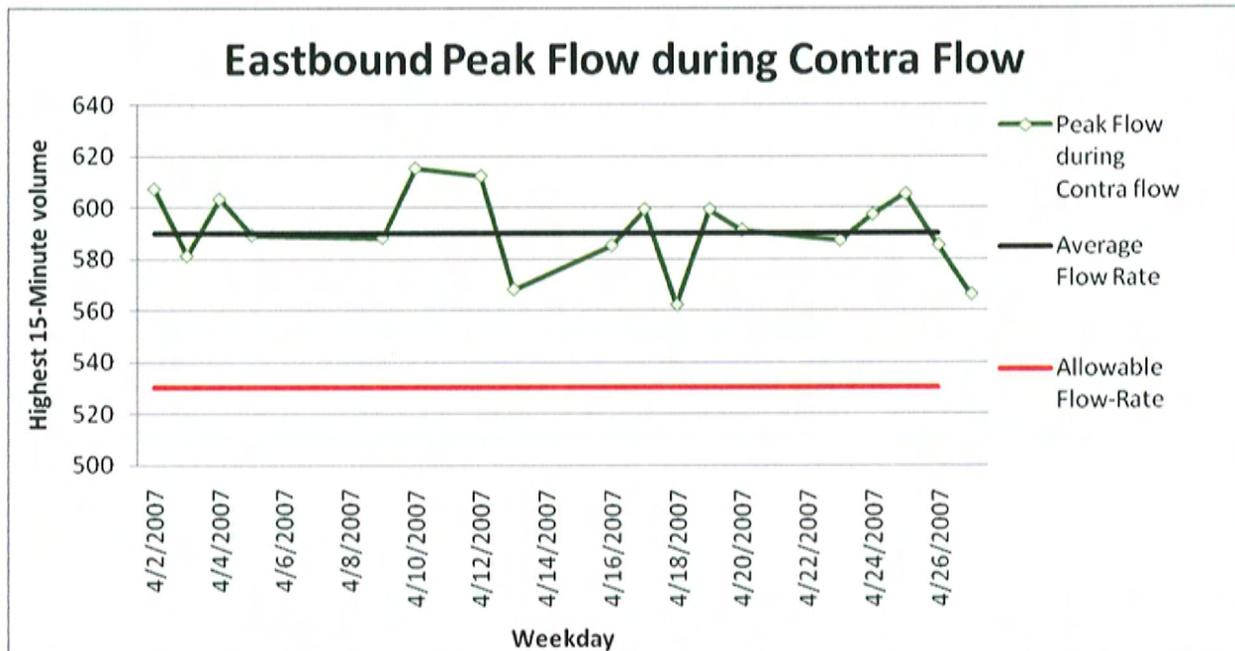


Figure 2: Weekday Contra Flow 15-min Peak Volumes Over Two-Lanes

Volume Analysis

The allowable two-lane flow rate of 530 vehicles per 15-minute period was used to identify overnight lane closure periods. As mentioned earlier, due to the contra flow operation in the morning, full operation of the Eastbound lanes must resume 30 minutes prior to the start of the contra flow per HDOT request, thus, this period was not analyzed by the study. The traffic data for the month of April 2007 was analyzed separately for the Eastbound and Westbound directions. The 15-minute volume increments of each



Mr. Roy K. Abe
HDR/Hawaii Pacific Engineers Inc.

April 1, 2009

day were also analyzed and compared to the allowable two-lane flow rate to determine the most reasonable time when overnight lane closures can occur.

Weekday Evening Period

- The Eastbound and Westbound volumes on Thursday and Friday evenings maintain higher demand for a prolonged period compared to the other weekday evenings. The Eastbound traffic volume for the other weekday evenings decrease to the allowable two-lane flow rate around 8:00 PM while Thursday and Friday evening volumes decrease to the allowable two-lane flow rate volume around 9:30 PM.
- The evening Westbound traffic is a relatively variable volume without a distinct decline, unlike the Eastbound direction which exhibits a distinct reduction in traffic demand; however, overall the magnitude of the volumes are lower and the traffic volumes decrease to the allowable two-lane flow rate around 5:00 PM on Monday and Tuesday, 6:30 PM on Wednesday and Thursday and 7:00 PM on Friday evenings.

Weekends

- On Saturday mornings, Eastbound traffic volumes approach the allowable two-lane flow rate around 8:30 AM in the Eastbound direction and 7:15 AM in the Westbound direction.
- On Saturday evenings, Eastbound traffic volumes decrease to the allowable two-lane flow rate around 7:30 PM in the Eastbound direction and 7:00 PM in the Westbound direction.
- On Sundays, traffic volumes are generally lower overall. On Sunday mornings, Eastbound traffic volumes approach the allowable two-lane flow rate around 9:45 AM in the Eastbound direction and 8:30 AM in the Westbound direction.
- On Sunday evenings, Eastbound traffic volumes decrease to the allowable two-lane flow rate around 6:30 PM in the Eastbound direction and 6:15 PM in the Westbound direction.

Figures 3 and 4 show the Eastbound and Westbound evening traffic volumes on weekdays and weekends compared to the allowable two-lane flow rate. Figure 5 shows the Eastbound and Westbound weekend volume during the morning period compared to the allowable two-lane flow rate.

Mr. Roy K. Abe
 HDR/Hawaii Pacific Engineers Inc.

April 1, 2009

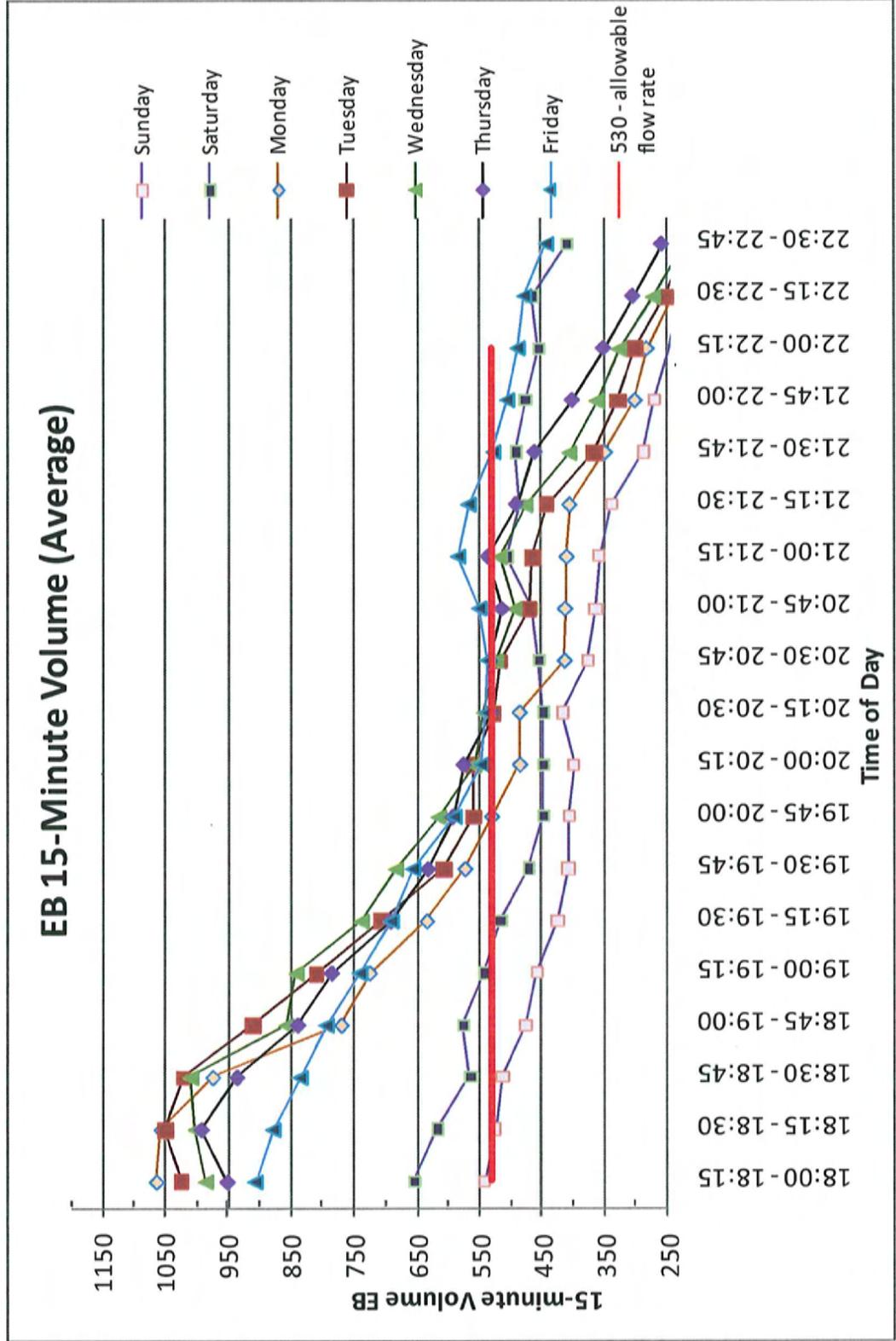


Figure 3: Eastbound Evening Weekday and Weekend Average 15-min Volumes

Mr. Roy K. Abe
HDR/Hawaii Pacific Engineers Inc.

April 1, 2009

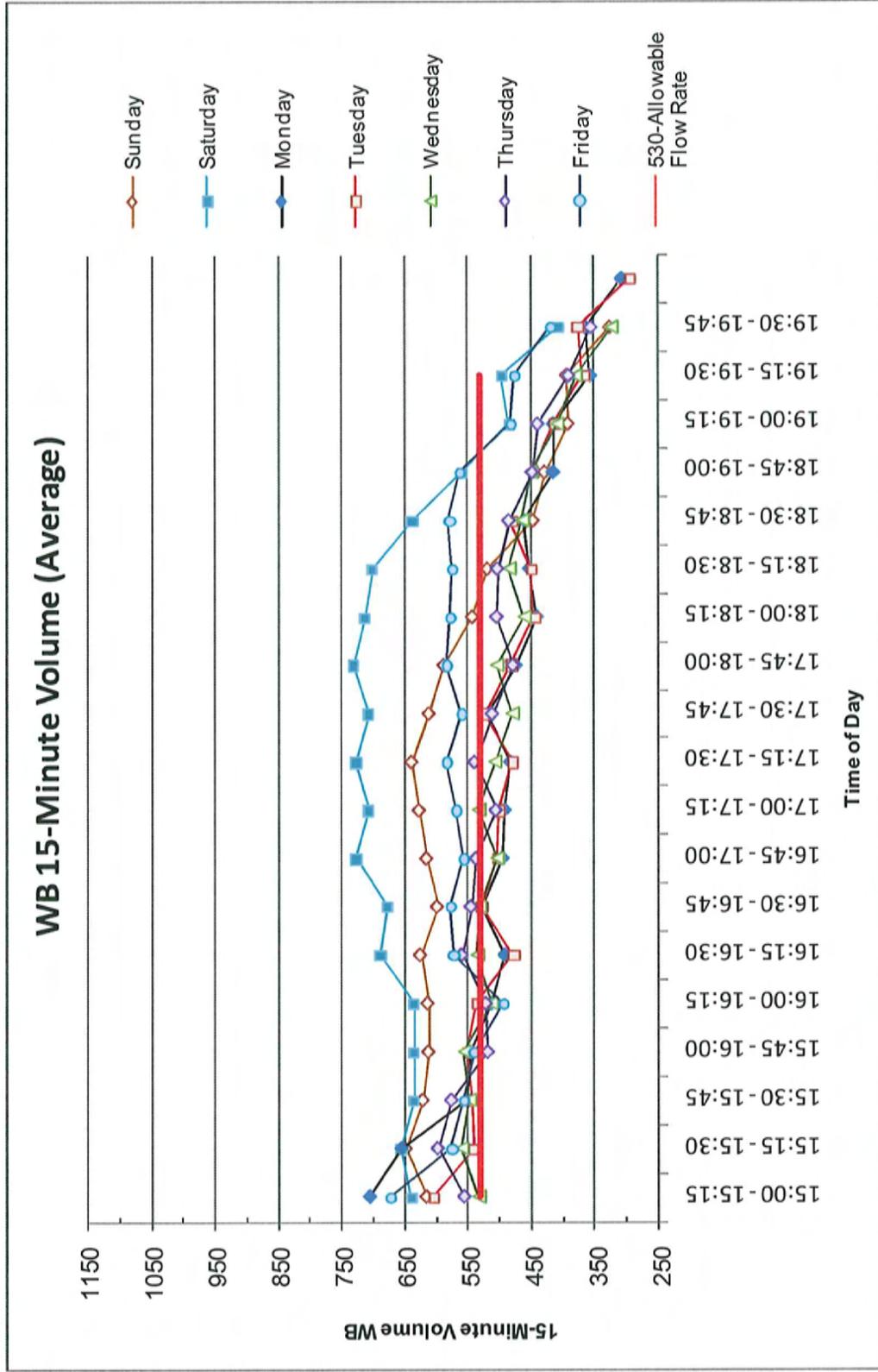


Figure 4: Westbound Evening Weekday and Weekend Average 15-min Volumes

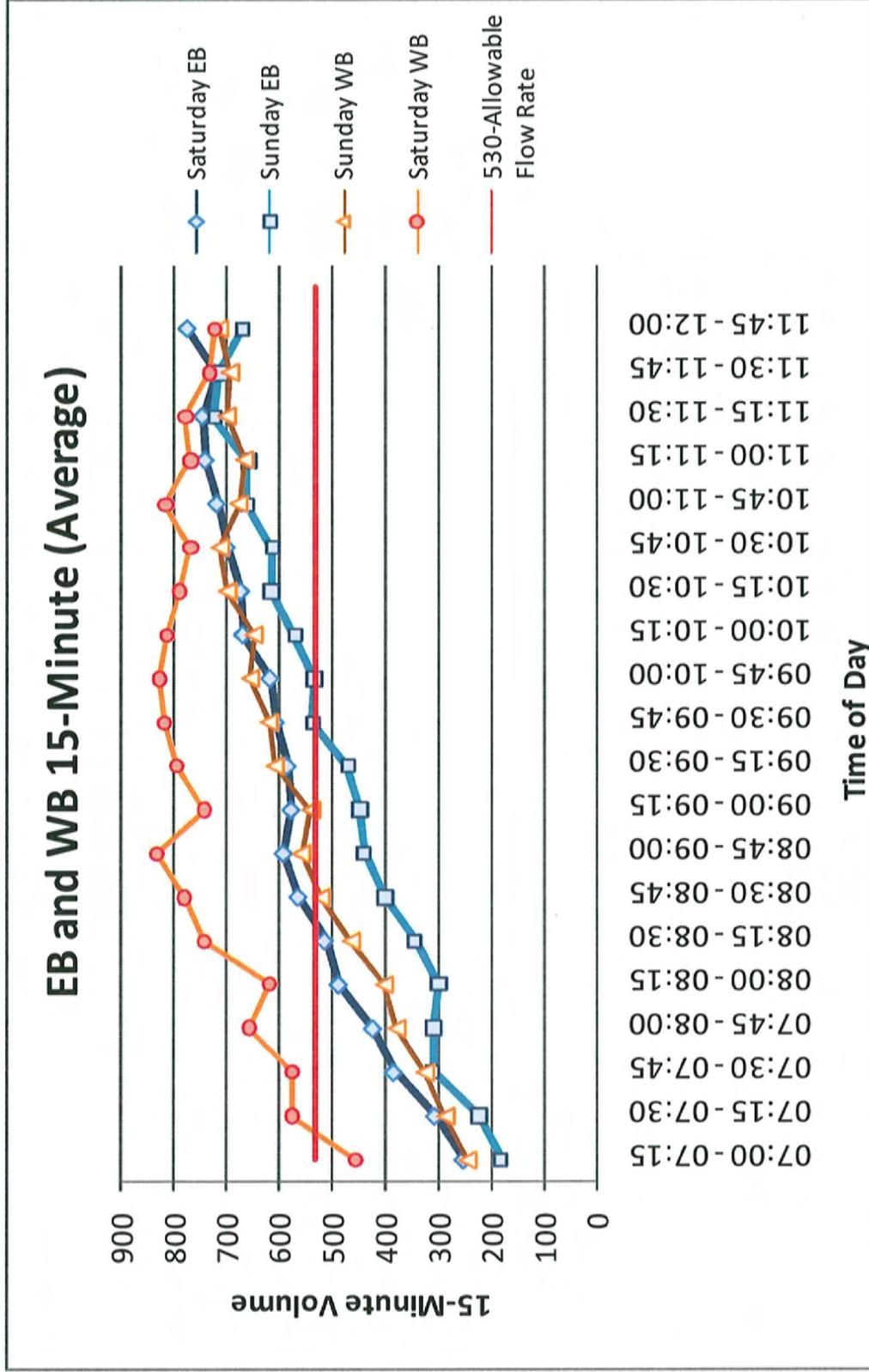


Figure 5: Weekend Morning Eastbound and Westbound Traffic Volumes



Mr. Roy K. Abe
HDR/Hawaii Pacific Engineers Inc.

April 1, 2009

Findings and Conclusions

An allowable two-lane flow rate of 530 vehicles per 15-minute period was used to determine allowable lane closure times for the Eastbound and Westbound directions which provides a conservative methodology as analysis of existing April 2007 traffic count data on Kalaniana'ole Highway reveals the following.

- April 2007 had the highest recorded AADT volumes in 2007 and traffic counts from April were used by the study.
- Traffic volumes on Kalaniana'ole Highway have remained relatively constant from 2006 through 2007 and are not anticipated to change in the near term.
- The actual magnitude of the traffic volumes in the Project area are approximately 20 percent lower than the traffic volume data used for the analysis (Count Station 045) as traffic disperses as it travels East on Kalaniana'ole Highway and builds as it travels West.
- The analysis of the 24-hour count data, determined that two-lanes accommodate a demand of 590 vehicles per 15-minute period which is based on actual flow during the contra flow operation with a reduction from three (3) to two (2) Eastbound traffic lanes.

Tables 4 and 5 show the proposed overnight lane closure schedule for the Eastbound and Westbound directions, respectively. The periods shown in the tables were determined by a detailed analysis of the incremental 15-minute volumes for individual days while the graphs in Figures 3 and 4 show an average value for each day and may not correlate exactly to the times shown in the tables. The times in the tables were also rounded down to the nearest half hour period and adjusted to be more conservative such as limiting the Eastbound closure on Sunday mornings to 9:00 AM instead of 9:45 AM (as noted in the previous section) to account for potential peak demands due to Sunday services or activities. The weekday morning end time was determined by providing a 30-minute buffer period prior to the start of contra flow operation as requested by HDOT.



Mr. Roy K. Abe
 HDR/Hawaii Pacific Engineers Inc.

April 1, 2009

Table 4: Eastbound Lane Closure Schedule

Overnight Period	Start	End	Duration (hr.)
Sunday-Monday	6:30 PM	5:00 AM*	10.5
Monday –Tuesday	8:00 PM	5:00 AM*	9.0
Tuesday -Wednesday	8:00 PM	5:00 AM*	9.0
Wednesday- Thursday	8:00 PM	5:00 AM*	9.0
Thursday - Friday	9:30 PM	5:00 AM*	7.5
Friday-Saturday	9:30 PM	8:30 AM	11.0
Saturday-Sunday	7:30 PM	9:00 AM	13.5

* = Time constrained by contra flow operation starting at 5:30 AM

Table 5: Westbound Lane Closure Schedule

Overnight Period	Start	End	Duration (hr.)
Sunday-Monday	6:30 PM	5:00 AM*	10.5
Monday –Tuesday	5:00 PM	5:00 AM*	12.0
Tuesday -Wednesday	5:00 PM	5:00 AM*	12.0
Wednesday- Thursday	6:30 PM	5:00 AM*	10.5
Thursday - Friday	6:30 PM	5:00 AM*	10.5
Friday-Saturday	7:00 PM	7:00 AM	12.0
Saturday-Sunday	7:00 PM	8:30 AM	12.5

* = Time constrained by contra flow operation starting at 5:30 AM

Recommendations

The schedules provided in Table 4 and Table 5 are meant for recurring travel patterns as it is recognized that fluctuations in traffic pattern will occur due to various non-recurring causes. The schedules in Tables 4 and 5 are provided as guidelines to identify overnight periods when traffic volumes are considered favorable to operate with only two (2) travel lanes on Kalanianaʻole Highway. Additional recommendations regarding the implementation of construction lane closures are shown below.

- Coordinate with contra flow operator as Eastbound Project lane closures and contra flow operation should not occur simultaneously. HDOT has requested a 30-minute buffer period between the two operations.



Mr. Roy K. Abe
HDR/Hawaii Pacific Engineers Inc.

April 1, 2009

- Notify the public in advance on the lane closure dates and times using message boards, advertisements and other means. Special events such as the Marathon or the Century Ride have been held successfully while implementing closures of more lanes or closures for longer periods, the success of which is due to notification of the public, who alter their driving patterns on those days based on advance information.
- Modify the schedule should congestion occur at the beginning or at the end of the time period.
- Prohibit lane closures on days of special events such as a marathon, bicycling or other events requiring roadway utilization.
- Include provisions for turn lanes for at least one vehicle at intersections with existing turn lanes when lane closures cross intersections on Kalaniana'ole Highway.
- Maintain access to driveways along Kalaniana'ole Highway or coordinate access with owners.
- Consider not implementing Eastbound and Westbound closures on the same days. Although the work areas are far enough away from each other to not create negative interactions between the two sites, the overall impact of simultaneous closures on public perception should be weighed and considered.

If you have any questions or require additional information regarding the subject Project, please contact me at 628-3681.

Sincerely,

AUSTIN, TSUTSUMI & ASSOCIATES, INC.

By

NEAL H. KASAMOTO, P.E.
Senior Transportation Engineer

NK:mt

Appendix E

Pre-Assessment Consultation Correspondence and Documentation



1132 Bishop Street, Suite 1003
Honolulu, Hawaii 96813-2830
Phone: (808) 524-3771 Fax: (808) 538-0445

SAMPLE LETTER REQUESTING INPUT

DATE: February 2, 2009
TO: Affected Parties (Homeowners, Residents and Businesses)
PROJECT: Kalaniana'ole Highway Sewer System Improvements
SUBJECT: Notice of Informational Meeting, Request for Noise Variance Comments, and Request for Pre-Assessment Comments on Environmental Assessment

On behalf of the City and County of Honolulu's Department of Design and Construction, the City's engineering consultant, HDR|Hawaii Pacific Engineers, would like to inform you of the upcoming Kalaniana'ole Highway Sewer System Improvements project. The project involves cleaning and rehabilitating existing sewer lines located along Kalaniana'ole Highway (from Niu Valley to Wailupe Beach Park) and along the Kahala Beach coastline.

Attached is a project Fact Sheet that describe the project and anticipated impacts. The project is required to resolve capacity problems and repair system defects that result in sewage spills. Problems with the sewer lines include partially clogged pipes from accumulated sediments and grease, corrosion of concrete pipe and manhole walls from sewer gases, and excessive groundwater and rainwater entering through cracks and other sewer defects.

The City would like to invite you to attend an informational meeting on the project. The meeting will be held on **February 12, 2009 at 7:00 p.m. at the Aina Haina Elementary School Cafetorium**. At the meeting, we will be discussing the project scope, objectives, tentative schedule, and potential impacts.

As part of the project, we have prepared and submitted a noise variance application to the State Department of Health (DOH) to perform activities at night and on weekends and holidays. In addition, an Environmental Assessment (EA) will be prepared for the project. We are currently soliciting comments on the City's noise variance request as well as pre-assessment consultation comments prior to preparation of the Draft EA (DEA). Comments may be provided to us at the informational meeting or mailed, faxed or emailed by February 26, 2009 to:

Roy Abe
HDR|Hawaii Pacific Engineers
1132 Bishop Street, Suite 1003
Honolulu, HI 96813
Facsimile: (808) 538-0445
Email: roy.abe@hdrinc.com

A representative from the DOH will be at the informational meeting to also receive public input on the noise variance. Pre-assessment comments on the DEA are being solicited to identify any special areas of concern. To address potential cultural impacts, we are especially interested in obtaining any input and information that you may have related to possible impacts on the traditional practices of any ethnic group. We are also interested in hearing about any past

Kalaniana'ole Highway Sewer System Improvements
February 2, 2009
Page 2 of 2

encounters with sea turtles, Hawaiian monk seals and other endangered wildlife on the Kahala shoreline so that this information may be included in the EA document and evaluated by the permitting agencies.

Please feel free to contact us if you would like a copy of the noise variance application or would like to be contacted further as part of the environmental review process. Copies of DEA will be provided to elected officials representing the area, government officials and permitting agencies, affected Neighborhood Boards, and other interested parties. A copy of the DEA, which is targeted to be completed in early April, will be available for review at the Aina Haina Public Library and the State Office of Environmental Quality's website.

If you have any questions or comments please feel free to contact me at 697-6228 or at roy.abe@hdrinc.com. City Department of Design and Construction Wastewater Division's project managers, Mr. Carl Arakaki (Ph. 768-8738 - Planning Branch) and Mr. Clifford Kanda (768-8753 - Design Branch), may also be contacted.

We thank you in advance for your patience and understanding as the City continues its program to rehabilitate its aging sewer system.

Very Truly Yours,

Roy K. Abe, Vice President
HDR|Hawaii Pacific Engineers

**PROJECT FACT SHEET
FOR
KALANIANAOLE HIGHWAY SEWER SYSTEM IMPROVEMENTS**
February 2, 2009

The City and County of Honolulu Department of Design and Construction will be undertaking a sewer renovation project in the East Honolulu area. HDR|Hawaii Pacific Engineers, the City's engineering consultant, has prepared this project fact sheet explaining the project and anticipated impacts. The information is presented in a question and answer format.

1. **Question:** Where is the project located? When will the sewer construction work start and how long will it take?

Answer: The project area and the location of the affected sewer lines are shown on the attached Figures 1 through 4. The project consists of the following three sewer line segments:

- Segment 1 is located along the coastline between Waialae Beach Park and Wailupe Beach Park (see Figure 2).
- Segment 2 is located along Kalanianaole Highway between Wailupe Beach Park and Kawaikui Beach Park (see Figure 3). Just east of Wailupe Stream, the sewer line turns toward the ocean and traverses through a residential area. The sewer returns back to Kalanianaole Highway approximately 700 feet east of Wailupe Stream.
- Segment 3 is located along Kalanianaole Highway between Halemaumau Street and just east of Paiko Drive.

The cleaning and rehabilitation work is expected to begin in September 2009 at the earliest and is anticipated to require approximately nine to twelve months to complete.

2. **Question:** Why is the project necessary?

Answer: The project is required to resolve capacity problems and repair system defects that result in sewage spills. Problems with the sewer lines include partially clogged pipes from accumulated sediments and grease, corrosion of concrete pipe and manhole walls from sewer gases, and excessive groundwater and rainwater entering through cracks and other sewer defects.

3. **Question:** What will the project involve?

Answer: The project will involve cleaning and rehabilitating existing sewer lines and manholes.

Special high-capacity "long-reach" sewer cleaning equipment is required for the large 30- to 36-inch diameter sewer line between the Kahala and Wailupe areas (Segment 1) due to limited access along the beach and resort area. The equipment may be also used to clean the sewer line between Wailupe and Aina Haina (portion of Segment 2). The equipment is designed to flush debris using a high capacity pump toward a downstream sewer manhole. Debris will be pumped from the manhole to an enclosed bin to drain excess liquid and then trucked to the landfill. The equipment is capable to cleaning up to 2,000 feet of pipe from a single location. Approximately 500 feet of sewer line can typically be cleaned per day. The locations of four proposed staging areas for the cleaning equipment are shown on Figure 2.

The remaining sewer lines in the Niu Valley to Aina Haina area (Segment 2 and 3) are expected to be cleaned with conventional "Vactor" trucks due to relatively good access to manholes along the highway and lack of suitable staging areas. The Vactor trucks are self-contained cleaning units with a pipe flushing hose, vacuum hose for debris removal, and truck-mounted sediment collection tank. Due to the limited reach of approximately 500 feet, the Vactor trucks would typically clean one manhole-to-manhole sewer segment at a time. A larger diameter pipe segment could require up to several days to clean.

In addition to cleaning, the Segment 2 and 3 sewer lines will be rehabilitated by a "trenchless" technology involving the use of a "cured-in-place pipe" (CIPP) liner. This rehabilitation method involves inserting a resin soaked fabric tube into an existing pipe and then circulating hot water or steam in the line to cure (harden) the liner. This process essentially forms a new smooth seamless pipe within the existing pipe. The lining work for a typical 700 foot long segment can generally be completed within a week. Temporary pumps and piping are required to bypass the wastewater flow around the work area. The use of CIPP trenchless pipe rehabilitation technology eliminates the need for highly disruptive and time-consuming open-trench pipe replacement work.

Rehabilitation work on selected manholes will include replacing corroded and/or undersized manhole covers and rehabilitating corroded interior manhole walls with an epoxy coating. The rehabilitation of manholes with epoxy coating will be generally limited to manholes along Segment 2 as other manholes have either been previously rehabilitated or are in relatively good condition.

4. **Question:** Will there be significant traffic impacts? What will be done to reduce traffic impacts? Will bicycle lanes and sidewalks be affected?

Answer: There will be some unavoidable traffic impacts associated with the project. The sewer cleaning, CIPP lining and manhole rehabilitation work will require temporary lane closures. Work conducted for Segment 2 will affect the east bound lanes while work for Segment 3 will impact the west bound lanes. Lane closures on Kalanianaole Highway will be only allowed between the non-peak hours of 9:00 a.m. 3:00 p.m. and 8:30 p.m. through 5:00 a.m., Monday through Friday, to minimize congestion. In most cases, only one lane will be closed.

Some work may require bicycle lanes and sidewalks to be temporarily closed and the use of longer alternate paths. In some cases, police officers may be provided to escort bicyclists and pedestrians through the work area.

5. Question: Will there be noise impacts?

Answer: Noise will be generated from the construction activities and equipment. Significant sources of noise include excavation equipment, pavement saw cutting, pumps and generators, boilers used for CIPP curing operations, compaction equipment, and other construction equipment. A noise permit and noise variance will be obtained from the State Department of Health (DOH) to allow noise limits to be temporarily exceeded. Most of the noise will be generated during the normal daytime work hours. Due to the need to maintain sewage flow, there will be a need to operate pumps (housed in sound-reducing enclosures) at night. CIPP rehabilitation work will also typically extend into night and early morning hours due to the time required to cure the liner. Since the work will progress from one area to another, the noise will generally be localized and temporary in nature. The contractor will have an incentive to limit the noise since the noise permit and variance may be revoked by DOH if there are excessive complaints.

6. Question: Will there be dust problems?

Answer: Some dust will be generated by the construction operations. The contractor will be required to water down the site to control dust.

7. Question: What will be the condition of the roads following the project?

Answer: The road pavement damaged during the work will be restored to the original preconstruction conditions to the extent possible. Some unevenness, however, may be unavoidable. Significant road pavement damage is not expected due to the use of trenchless pipe rehabilitation methods and because the majority of the temporary bypass lines will be located aboveground. Pavement damage will occur primarily in the vicinity of manholes due to work on the manholes and the need for buried temporary bypass lines in the road between manholes and sidewalk.

8. Question: What are alternatives were considered?

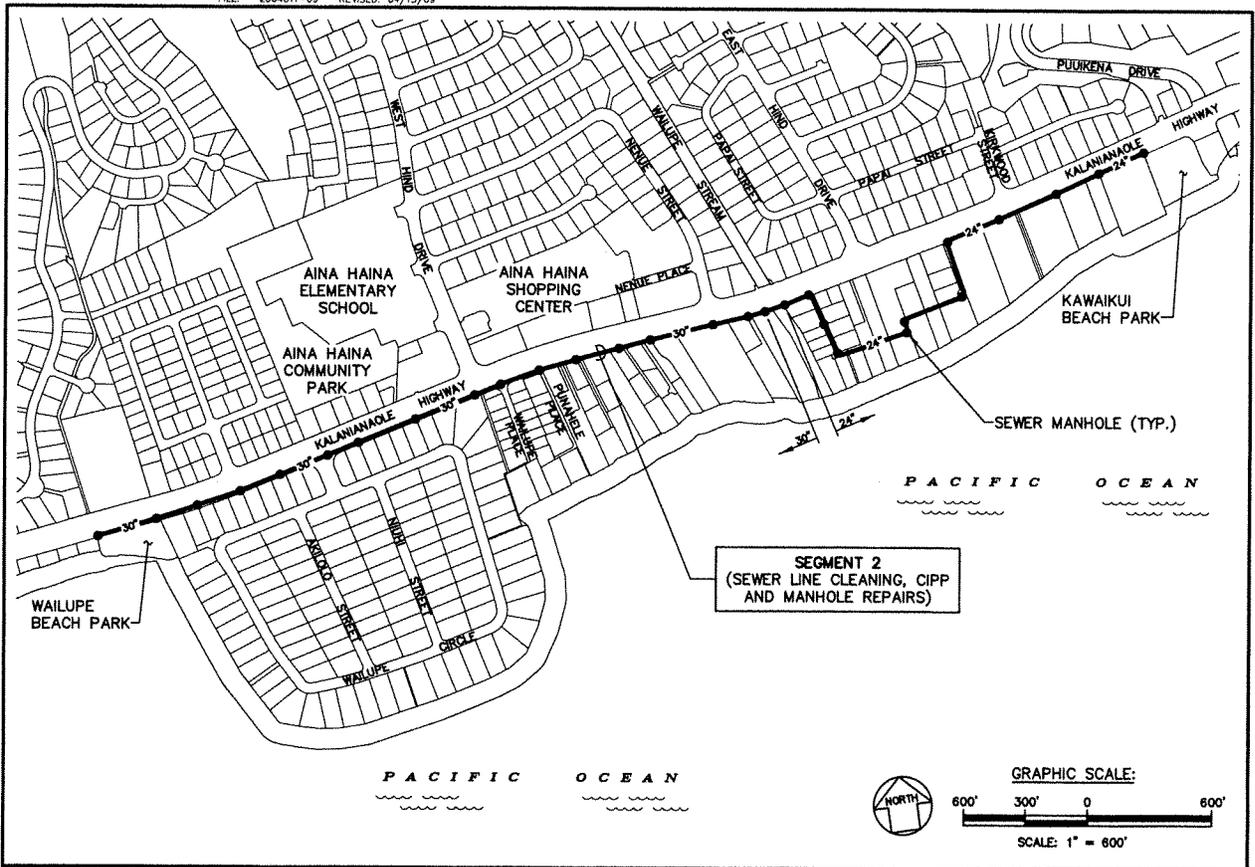
Answer: Various options involving installation of new sewer lines to increase the flow capacity and replace the aging lines were evaluated. Cleaning and rehabilitation of the system, however, was considered to be more cost-effective due to lower costs and substantially less traffic and environmental impacts. The proposed project is estimated to cost less than \$10 million whereas new sewer lines could potentially cost \$30 million or more. Construction of new sewers would require heavy construction work and extensive highway lane closures for up to several years.

9. Question: Where can I find more information on the project?

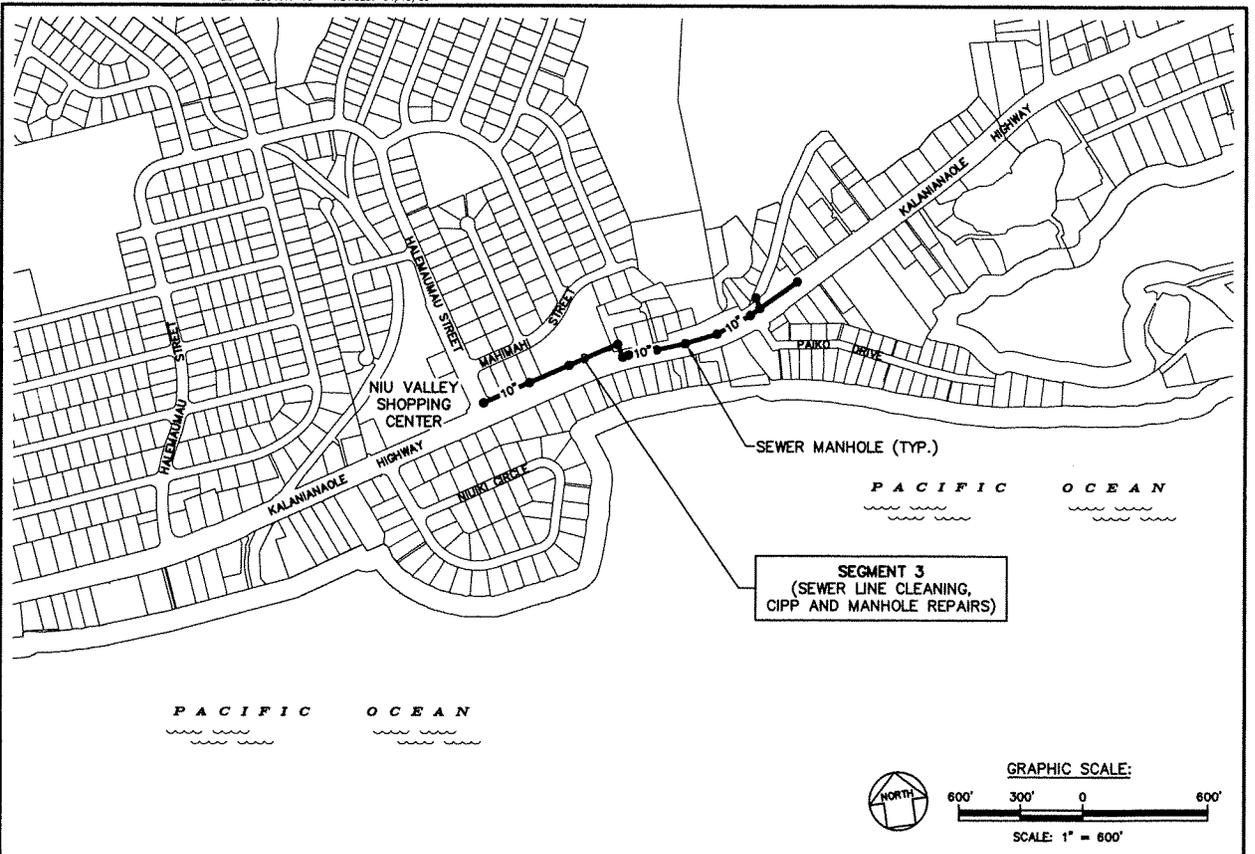
Answer: Please contact:

Roy Abe
HDR|Hawaii Pacific Engineers
1132 Bishop Street, Suite 1003
Honolulu, HI 96813

Facsimile: (808) 538-0445
Email: roy.abe@hdrinc.com



<p>Hawaii Pacific Engineers, Inc.</p>	<p>KALANIANA'OLE HIGHWAY SEWER SYSTEM IMPROVEMENTS EAST HONOLULU, OAHU, HAWAII</p>	<p>LOCATION MAP FOR SEGMENT 2</p>	<p>FIGURE 3</p>
---------------------------------------	--	-----------------------------------	-----------------



<p>Hawaii Pacific Engineers, Inc.</p>	<p>KALANIANA'OLE HIGHWAY SEWER SYSTEM IMPROVEMENTS EAST HONOLULU, OAHU, HAWAII</p>	<p>LOCATION MAP FOR SEGMENT 3</p>	<p>FIGURE 4</p>
---------------------------------------	--	-----------------------------------	-----------------



United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122, Box 50088
Honolulu, Hawaii 96850



RECEIVED
MAR 18 2009
HDR | HAWAII PACIFIC ENGINEERS

In Reply Refer To:
12200-2009-FA-0058

Mr. Roy Abe
HDR Hawaii Pacific Engineers
1132 Bishop Street, Suite 1003
Honolulu, HI 96813

MAR 16 2009

Subject: Kalaniana'ole Highway Sewer System Improvements Project

Dear Mr. Abe:

The U.S. Fish and Wildlife Service (Service) has received the notice of intent to produce a Draft Environmental Assessment (DEA) for the Kalaniana'ole Highway Sewer System Improvements project, O'ahu, Hawai'i. This letter has been prepared under the authority of and in accordance with provisions of the Clean Water Act of 1977 [33 USC 1251 et seq.; 91 Stat. 1566], as amended; the Endangered Species Act of 1973 [16 U.S.C. 1531 et seq.; 87 Stat. 884], as amended; and other authorities regarding Federal trust resources. Based on these authorities, we offer the following comments for your consideration.

The City and County of Honolulu proposes to resolve capacity problems and repair system defects that result in sewage spills. The cleaning and rehabilitation of existing sewer lines will occur along Kalaniana'ole Highway (from Niu Valley to Wailupe Beach Park) and along the Kahala Beach coastline.

Fish and wildlife resources occur adjacent to the proposed project area and the potential exists for sewer spillage events during the system cleaning and rehabilitation. The DEA should include an analysis of the potential for the proposed project to impact listed species and Federal trust resources. Particular attention should be given to potential construction-related impacts to: endangered and threatened species, including sea turtles and seabirds; migratory seabirds and shorebirds; coral reefs; macroalgae beds; and rare, native species and habitats. We recommend that the indirect and cumulative effects of potential impacts over time be discussed in the DEA, and measures to avoid unnecessary impacts and minimize unavoidable impacts be included.

The February 2009 Project Fact Sheet mentions that dust will be generated by the construction operations and that the contractor will be watering down the site to control dust. Fine sediment suspended by project-related activities may abrade, settle on, and smother established coral colonies, algae meadows, or sessile organisms that occur within the nearshore environment. We

Mr. Roy Abe

recommend that absorbent pads be used in these areas along the project area boundary to prevent additional surface runoff into the adjacent marine environment.

During the proposed nighttime lane closures (8:30 p.m. to 5:00 a.m.), lights in the construction area should be shielded and directed downward to help reduce the likelihood of seabird collisions with tall equipment and other structures. Standard Fish and Wildlife Best Management Practices should be incorporated into the project to avoid or minimize the project-related degradation of water quality conditions that may impact fish and wildlife resources (enclosed).

We appreciate the opportunity to coordinate early on in the development of this project and recommend that these comments be addressed in the DEA. If you have questions regarding these comments, please contact Fish and Wildlife Biologist Nadiera C. Sukhraj at (808) 792-9410 or Nadiera_Sukhraj@fws.gov.

Sincerely,

[Handwritten signature of Patrick Leonard]

Patrick Leonard
Field Supervisor

- cc: ACOE, Honolulu District
NMFS-PIRO, Honolulu
USEPA-PICO, Honolulu
HDAR, Honolulu
HCWB, Honolulu
HCZMP, Honolulu



**U.S. Fish and Wildlife Service
Recommended Standard Best Management Practices**

The Fish and Wildlife Service recommends that the following measures be incorporated into projects to minimize the degradation of water quality and adverse impacts to fish and wildlife resources.

1. Turbidity and siltation from project-related work shall be minimized and contained to within the vicinity of the site through the appropriate use of effective silt containment devices and the curtailment of work during adverse tidal and weather conditions.
2. Dredging/filling in the marine environment shall be scheduled to avoid coral spawning and recruitment periods and sea turtle nesting and hatching periods.
3. Dredging and filling activities in the marine/aquatic environment shall be designed to avoid or minimize the loss of beach and special aquatic site (coral reefs, wetlands, streams etc.) habitat, and any ecological functions unavoidably lost as a result of the project shall be replaced.
4. All project-related materials and equipment (dredges, barges, backhoes etc) to be placed in the water shall be cleaned of pollutants prior to use.
5. No project-related materials (fill, revetment rock, pipe etc.) shall be stockpiled in the water (intertidal zones, reef flats, stream channels, wetlands etc.);
6. All debris removed from the marine/aquatic environment shall be disposed of at an approved upland or ocean dumping site.
7. No contamination (trash or debris disposal, non-native species introductions attraction of non-native pests etc.) of adjacent marine/aquatic environments (reef flats, channels, open ocean, stream channels, wetlands, beaches, forests etc.) shall result from project-related activities. This shall be accomplished by implementing a litter-control plan and developing a Hazard Analysis and Critical Control Point Plan (HACCP – see <http://www.haccp-nrm.org/Wizard/default.asp>) to prevent attraction and introduction of non-native species.
8. Fueling of project-related vehicles and equipment shall take place away from the water and a contingency plan to control petroleum products accidentally spilled during the project shall be developed. Absorbent pads and containment booms shall be stored on-site, if appropriate, to facilitate the clean-up of accidental petroleum releases.
9. Any under-layer fills used in the project shall be protected from erosion with stones (or core-loc units) as soon after placement as practicable.
10. Any soil exposed near water as part of the project shall be protected from erosion (with plastic sheeting, filter fabric etc.) after exposure and stabilized as soon as practicable (with native or non-invasive vegetation matting, hydroseeding etc.).



1132 Bishop Street, Suite 1003
Honolulu, Hawaii 96813-2830
Phone: (808) 524-3771 Fax: (808) 538-0445

April 24, 2009

Mr. Patrick Leonard, Field Supervisor
United States Department of the Interior
Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122, Box 50088
Honolulu, Hawaii 96850

Dear Mr. Leonard:

SUBJECT: Kalaniana'ole Highway Sewer System Improvements Project
Pre-assessment Consultation for Draft Environmental Assessment

On behalf of the Department of Design and Construction, City and County of Honolulu, thank you very much for reviewing the proposed project information and for your correspondence of March 16, 2009.

We acknowledge your concerns of potential construction-related impacts to fish and wildlife resources in the project area. A discussion of the impacts and mitigation measures to be employed will be addressed in the Draft Environmental Assessment (DEA). The "Recommended Standard Best Management Practices" will be included in the project's contract documents to minimize adverse impacts to water quality and fish and wildlife resources.

Thank you for your interest and participation in the pre-assessment consultation phase of the environmental review process. A copy of your letter and this response will be included in the DEA. A copy of the DEA will be forwarded to you shortly. Should you have any questions, please contact me at 522-7425 or at roy.abe@hdrinc.com.

Very truly yours,

Roy K. Abe
Vice President

cc: Carl Arakaki, Dept. of Design and Construction, Planning Branch
Clifford Kanda, Dept. of Design and Construction, Design Branch



Mr. Roy K. Abe
March 5, 2009
Page 2

03016PJF.09

RECEIVED

MAR 10 2009

HDR | HAWAII PACIFIC ENGINEERS

STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. BOX 3378
HONOLULU, HAWAII 96801-3378

March 5, 2009

In reply, please refer to
EMD / CWB

03016PJF.09

Mr. Roy K. Abe
Vice President
Hawaii Pacific Engineers, Inc.
1132 Bishop Street, Suite 1003
Honolulu, Hawaii 96813-2830

Dear Mr. Abe:

**SUBJECT: Kalaniana'ole Highway Sewer System Improvements
East Honolulu, Island of Oahu, Hawaii**

The Department of Health, Clean Water Branch (CWB), has reviewed the subject plan and offers these comments on your project. Please note that our review is based solely on the information provided in the subject plan and its compliance with Hawaii Administrative Rules (HAR), Chapters 11-54 and 11-55. You may be responsible for fulfilling additional requirements related to our program. We recommend that you also read our standard comments on our website at <http://www.hawaii.gov/health/environmental/env-planning/landuse/CWB-standardcomment.pdf>.

1. Any project and its potential impacts to State waters must meet the following criteria:
 - a. Antidegradation policy (HAR, Section 11-54-1.1), which requires that the existing uses and the level of water quality necessary to protect the existing uses of the receiving State water be maintained and protected.
 - b. Designated uses (HAR, Section 11-54-3), as determined by the classification of the receiving State waters.
 - c. Water quality criteria (HAR, Sections 11-54-4 through 11-54-8).
2. You are required to obtain a National Pollutant Discharge Elimination System (NPDES) permit for discharges of wastewater, including storm water runoff, into State surface waters (HAR, Chapter 11-55). For the following types of discharges into Class A or Class 2 State waters, you may apply for NPDES general permit coverage by submitting a Notice of Intent (NOI) form:

- a. Storm water associated with construction activities, including clearing, grading, and excavation, that result in the disturbance of equal to or greater than one (1) acre of total land area. The total land area includes a contiguous area where multiple separate and distinct construction activities may be taking place at different times on different schedules under a larger common plan of development or sale. An NPDES permit is required before the start of the construction activities.
- b. Hydrotesting water.
- c. Construction dewatering effluent.

You must submit a separate NOI form for each type of discharge at least 30 calendar days prior to the start of the discharge activity, except when applying for coverage for discharges of storm water associated with construction activity. For this type of discharge, the NOI must be submitted 30 calendar days before to the start of construction activities. The NOI forms may be picked up at our office or downloaded from our website at <http://www.hawaii.gov/health/environmental/water/cleanwater/forms/genl-index.html>.

3. For types of wastewater not listed in Item 2 above or wastewater discharging into Class 1 or Class AA waters, you may need an NPDES individual permit. An application for an NPDES individual permit must be submitted at least 180 calendar days before the commencement of the discharge. The NPDES application forms may be picked up at our office or downloaded from our website at <http://www.hawaii.gov/health/environmental/water/cleanwater/forms/indiv-index.html>.
4. You must also submit a copy of the NOI or NPDES permit application to the State Department of Land and Natural Resources, State Historic Preservation Division (SHPD), or demonstrate to the satisfaction of the CWB that SHPD has or is in the process of evaluating your project. Please submit a copy of your request for review by SHPD or SHPD's determination letter for the project along with your NOI or NPDES permit application, as applicable.
5. Please note that all discharges related to the project construction or operation activities, whether or not NPDES permit coverage and/or Section 401 Water Quality Certification are required, must comply with the State's Water Quality Standards. Noncompliance with water quality requirements contained in HAR, Chapter 11-54, and/or permitting requirements, specified in HAR, Chapter 11-55, may be subject to penalties of \$25,000 per day per violation.

Mr. Roy K. Abe
March 5, 2009
Page 3

03016PJF.09



1132 Bishop Street, Suite 1003
Honolulu, Hawaii 96813-2830
Phone: (808) 524-3771 Fax: (808) 538-0445

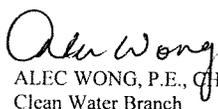
6. The Clean Water Act, Section 303(d) list of impaired water bodies in Chapter IV of the 2006 State of Hawaii Water Quality Monitoring and Assessment Report was reviewed for the following water bodies:

Water Body Name	TMDL Priority	Category	Not Attaining
Wai'ala'e Beach Co. Park	Low	3, 5	enterococci
Kahala Beach Shoreline	Not Listed	3	unknown
Kahala Hilton Beach	Not Listed	3	unknown
Wailupe Beach Park	Not Listed	3	unknown
Kawaikui Beach Park	Low Priority	3, 5	enterococci

Any NPDES permit(s) for discharges into these water bodies will incorporate the requirement for the Permittee to develop and implement project-specific Waste Load Allocation (WLA) implementation and monitoring plan when a Total Maximum Daily Load (TMDL) which specifies WLAs applicable to the Permittee's project is approved by the U.S. Environmental Protection Agency (EPA). The Permittee shall incorporate and implement the project-specific WLA implementation and monitoring plan as part of the project's Storm Water Pollution Control Plan or Site-Specific Best Management Practices (BMPs) Plan, as appropriate. The project-specific WLA implementation and monitoring plan shall include Data Quality Objectives (DQO) and Quality Assurance (QA) and Quality Control (QC) methods. The purpose and goal of DQO process can be found at <http://www.hanford.gov/dqo>. Information on the DOH WLA Implementation and TMDLs are available on the DOH Environmental Planning Office website at <http://hawaii.gov/health/environmental/env-planning/wqm/wqm.html> (see *TMDL Technical Reports and Implementation Plans for approved TMDLs are available here for download in pdf format*).

If you have any questions, please visit our website at <http://www.hawaii.gov/health/environmental/water/cleanwater/index.html>, or contact the Engineering Section, CWB, at 586-4309.

Sincerely,


ALEC WONG, P.E., CHIEF
Clean Water Branch

JF:cu

April 24, 2009

Mr. Alec Wong, P.E., Chief
State of Hawaii
Department of Health
Clean Water Branch
P.O. Box 3378
Honolulu, Hawaii 96801-3378

Dear Mr. Wong:

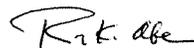
SUBJECT: Kalaniana'ole Highway Sewer System Improvements Project
Pre-assessment Consultation for Draft Environmental Assessment

On behalf of the Department of Design and Construction, City and County of Honolulu, thank you very much for reviewing the proposed project information and for your correspondence of March 5, 2009.

We acknowledge that the project and any potential impacts will be required to comply with the policies and regulations indicated in your letter. The water quality regulations, permitting requirements and impact mitigation measures will be addressed in detail in the Draft Environmental Assessment (DEA).

Thank you for your interest and participation in the pre-assessment consultation phase of the environmental review process. A copy of your letter and this response will be included in the DEA. A copy of the DEA will be forwarded to you shortly. Should you have any questions, please contact me at 522-7425 or at roy.abe@hdrinc.com.

Very truly yours,



Roy K. Abe
Vice President

cc: Carl Arakaki, Dept. of Design and Construction, Planning Branch
Clifford Kanda, Dept. of Design and Construction, Design Branch

LINDA LINGLE
GOVERNOR OF HAWAII



CHIYOME LEINAALA FUKINO, M.D.
DIRECTOR OF HEALTH

LINDA LINGLE
GOVERNOR OF HAWAII



LATRA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RECEIVED
FEB 17 2009

STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. BOX 3378
HONOLULU, HAWAII 96801

In reply, please refer to:
EMD / WB
LUD-O Kalaniana'ole Hwy

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

HDR | HAWAII PACIFIC ENGINEERS

February 11, 2009

February 27, 2009

Mr. Roy Abe
HDR/Hawaii Pacific Engineers
1132 Bishop Street Suite 1003
Honolulu, Hawaii 96813

HDR/Hawaii Pacific Engineers
1132 Bishop Street Suite 1003
Honolulu, Hawaii 96813

RECEIVED
MAR 3 2009

Dear Mr. Abe:

Attention: Mr. Roy Abe

HDR | HAWAII PACIFIC ENGINEERS

Subject: Kalaniana'ole Highway Sewer System Improvements
Request for Pre-Assessment Comments on Upcoming Environmental
Assessment and Notice of Informational Meeting
Along Kalaniana'ole Highway - from Niu Valley to Wailupe Beach Park

Ladies and Gentlemen:

Subject: Pre-Assessment for Environmental Assessment for Kalaniana'ole Highway
Sewer System Improvement Project

Thank you for allowing us the opportunity to review the above subject project which states the upcoming Kalaniana'ole Highway Sewer System Improvements project. We have the following comments and information on the above subject property:

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 comment.

We have no objections to the upcoming sewer system improvements and are in agreement with the improvements to effectively and safely serve the residents of Honolulu with new and properly operating sewer system needs. We further appreciate the invitation to participate in the public informational meeting but decline attendance as we have no objections to the proposal.

Other than the comments from Engineering Division, Land Division, Division of Boating & Ocean Recreation, the Department of Land and Natural Resources has no other comments to offer on the subject matter. Should you have any questions, please feel free to call our office at 587-0433. Thank you.

Should you have any questions, please contact the Planning & Design Section of the Wastewater Branch at 586-4294.

Sincerely,

Sincerely,

TOMAS S. SEE, P.E., CHIEF
Wastewater Branch

Morris M. Atta
Administrator

c: City & County of Honolulu's Jeff Lee
DOH's Environmental Planning Office Jiakai Liu



LAURA H. THELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RECEIVED
LAND DIVISION

2009 FEB 27 P 2:32

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

DEPT. OF LAND &
NATURAL RESOURCES
STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LD/MorrisAtta
Ref.: PreAssessEAKalaniana'oleHwySewerImpvts
Oahu.661

COMMENTS

- () We confirm that the project site, according to the Flood Insurance Rate Map (FIRM), is located in Flood Zone ____.
- () Please take note that the project site, according to the Flood Insurance Rate Map (FIRM), is located in Flood Zone ____.
- () Please note that the correct Flood Zone Designation for the project site according to the Flood Insurance Rate Map (FIRM) is ____.
- () 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:

- () 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. Kelly Gomes at (808) 961-8327 (Hilo) or Mr. Kiran Emler at (808) 327-3530 (Kona) of the County of Hawaii, Department of Public Works.
- () Mr. Francis Cerizo at (808) 270-7771 of the County of Maui, Department of Planning.
- () Mr. Mario Antonio at (808) 241-6620 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.

() Additional Comments: _____

(X) **Other: We do not have any objections for the cleaning and rehabilitation of existing sewer lines located along Kalaniana'ole Highway (from Niu Valley to Wailupe Beach) and along the Kahala Beach Coastline.**

Should you have any questions, please call Ms. Suzie Agraan of the Planning Branch at 587-0258.

February 6, 2009

MEMORANDUM

TO: **DLNR Agencies:**
 Div. of Aquatic Resources
 Div. of Boating & Ocean Recreation
 Engineering Division
 Div. of Forestry & Wildlife
 Div. of State Parks
 Commission on Water Resource Management
 Office of Conservation & Coastal Lands
 Land Division -Oahu District

FROM: *for* Morris M. Atta *Charlene*
SUBJECT: Pre-Assessment for environmental assessment for Kalaniana'ole Highway Sewer System Improvement Project
LOCATION: Honolulu, Oahu
APPLICANT: HDR/Hawaii Pacific Engineers, Inc.

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by March 1, 2009.

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 my office at 587-0433. Thank you.

Attachments

- We have no objections.
- We have no comments.
- Comments are attached.

Signed: *Eric T. Hiranano*
Date: *2/27/09*

Signed: *Eric T. Hiranano*
ERIC T. HIRANO, CHIEF ENGINEER

Date: *2/27/09*

LINDA LINGLE
GOVERNOR OF HAWAII



LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

LINDA LINGLE
GOVERNOR OF HAWAII



LAURA H. THIELEN
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

February 6, 2009



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

February 6, 2009

MEMORANDUM

TO: **DLNR Agencies:**
 Div. of Aquatic Resources
 Div. of Boating & Ocean Recreation
 Engineering Division
 Div. of Forestry & Wildlife
 Div. of State Parks
 Commission on Water Resource Management
 Office of Conservation & Coastal Lands
 Land Division - Oahu District

FROM: *for* Morris M. Atta *Charlene*
SUBJECT: Pre-Assessment for environmental assessment for Kalaniana'ole Highway Sewer System Improvement Project
LOCATION: Honolulu, Oahu
APPLICANT: HDR/Hawaii Pacific Engineers, Inc.

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by March 1, 2009.

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 my office at 587-0433. Thank you.

Attachments

- We have no objections.
- We have no comments.
- Comments are attached.

Signed: *[Signature]*
Date: 2/10/09

RECEIVED
LAND DIVISION
2009 FEB 11 P 2:05
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

MEMORANDUM

From: TO: **DLNR Agencies:**
 Div. of Aquatic Resources
 Div. of Boating & Ocean Recreation
 Engineering Division
 Div. of Forestry & Wildlife
 Div. of State Parks
 Commission on Water Resource Management
 Office of Conservation & Coastal Lands
 Land Division - Oahu District

To: FROM: *for* Morris M. Atta *Charlene*
SUBJECT: Pre-Assessment for environmental assessment for Kalaniana'ole Highway Sewer System Improvement Project
LOCATION: Honolulu, Oahu
APPLICANT: HDR/Hawaii Pacific Engineers, Inc.

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by March 1, 2009.

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 my office at 587-0433. Thank you.

Attachments

- We have no objections.
- We have no comments.
- Comments are attached.

Signed: *[Signature]*
Date: 2/19/09 *pc*

LINDA LINGLE
GOVERNOR



STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

BRENNON T. MORIOKA
DIRECTOR

Deputy Directors
MICHAEL D. FORMBY
FRANCIS PAUL KEENO
BRIAN H. SEKIGUCHI
JIRO A. SUMADA

IN REPLY REFER TO:

STP 8.3151

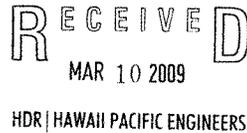


1132 Bishop Street, Suite 1003
Honolulu, Hawaii 96813-2830
Phone: (808) 524-3771 Fax: (808) 538-0445

March 5, 2009

April 24, 2009

Mr. Roy Abe
Hawaii Pacific Engineers, Inc.
1132 Bishop Street, Suite 1003
Honolulu, Hawaii 96813-2830



Mr. Brennon T. Morioka, Ph.D., P.E., Director
State of Hawaii
Department of Transportation
869 Punchbowl Street
Honolulu, Hawaii 96813-5097

Dear Mr. Abe:

Dear Mr. Morioka:

Subject: Kalaniana'ole Highway Sewer System Improvements
Pre-Consultation for Upcoming Environmental Assessment and
Notice of Informational Meeting

SUBJECT: Kalaniana'ole Highway Sewer System Improvements Project
Pre-assessment Consultation for Draft Environmental Assessment

Thank you for requesting the State Department of Transportation's (DOT) review of the subject project.

On behalf of the Department of Design and Construction, City and County of Honolulu, thank you very much for reviewing the proposed project information and for your correspondence of March 5, 2009.

DOT understands that the subject pre-consultation addresses a proposed project by the City and County of Honolulu ("City") involving the cleaning and rehabilitation of the existing sewer lines located along Kalaniana'ole Highway (Niu Valley to Wailupe Beach Park) and along the Wailupe-Kahala Beach coastline. The project will require temporary lane closures on Kalaniana'ole Highway and the restoration of any resultant damage to the highway or right-of-way.

We acknowledge your comments regarding motorist/pedestrian safety and your request for advanced project coordination/consultation with the State Department of Transportation (DOT) Highways Division Planning Branch. Traffic impacts will be discussed in detail in the Draft Environmental Assessment (DEA). Provisions in the construction plans and specifications will require the contractor to minimize impacts to motorists and pedestrians to the extent possible. A traffic assessment study for the project has been prepared by Austin, Tsutsumi & Associates, Inc. and will be included in the DEA. A copy of the study and proposed traffic control lane plans for the proposed lane closures have been forwarded to the Highways Division Construction and Maintenance Branch for comments.

The proposed project is not anticipated to cause significant, adverse impacts to the State highway, Kalaniana'ole Highway, and highway right-of-way. During the project activity, DOT expects that the City and its project contractor will exercise all reasonable best management practices to avoid or minimize impacts to motorists and their safety. DOT requests that the City undertake all necessary advance coordination and consultation with the DOT Highways Division Planning Branch, at telephone no. (808) 587-1830, and the Oahu District Office, at telephone no. (808) 831-6703.

Thank you for your interest and participation in the pre-assessment consultation phase of the environmental review process. A copy of your letter and this response will be included in the DEA. A copy of the DEA will be forwarded to you shortly. Should you have any questions, please contact me at 522-7425 or at roy.abe@hdrinc.com.

DOT appreciates the opportunity to provide comments and requests four (4) copies of the project Draft Environmental Assessment (DEA) be provided to the Highways Division, ATTN: Planning Branch. If there are any other questions, please contact Mr. David Shimokawa of the DOT Statewide Transportation Planning Office at (808) 587-2356.

Very truly yours,

Very truly yours,

Roy K. Abe
Vice President

BRENNON T. MORIOKA, PH.D., P.E.
Director of Transportation

cc: Carl Arakaki, Dept. of Design and Construction, Planning Branch
Clifford Kanda, Dept. of Design and Construction, Design Branch

PHONE (808) 594-1888



FAX (808) 594-1865

STATE OF HAWAII
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAII 96813

Roy Abe, Vice President
February 25, 2009
Page 2

HRD09/4133

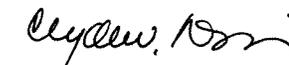
constitutionally protected traditional and customary purposes, in accordance with the Hawai'i State Constitution, Article XII, Section 7.

OHA requests clarification about whether an archaeological inventory survey for the project will be submitted to the State Historic Preservation Division for review and approval. If so, OHA should be allowed the opportunity to comment on the criteria assigned to any cultural or archaeological sites identified within the archaeological inventory survey.

We also request the applicant's assurances that should iwi kūpuna or Native Hawaiian cultural or traditional deposits be found during the construction of the project, work will cease, and the appropriate agencies will be contacted pursuant to applicable law.

Thank you for the opportunity to comment. We look forward to reviewing your forthcoming Draft EA and providing further comments at that time. If you have additional questions, please contact Heidi Guth by phone at (808) 594-1462 or e-mail her at heidig@oha.org.

'O wau iho nō me ka 'oia'i'i'o,


Clyde W. Nāmu'o
Administrator

February 23, 2009

RECEIVED
MAR 4 2009

HDR | HAWAII PACIFIC ENGINEERS

Roy Abe, Vice President
HDR/Hawaii Pacific Engineers
1132 Bishop Street, Suite 1003
Honolulu, HI 96813

RE: Request for Pre-Assessment Comments on Upcoming Environmental Assessment and Notice of Informational Meeting for Kalaniana'ole Highway Sewer System Improvements.

Aloha e Roy Abe,

The Office of Hawaiian Affairs (OHA) has received the above-mentioned letter dated February 2, 2009. The City and County of Honolulu's Department of Design and Construction and its consultant HDR/Hawaii Pacific Engineers propose the Kalaniana'ole Highway Sewer Systems Improvements project. This project includes cleaning and rehabilitating the current sewer lines along Kalaniana'ole Highway and the Kahala Beach coastline. OHA has reviewed the project and offers the following comments.

OHA has substantive obligations to protect the cultural and natural resources of Hawai'i for its beneficiaries, the people of this land. The Hawaii Revised Statutes mandate that OHA "[s]erve as the principal public agency in the State of Hawaii responsible for the performance, development, and coordination of programs and activities relating to native Hawaiians and Hawaiians; . . . and [t]o assess the policies and practices of other agencies impacting on native Hawaiians and Hawaiians, and conducting advocacy efforts for native Hawaiians and Hawaiians." (HRS § 10-3)

Chapter 343 of the Hawaii Revised Statutes (HRS) requires that the Draft Environmental Assessment (EA) include a Cultural Impact Assessment (CIA). The CIA should include information relating to the traditional and customary practices and beliefs of the proposed project area's Native Hawaiians, and the community should be involved in this assessment. Consideration must also be afforded to any individuals accessing the project area for

DEPARTMENT OF FACILITY MAINTENANCE
CITY AND COUNTY OF HONOLULU

1000 Uluohia Street, Suite 215, Kapolei, Hawaii 96707
Phone: (808) 768-3343 • Fax: (808) 768-3381
Website: www.honolulu.gov



1132 Bishop Street, Suite 1003
Honolulu, Hawaii 96813-2830
Phone: (808) 524-3771 Fax: (808) 538-0445

April 24, 2009

Mr. Clyde W. Nāmu'ō
State of Hawaii
Office of Hawaiian Affairs
711 Kapiolani Boulevard, Suite 500
Honolulu, Hawaii 96813

Dear Mr. Nāmu'ō:

SUBJECT: Kalaniana'ole Highway Sewer System Improvements Project
Pre-assessment Consultation for Draft Environmental Assessment

On behalf of the Department of Design and Construction, City and County of Honolulu, thank you very much for reviewing the proposed project information and for your correspondence of February 23, 2009.

We acknowledge your comments regarding the need to protect cultural, archeological and natural resources in the project area, and the requirement for a Cultural Impact Assessment (CIA). Archaeological monitoring of the excavation work associated with the project is proposed based on the recommendations of the archaeological literature review, field inspection and cultural background study conducted by our subconsultant, Cultural Surveys Hawaii, Inc. (CSH). The CSH study will be submitted to the State Historic Preservation Division and included in the DEA. Due to potential use of Federal stimulus funds for the project, consultation procedures will conform to National Historic Preservation Act Section 106 requirements. The CIA findings will be included in the Draft Environmental Assessment (DEA).

Thank you for your interest and participation in the pre-assessment consultation phase of the environmental review process. A copy of your letter and this response will be included in the DEA. A copy of the DEA will be forwarded to you shortly. Should you have any questions, please contact me at 522-7425 or at roy.abe@hdrinc.com.

Very truly yours,

Roy K. Abe
Vice President

cc: Carl Arakaki, Dept. of Design and Construction, Planning Branch
Clifford Kanda, Dept. of Design and Construction, Design Branch

MUFI HANNEMANN
MAYOR

RECEIVED
MAR 6 2009

HDR | HAWAII PACIFIC ENGINEERS



February 27, 2009

Mr. Roy Abe
HDR Hawaii Pacific Engineers
1132 Bishop Street, Suite 1003
Honolulu, Hawaii 96813

Dear Mr. Abe:

Subject: Pre-Assessment Comments on Upcoming Environmental
Assessment and Notice of Informational Meeting
Kalaniana'ole Highway Sewer System Improvements

Thank you for the opportunity to provide pre-assessment comments on the upcoming environmental assessment for the subject proposed sewer system improvements project.

Kalaniana'ole Highway is a State Department of Transportation roadway and our only comment at this time regarding the project is that the sewer line improvement work may affect the City's morning traffic contra-flow lane. The contra-flow lane from Niu Valley to the H-1 Freeway starts at 5:30 am and ends at 9:30 am. We request that the Draft Environmental Assessment addresses the effects the proposed project may have on the contra-flow lane and on our Division of Road Maintenance operations of placing and removing the traffic cones and signs designating this lane.

Should you have any questions, please call Charles Pignataro of the Division of Road Maintenance at 768-3697.

Sincerely,

Jeffrey S. Cudiamat, P.E.
Acting Director and Chief Engineer



1132 Bishop Street, Suite 1003
 Honolulu, Hawaii 96813-2830
 Phone: (808) 524-3771 Fax: (808) 538-0445

April 24, 2009

Mr. Jeffrey S. Cudiamat, P.E.
 Director and Chief Engineer
 City and County of Honolulu
 Department of Facility Maintenance
 1000 Uluohia Street, Suite 215
 Kapolei, Hawaii 96707

Dear Mr. Cudiamat:

SUBJECT: Kalaniana'ole Highway Sewer System Improvements Project
 Pre-assessment Consultation for Draft Environmental Assessment

On behalf of the Department of Design and Construction, City and County of Honolulu, thank you very much for reviewing the proposed project information and for your correspondence of February 27, 2009.

We acknowledge your concerns related to the impact on the morning traffic contra-flow lane and your department's placement and removal of cones. Lane closures for the proposed project will be prohibited during the hours of the morning contra-flow lane. A 30-minute buffer from the start and end times of the contra-flow lane cone and sign placement work will be implemented at the request of the State Department of Transportation. A traffic assessment study for the project has been prepared by Austin, Tsutsumi & Associates, Inc. and will be included in the Draft Environmental Assessment (DEA).

Thank you for your interest and participation in the pre-assessment consultation phase of the environmental review process. A copy of your letter and this response will be included in the DEA. A copy of the DEA will be forwarded to you shortly. Should you have any questions, please contact me at 522-7425 or at roy.abe@hdrinc.com.

Very truly yours,

Roy K. Abe
 Vice President

cc: Carl Arakaki, Dept. of Design and Construction, Planning Branch
 Clifford Kanda, Dept. of Design and Construction, Design Branch

DEPARTMENT OF PLANNING AND PERMITTING
CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET, 7TH FLOOR • HONOLULU, HAWAII 96813
 PHONE: (808) 768-8000 • FAX: (808) 768-6041
 DEPT. WEB SITE: www.honolulu.gov • CITY WEB SITE: www.honolulu.gov

MUFI HANNEMANN
 MAYOR

RECEIVED

MAR 12 2009



March 10, 2009

HDR | HAWAII PACIFIC ENGINEERS

DAVID K. TANOUÉ
 DIRECTOR

ROBERT M. SUMITOMO
 DEPUTY DIRECTOR

2009/ELOG-404(MH)

Mr. Roy Abe
 HDR Hawaii Pacific Engineers, Inc.
 1132 Bishop Street, Suite 1003
 Honolulu, Hawaii 96813-2830

Dear Mr. Abe:

Subject: Pre-Assessment Consultation for
 Kalaniana'ole Highway Sewer System Improvements

In response to your request for comments of February 2, 2009 regarding the preparation of the Draft Environmental Assessment (DEA) for the subject project, we have the following comments:

1. The DEA should include a discussion of how the proposed project is consistent with the objectives and policies of Section V Transportation and Utilities in the City and County of Honolulu's General Plan. Refer to objectives B and C, and applicable policies of this referenced section.
2. The DEA should also discuss how the proposed project is consistent with Section 4.3 Wastewater Treatment of the East Honolulu *Sustainable Communities Plan*.
3. The subject project is exempt from Special Management Area (SMA) requirements pursuant to Section 25-1.3(2)(B) and (D) of the Revised Ordinances of Honolulu, as amended.
4. The DEA should further include a complete listing of required permits and approvals.

Should you have any questions, please contact Matt Higashida of our staff at 768-8045.

Very truly yours,

David K. Tanoue, Director
 Department of Planning and Permitting

DKT:js

cc: Office of Environmental Quality Control
 Department of Design and Construction

P:\DivFunction\Ea-eis\2009\Pre Assessment Comments on Kalaniana'ole Highway Sewer System Improvements.doc



1132 Bishop Street, Suite 1003
 Honolulu, Hawaii 96813-2830
 Phone: (808) 524-3771 Fax: (808) 538-0445

DEPARTMENT OF TRANSPORTATION SERVICES
 CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET, 3RD FLOOR
 HONOLULU, HAWAII 96813
 Phone: (808) 768-8305 • Fax: (808) 523-4730 • Internet: www.honolulu.gov

MUFI HANNEMANN
 MAYOR



WAYNE Y. YOSHIOKA
 ACTING DIRECTOR

SHARON ANN THOM
 DEPUTY DIRECTOR

April 24, 2009

Mr. David K. Tanoue, Director
 City and County of Honolulu
 Department of Planning and Permitting
 650 South King Street, 7th Floor
 Honolulu, Hawaii 96813

Dear Mr. Tanoue:

SUBJECT: Kalaniana'ole Highway Sewer System Improvements Project
 Pre-assessment Consultation for Draft Environmental Assessment

On behalf of the Department of Design and Construction, City and County of Honolulu, thank you very much for reviewing the proposed project information and for your correspondence of March 10, 2009.

We acknowledge your comments indicating that the project should be consistent with the City and County of Honolulu's General Plan and the East Honolulu Sustainable Communities Plan, and that the project is exempt from Special Management Area requirements. The project's compliance with the two abovementioned plans will be discussed by the Draft Environmental Assessment (DEA). A complete listing of required permits and approvals will be included in the DEA as suggested.

Thank you for your interest and participation in the pre-assessment consultation phase of the environmental review process. A copy of your letter and this response will be included in the DEA. A copy of the DEA will be forwarded to you shortly. Should you have any questions, please contact me at 522-7425 or at roy.abe@hdrinc.com.

Very truly yours,

Roy K. Abe
 Vice President

cc: Carl Arakaki, Dept. of Design and Construction, Planning Branch
 Clifford Kanda, Dept. of Design and Construction, Design Branch

RECEIVED
 FEB 20 2009

February 18, 2009

TP2/09-298276R

HDR | HAWAII PACIFIC ENGINEERS

Mr. Roy K. Abe, Vice President
 HDR/Hawaii Pacific Engineers
 1132 Bishop Street, Suite 1003
 Honolulu, Hawaii 96813-2830

Dear Mr. Abe:

Subject: Kalaniana'ole Highway Sewer System Improvements

This responds to your letter of February 2, 2009, requesting consultation and comments in preparing an Environmental Assessment for the subject project.

The department reserves comment on the project pending the preparation of a traffic impact study for the EA document. Upon completion of the study, we request that a copy be forwarded to our department for review and comment.

Very truly yours,

WAYNE Y. YOSHIOKA
 Acting Director



1132 Bishop Street, Suite 1003
 Honolulu, Hawaii 96813-2830
 Phone: (808) 524-3771 Fax: (808) 538-0445

April 24, 2009

Mr. Wayne Yoshioka, Director
 City and County of Honolulu
 Department of Transportation Services
 650 South King Street, 3rd Floor
 Honolulu, Hawaii 96813

Dear Mr. Yoshioka:

SUBJECT: Kalaniana'ole Highway Sewer System Improvements Project
 Pre-assessment Consultation for Draft Environmental Assessment

On behalf of the Department of Design and Construction, City and County of Honolulu, thank you very much for reviewing the proposed project information and for your correspondence of February 18, 2009.

A traffic assessment study for the project has been prepared by Austin, Tsutsumi & Associates, Inc. and will be included in the Draft Environmental Assessment (DEA).

Thank you for your interest and participation in the pre-assessment consultation phase of the environmental review process. A copy of your letter and this response will be included in the DEA. A copy of the DEA will be forwarded to you shortly. Should you have any questions, please contact me at 522-7425 or at roy.abe@hdrinc.com.

Very truly yours,

Roy K. Abe
 Vice President

cc: Carl Arakaki, Dept. of Design and Construction, Planning Branch
 Clifford Kanda, Dept. of Design and Construction, Design Branch

DEPARTMENT OF PARKS & RECREATION
CITY AND COUNTY OF HONOLULU

1000 Ulukouia Street, Suite 309, Kapolei, Hawaii 96707
 Phone: (808) 768-3003 • Fax: (808) 768-3053
 Website: www.honolulu.gov

MUFI HANNEMANN
 MAYOR



LESTER K. C. CHANG
 DIRECTOR

GAIL Y. HARAGUCHI
 DEPUTY DIRECTOR

RECEIVED
 MAR 3 2009

February 26, 2009

HDR | HAWAII PACIFIC ENGINEERS

Mr. Roy Abe
 HDR/Hawaii Pacific Engineers
 1132 Bishop Street, Suite 1003
 Honolulu, Hawaii 96813

Dear Mr. Abe:

Thank you for your informative letter dated February 2, 2009, regarding your upcoming project to rehabilitate the existing sewer lines located along Kalaniana'ole Highway and along the Kahala Beach coastline.

The information provided in your letter did not specifically indicate what impact your project will have on the aforementioned three beach park properties. Specifically, what are your expectations in using Waialae Beach Park, Waiupe Beach Park and Kawaiui Beach Park?

Please contact my secretary, Carolyn, at 768-3001 to schedule an appointment with me to discuss how your project will affect our beach properties. Keep in mind that we wish to avoid disturbances to the daily recreational experiences at our beach properties. As such, we recommend that you weigh any request for use of our properties with the impact that will affect the neighboring community and park users.

Sincerely,

LESTER K. C. CHANG
 Director

LKCC:fe
 (298282)



1132 Bishop Street, Suite 1003
Honolulu, Hawaii 96813-2830
Phone: (808) 524-3771 Fax: (808) 538-0445

April 24, 2009

Mr. Lester K.C. Chang, Director
City and County of Honolulu
Department of Parks & Recreation
1000 Uluohia Street, Suite 309
Kapolei, Hawaii 96707

Dear Mr. Chang:

SUBJECT: Kalaniana'ole Highway Sewer System Improvements Project
Pre-assessment Consultation for Draft Environmental Assessment

On behalf of the Department of Design and Construction, City and County of Honolulu, thank you very much for reviewing the proposed project information and for your correspondence of February 26, 2009.

Discussions on the impacts to the City parks and proposed mitigation measures will be included in the Draft Environmental Assessment (DEA). Additional detailed information will be forwarded shortly for your review and comments in response to concerns expressed at the March 9, 2009 meeting with you and your staff.

Thank you for your interest and participation in the pre-assessment consultation phase of the environmental review process. A copy of your letter and this response will be included in the DEA. A copy of the DEA will be forwarded to you shortly. Should you have any questions, please contact me at 522-7425 or at roy.abe@hdrinc.com.

Very truly yours,

Roy K. Abe
Vice President

cc: Carl Arakaki, Dept. of Design and Construction, Planning Branch
Clifford Kanda, Dept. of Design and Construction, Design Branch

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843



February 9, 2009

MUFI HANNEMANN, Mayor
RANDALL Y. S. CHUNG, Chairman
SAMUEL T. HATA
ALLY J. PARK
ROBERT K. CUNDIFF
JEFFREY S. CUDIAMAT, Ex-Officio
BRENNON T. MORIOKA, Ex-Officio
WAYNE M. HASHIRO, P.E.
Manager and Chief Engineer
DEAN A. NAKANO
Deputy Manager and Chief Engineer

RECEIVED
FEB 11 2009

HDR | HAWAII PACIFIC ENGINEERS

Mr. Roy K. Abe, Vice President
HDR/Hawaii Pacific Engineers, Inc.
1132 Bishop Street, Suite 1003
Honolulu, Hawaii 96813

Dear Mr. Abe:

Subject: Your Letter Dated February 2, 2009 Requesting Pre-Assessment Comments on the Environmental Assessment for Kalaniana'ole Highway Sewer System Improvements

Thank you for the opportunity to comment on the proposed project

We have no objections to the proposed project.

If you have any questions, please contact Robert Chun at 748-5443.

Very truly yours,

KEITH S. SHIDA
Program Administrator
Customer Care Division



1132 Bishop Street, Suite 1003
Honolulu, Hawaii 96813-2830
Phone: (808) 697-6222 Fax: (808) 697-6201

MEMORANDUM

To: Files **Date:** February 12, 2009
From: Roy Abe and Eric Okamura **Project:** 2004011
Project: Kalaniana'ole Highway Sewer System Improvements
Subject: Summary of Public Information Meeting on 12 February 2009 at Aina Haina Elementary School, 7:00 pm
Attendees: See attached list

1. The purposes of the meeting were to inform the community of the project, discuss and solicit input on the City's application for a noise variance permit, solicit comments prior to the Draft Environmental Assessment preparation, and respond to questions from the residents and business owners that will be affected by the project.
2. Eric Okamura presented a PowerPoint slide show that explained the purpose of the meeting; discussed the design team and stakeholders; addressed the project background and need for the project; described the project and proposed construction methods; and explained the project challenges, impacts and solutions. See attached copy of PowerPoint slides that were distributed to the attendees. The attached project fact sheet was also provided to the attendees.
3. A question and answer session was conducted at the end of the slide show. Questions and comments from the attendees and responses to the questions are summarized below (responses are in italics).
 - Would you still be able to use you toilets and faucets while the work is being conducted? *Eric indicated that residents will have uninterrupted sewer service. All laterals will be connected to a temporary bypass line.*
 - How long is the project going to last? How long is each stage of the project going to take? *Eric indicated that the project specifications indicate that the contractor will have 18 months to finish the project. The work will not remain in a single area. The work will move along the sewer line.*
 - A resident indicated that he is concerned about tax dollars being wasted by having to redo work in areas multiple times. He identified Kapiolani Boulevard as an example where trenching was conducted and months later more trenching was conducted in the same area. *Eric indicated that the cleaning and cured-in-place pipe (CIPP) rehabilitation work will be conducted first. After this is completed, the contractor will return to rehabilitate the manholes. Eric indicated that trenching will be limited to shallow bury, temporary bypass lines.*

Memorandum
February 12, 2009
Page 2 of 4

- The same resident asked why can't the work be completed all at one time? Wouldn't it be more cost effective to do one segment, complete it, and then move on to the new segment? *Guy Inouye indicated that typically for CIPP rehabilitation work, the line is first CIPP lined and then the manholes are rehabilitated. The sewer line and manholes can not be rehabilitated at the same time. There are separate contractors for each type of work. Temporary bypass lines will be necessary because the sewer lines being rehabilitated need to be "dry" during the CIPP process. The bypass line will generally be located aboveground except for where it would interrupt traffic such as at intersections and driveways.*
- In the area where the sewer line running off of Kalaniana'ole Highway and passing through private properties, is the bypass line going to be aboveground running through yards? *Clifford Kanda indicated that the main bypass line would be located along Kalaniana'ole Highway and laterals from each lot would be connected to the main bypass line. The bypass lines used to connect the laterals would likely be aboveground. Eric indicated that the contractor will coordinate his work with the residents and businesses in the area.*
- Has the contractor been selected? *Eric indicated that the project is still in the final design phase and the project has not yet been advertised.*
- Are contractors that are currently doing this kind of work on other parts of the island going to be the ones that possibly do the work? *Yes. Although a mainland contractor may also be selected.*
- A resident who lives on Keahia Way indicated that there is a storm drain located below the road. The State Department of Transportation (DOT) has concerns whether the structural integrity of the storm drain will be weakened if heavy equipment is located on the road for a significant amount of time. *Eric indicated that HDR\HPE will research the storm drain construction drawings and retain a structural engineer to ensure that road will be able to support the weight of the equipment.*
- The resident of Keahia Way indicated that he would like a copy of whatever the DOT approves for the road since the DOT will hold the residents in the area responsible for anything that happens to the road. *HDR\HPE will provide a copy of all information and correspondences with DOT to the resident.*
- The informational meeting letter stated that the contractor is to restore the road to its original condition, but the contractor hasn't been selected yet. How do we know that the contractor that is selected is going to restore the road to its original condition? *The project documents indicate that the contractor must restore all improvements (pavements, walls, landscaping, etc.) damaged from his construction.*
- What is the estimated start date of the project and will they be working on all three areas at once, or are they going to be working from segment 1 to segment 3 or vice

versa? *The project is estimated to begin construction in August of this year. The contractor will determine the sequence of the work. Guy indicated that as the construction date gets closer, the contractor will conduct an informational meeting before beginning construction. The contractor will have a 24 hour hotline that residents can call if they have any concerns.*

- *A resident who lives on Keahia Way indicated that the informational meeting letter indicated that work at each staging area will last for a few weeks. His house is located at the makai end of Keahia Way and he wanted to know how long the equipment would block his driveway. He also mentioned that he supported the project and he understands that the City needs to repair its sewer system. Eric indicated that the high capacity cleaning equipment could clean approximately 300 feet per day depending on the amount of debris in the sewer line. Eric indicated that the exact amount of debris in the sewer line is not known. Eric indicated that the equipment is capable of cleaning 2,000 feet of sewer line from a single point. The resident was informed that the cleaning equipment may be located in front of his driveway for two weeks. He did not have a problem with that.*
- *A resident was concerned on how are spills going to be handled? The contractor is required to contain and cleanup all spills.*
- *Waiialae Golf Course personnel (Dave Nakama) asked if the country club will have input as to when the equipment will be staged at the golf course. He indicated that the golf course has events throughout the year. There are certain times during the year that the work would best accommodate the golf course. Eric indicated that he should let HDR\HPE know when would be the best time for the work to be conducted on the golf course property. HDR\HPE would include those dates in the project documents. This will allow the contractor to plan his work schedule and adjust his bid as necessary. After the construction contract is awarded and before construction starts, a second informational meeting will be held. At that time, the contractor's schedule will be presented.*
- *How long is the CIPP expected to last compared to regular sewer pipes? CIPP liner is expected to last approximately 50 years. It is non-corrosive and seamless, which prevents infiltration through joints.*
- *A person who conducts weddings at Calvary by the Sea Church was concerned as to when the work near the church would be conducted. Eric indicated that he has met with church personnel and they indicated that the first two weeks of August would be the best time because there are no weddings scheduled and the preschool is not in session. These dates will be included in the project documents.*
- *The person asked whether the work would be conducted this August or next August. Eric indicated that it is likely that the work would be conducted next August given the fact the construction for this project is expected to begin this August.*
- *The person also asked if the work would be completed within the two week period. Eric indicated that the work should be completed with the two weeks.*

- *Is the traffic going to be rerouted for the east bound lanes during the evening rush hour, similar to how it is done during the morning rush hour? No. The project documents indicate that no lane closures along Kalaniana'ole Highway are allowed during the morning and evening rush hours (5:00 a.m. to 9:00 a.m. and 3:00 p.m. to 8:30 p.m.).*

Summary of E-mailed Comments

Ms. Moe Hinkforth, Parish Administrator, Calvary by the Sea Lutheran Church, email received on February 4, 2009.

Ms. Annie Deweese, Administration/Admissions, Calvary by the Sea Montessori School, email received on February 4, 2009.

Comments:

Ms. Hinkforth's Comments:

"Calvary by the Sea Lutheran Church, 5339 Kalaniana'ole Hwy, has ongoing indoor and outdoor weddings scheduled throughout this time period.

We have concerns about the noise and the trucks that would be required to be in front of and on our property which has very limited parking. I believe we have a manhole on the church property as well. The noise would be devastating to our weddings.

In addition to the weddings we have safety concerns regarding the heavy foot traffic on Thursday and Friday to our property from Kalaniana'ole Hwy. from bus riders, bike riders and homeless who come to our Food Bank. Our church property *also* houses a preschool from ages 2-6 with parents and children coming and going throughout the day. Road access is extremely tight and we have big concerns.

We need to have any information you can give us as to what we should be expecting from this project."

Ms. Deweese's Comments:

"Can you tell me the projected start date and duration of the Kalaniana'ole Hwy. Sewer System Improvement project?"

Follow-Up Information:

A meeting was held on February 9, 2009 with Mr. Hinkforth and representatives of the City (Mr. Clifford Kanda) and HDR/Hawaii Pacific Engineers (Mr. Eric Okamura) to discuss the project. It was concluded that the work within the church property could be performed during the annual two-week period in August when the preschool is not in session and weddings are not held.

Summary of E-mailed Comments

Mr. Walter Laskey, Keahia Way resident and owner, email received on February 8, 2008.

Comments:

"Thank you for your letter of Feb 2, 2009 regarding the sewer work and the equipment staging to be performed on Keahia Way. First let me say that my wife and I have no objection to any of your plans and it appears that we would probably be the most inconvenienced of everyone who lives on the roadway. Our home is on the makai Kokohead portion of the lane.

However, there are some things you should know before you proceed.

1. Keahia Way is private property owned jointly by my wife and I, and Mrs. Carole Beal.
2. I do not speak for any other resident on the lane and, of course, not for my co-owner, Mrs. Beal and her family.
3. The State of Hawaii has been granted an easement over the property permitting it to install, and requiring it to maintain, a box culvert type storm drain; the top of which serves as a replacement of the original roadway.

The easement was granted in 1954, so the State Department of Transportation may have some input for you with respect to the structural integrity of the makai end of the roadway on which you wish to move and store your equipment. I would request that you secure their approval for your project and copy Mrs. Beal and myself upon Brennon Morioka's approval.
4. Approximately three months ago the residents of the lane, at considerable expense to themselves, resurfaced the mauka portion of the roadway. While we believe the new concrete surface to be strong enough to support the normal traffic of passenger cars, light pickups and the occasional delivery van we cannot be certain that the unknown weight of your vehicles repeatedly traversing the new ramp will not damage it.
5. Please provide some assurances that any health issues with respect to spills on our property or the public beach where you will be operating will be adequately dealt with. Effluent hosed by the contractor onto the beach or our garden would not be considered adequate resolution. There are beachgoers including small barefoot children at play on the beach most weekends.
6. Please be aware that several survey and sanitation crews have frequented the site to try to locate the manhole which appears on your "Location Map for Segment 1" at the makai kokohead corner of my property. They have used probes, metal detecting devices and finally a backhoe to find the manhole under the sand. All to no Avail.
7. Finally, we believe that the work you are doing to renew our sewer system is essential and we are definitely supportive. We would ask that you consider the above with respect to weight and spills while you proceed."

Summary of E-mailed Comments (continued - Mr. Walter Laskey)

Follow-Up Information:

A structural engineer was retained to estimate the safe loading capacity of the driveway. It was determined that the driveway should be capable of withstanding wheel loads up to 4,000 pounds spaced not less than 6 feet apart. The contractor performing the work will be required to comply with these weight restrictions. Information on the proposed use of the driveway and the structural calculations will be sent to the State Department of Transportation for review and comments.

The contractor will be required to follow stringent spill prevention and mitigation measures that are included in the contract documents. In addition to the City's typical requirements for sewage spill prevention and control, the contract documents will include requirements for an impermeable liner and low berm around the cleaning equipment to minimize the impacts of any accidental spills. The contractor will be required to follow the City's and State Department of Health's sewage spill reporting and public notification procedures. Disinfection requirements are included as part of the sewage spill cleanup procedures.

Summary of Phone Conversation Comments

Mr. Gregg Kashiwa, Kalaniana'ole Highway resident near Wailupe Stream, phone conversation on October 22, 2008

Comments:

During the 2006 storm, sewage backed into Mr. Kashiwa's shower and spilled into the bathroom. A manhole cover at Wailupe Place was lifted off and dirty brown water spilled out. Mr. Kashiwa noted that this is a dangerous situation since kids play in the area. Also during the 2006 storm, there were sewage spills at Kawaikui Beach Park that entered the shoreline waters. Mr. Kashiwa and surfers posted warning signs.

Follow-Up Information:

Pertinent information provided by Mr. Kashiwa is incorporated into the body of the environmental assessment report.

Summary of Phone Conversation Comments

Mr. Robert Chang, Wailupe resident living near Wailupe Beach Park, phone conversation on February 20, 2008

Comments:

1. Impact of construction on ingress and egress from homes is a concern since this is difficult even under normal traffic conditions.
2. Mr. Chang recalls two incidents in about the past 15 years of monk seals on the beach. The last incident was a few months ago. This was reported to the State Department of Land and Natural Resources.
3. There are a few resident sea turtles in the area between the park and Mr. Chang's home. During low tide, the turtles tend to be in the deeper channel near Wailupe Circle.
4. Fishermen often get together at Wailupe Beach Park and they would be a good source of information.
5. Oopu can be found in the streams. They can be found upstream or where the stream empties into the ocean.
6. The area has rare Eleele limu, which is a long green limu (maiden's hair), usually in fall. It is found in brackish water where fresh water enters the shoreline. The area also has ogo.
7. Kolea (plover) frequents the beach along with other water birds.
8. University of Hawaii students (marine biology students) have come out to study the fish in the area.

Follow-Up Information:

Pertinent information provided by Mr. Chang is incorporated into the body of the environmental assessment report.